

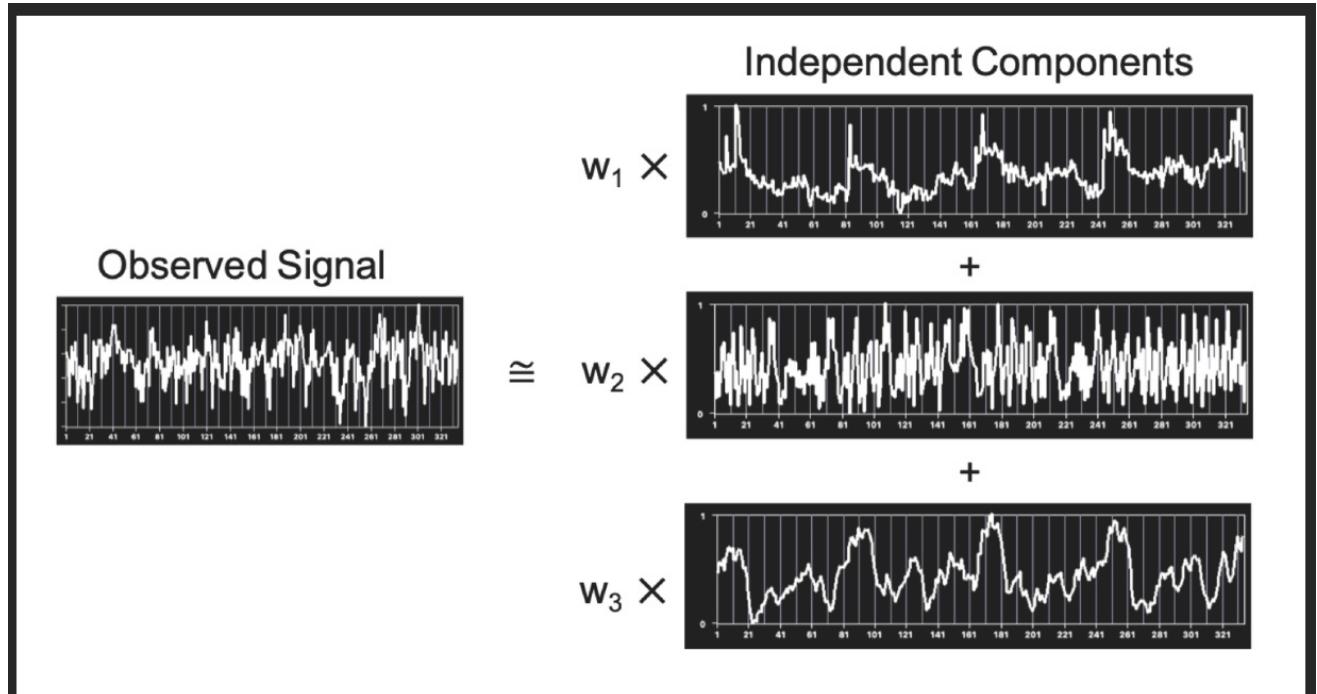
Klasyfikacja Komponentów mózgowych ICA

Uwagi o zbiorze danych i komponentach ICA

\

ICA - czyli Independent Component Analysis to technika stosowana w wielu dziedzinach związanych z analizą sygnału, której celem jest wydzielenie tzw. Niezależnych Komponentów - czyli rozkład sygnału na pewne fale składowe, dające kontrybucję do całości sygnału. To rozdział wielowymiarowego sygnału na niegaussowskie sygnały. Przykładem takiej dekompozycji jest rozwiązanie problemu Coctail party i z ogólnego harmideru i hałasu, czy da się wydzielić głosy poszczególnych uczestników zabawy. Staramy się następnie znaleźć, jakie komponenty, w których **mixing matrix** będzie skutecznie dawała nam niezależne kanały. Każda taka macierz ma za zadanie dać nam maksymalnie niezależne komponenty.

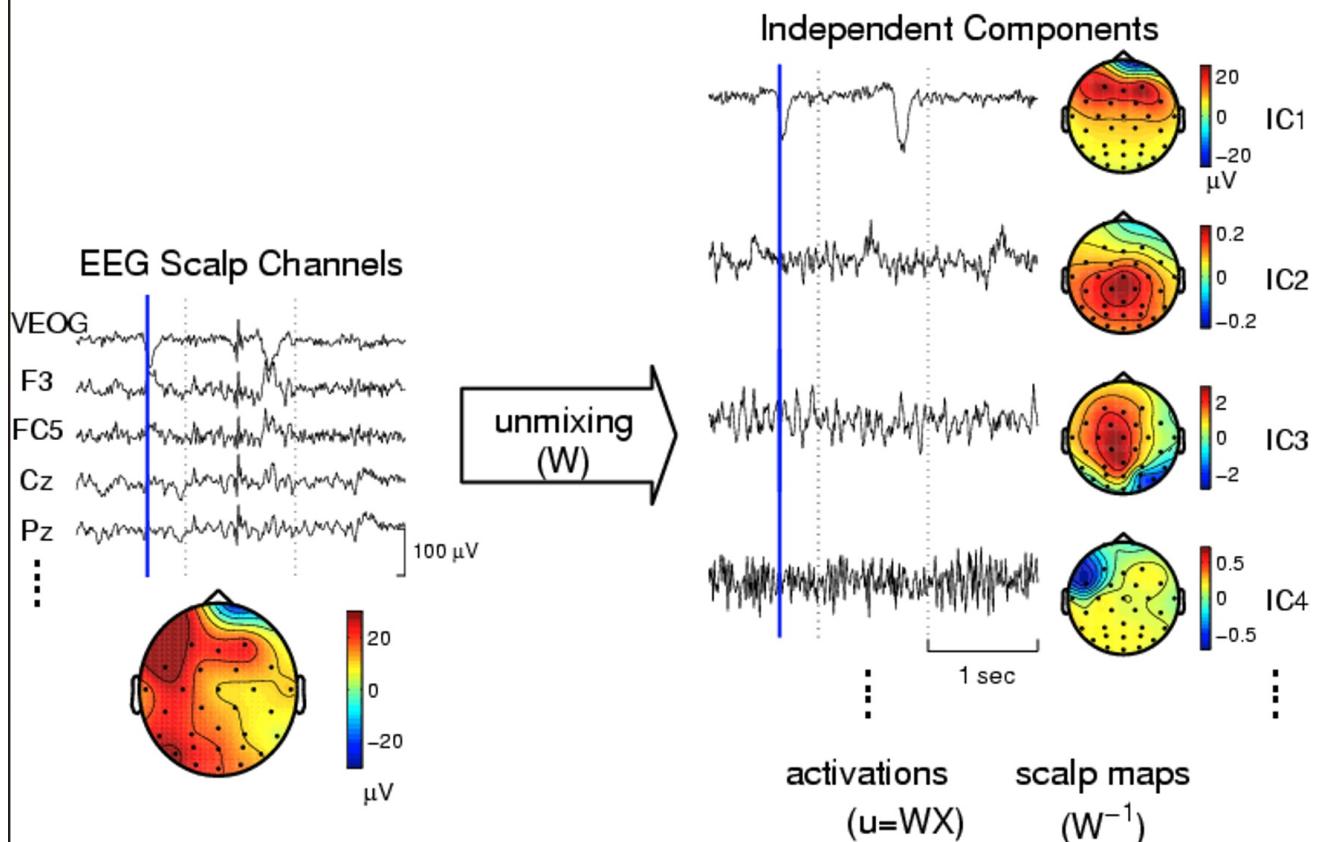
Innymi słowy nas całociowy sygnał, jest dany jako **mixing matrix** przemnożone przez szereg czasowy poszczególnych komponentów z dodatkiem szumu. - każdy Mixing matrix -**będzie obrazował nasz komponent ICA**



W przypadku danych Elektrofizjologicznych, a szczególnie danych mózgowych, ICA służy do wydzielenia pewnych źródeł aktywności mózgowej, która składa się na obserwowany przez nas przy pomocy EEG, mocno zagmatwany i zaszumiony sygnał. Możemy dzięki temu z czasowego sygnału EEG, uzyskać komponenty, gdzie większa katywność będzie widoczna na pewnych konkretnie ułożonych w przestrzeni elektrodach - tym samym, można wnioskować o źródle tego konkretnego komponentu:

Mixing Matrix, w przypadku neurofizjologii będzie więc obrazowało, jaka wartość będzie rejestrowana na każdej z elektrod, dając nam określone źródło aktywności.

ICA decomposition



Natomiast ICA nie będzie klasyfikowało jedynie źródła mózgowe - ponieważ liczy się tutaj tylko sygnał Elektrofizjologiczny! Oznacza to, że ruchy oczu, mięśni, bicie serca, a nawet otaczające badanego urządzenia elektryczne również mogą pojawić się jako niezależne komponenty! --> trzeba w takim razie móc je skutecznie odfiltrować.

Istnieją pewne konkretne metody by wykonywać tą operację automatycznie, jednak szczególnie w badaniach, gdzie wymagana jest duża ilość komponentów - dalsze analizy ICA będą dawały komponenty niezbyt wyraźne i mało konkretne: odróżnienie tego typu komponentów, dokonuje się więc najczęściej manualnie - co jest niezwykle żmudne i czasochłonne. Prócz tego, odróżnienie komponentów mózgowych od artefaktów jest Ekstremalnie trudne i wymaga wprawy - szacuje się, że nawet doświadczony ekspert może osiągnąć skuteczność maksymalnie 90%

Dlatego właśnie w tym projekcie chciałbym zeksplorować, czy możliwe jest zautomatyzowanie procesu przez zastosowanie modeli uczenia maszynowego zarówno dla danych koreacyjnych jak i danych topograficznych i czy da się to wykorzystać w praktyce?'

zbiór danych który jest tutaj rozważany pochodzi ze zbiorów Instytutu Psychologii. Zawiera on podział na testowe i treningowe zbiory zawierające obrazki, zalabelowane jako rozkład topograficzny aktywności elektrofizjologicznej dla sygnałów pochodzących z mózgu, oraz tych które z mózgu nie pochodzą.

Mamy też zbiory testowe i treningowe z danych koreacyjnych, które kojarzą, dany komponent wydzielony przez Analizę ICA, z z amplitudą, częstotliwością, fazą itp. sygnału z elektrod referencyjnych - to znaczy umieszczonego na Mastoidach (uszy) oraz w okolicznych (EOG) lub serca (EKG) - Koreacje te, będą informowały o występowaniu artefaktów.

Inferencja Mózgowych komponentów z danych koreacyjnych

Ładowanie danych

Pliki z danymi koreacyjnymi są przechowywane w formie struktur **.mat** - mogą one być problematyczne do odczytania. Do tego, dane dla każdej osoby są osobno przechowywane: potrzebujemy więc Customowego ładowania

Ładowanie plików mat dzieje się przez bibliotekę **mat4py**, to prosta biblioteka która ładuje pliki **mat** do słownika - opiera swoje działanie na **h5py** oraz **numpy**.

Interesują nas zmienne zapisane w wektorach, to znaczy

- **Eic_power_core** - Korelacja mocy (amplitudy) naszego sygnału z mocą elektrod referencyjnych (zarówno ocznych jak i masztoidowych)
- **Eic_spectrum_corr** - Korelacja spektrum naszego sygnału ze spektrum elektrod referencyjnych (zarówno ocznych jak i masztoidowych)
- **Kurtosis** - Kurtoza zapisu Elektrofizjologicznego: Duża, powinna świadczyć o artefaktach

- **Spect_flat**- Spektrum częstotliwościowe sygnału dla danego komponentu - Przez porównanie z brązowym szumem, może świadczyć o zasumieniu i potencjalnej artefaktowości naszego sygnału
- **Spect_one_over_f**- Miara analogiczna
- **elc_signal_corr**- Korelacja naszego sygnału elektrofizjologicznego z elektrodami referencyjnymi (zarówno ocznych jak i masztoidowych)
- **Y** - Target, określa czy komponent ICA pochodzi z mózgu czy też nie

```
In [30]: import numpy as np
from scipy.io import loadmat # this is the SciPy module that loads mat-files
import matplotlib.pyplot as plt
from datetime import datetime, date, time
import pandas as pd
!pip install mat4py

import mat4py

path = r'.\Data\Categorical_data\Cat_data.mat'
data = loadmat(path)
data
```

Requirement already satisfied: mat4py in c:\users\barak\anaconda3\lib\site-packages (0.5.0)

WARNING: Ignoring invalid distribution -atplotlib (c:\users\barak\anaconda3\lib\site-packages)
 WARNING: Ignoring invalid distribution -atplotlib (c:\users\barak\anaconda3\lib\site-packages)

```
Out[30]: {'__header__': b'MATLAB 5.0 MAT-file, Platform: PCWIN64, Created on: Sun Jun 5 21:04:31 2022',
 '__version__': '1.0',
 '__globals__': [],
 'Elc_power_core': array([[ 4.52676578],
 [ 4.37887548],
 [ 0.91510206],
 ...,
 [-0.42353748],
 [-0.25556756],
 [ 4.91048595]]),
 'Elc_spectrum_corr': array([[ 1.0928423 ],
 [ 1.07813647],
 [-0.41005008],
 ...,
 [ 0.65058311],
 [ 0.55955115],
 [ 0.96145656]]),
 'Kurtosis': array([[ 1.69228073],
 [ 0.27623607],
 [-0.19667112],
 ...,
 [ 0.14594967],
 [ 0.84518311],
 [-0.03987032]]),
 'Spect_flat': array([[ 4.50574635],
 [ 1.4191207 ],
 [-0.41444 ],
 ...,
 [ 0.73312987],
 [-0.40405524],
 [ 3.33068112]]),
 'Spect_one_over_f': array([[ 0.38304087],
 [ 0.6381942 ],
 [-2.47987478],
 ...,
 [ 0.39534112],
 [ 0.26541815],
 [ 0.50182401]]),
 'Y': array([[0, 0, 0, ..., 1, 1, 0]], dtype=uint8),
 'elc_signal_corr': array([[ 4.81287747],
 [ 4.58997282],
 [ 0.93090155],
 ...,
 [-0.52720811],
 [-0.30866144],
 [ 4.83842375]]),
 'None': MatlabOpaque([(b'unmx_table', b'MCOS', b'table', array([[3707764736],
 [ 2],
 [ 1],
 [ 1],
 [ 1],
 [ 1]]], dtype=uint32)),
 [ 1],
 [ 1],
 [ 1],
 [ 1],
 [ 1]]], dtype=uint32))},
 dtype=[('s0', 'O'), ('s1', 'O'), ('s2', 'O'), ('arr', 'O')]),
 '__function_workspace__': array([[ 0, 1, 73, ..., 0, 0, 0]], dtype=uint8)}
```

```
In [31]: list_of_variables = [data[i] for i in list(data.keys())[3:-2]]
```

```

for i in range(len(list_of_variables)-1):
    data_df = np.hstack((list_of_variables[i],list_of_variables[i+1].reshape(data['Elc_power_core'].shape)))
    list_of_variables[i+1] = data_df

data_df = list_of_variables[-1]
df_cat_data = pd.DataFrame(data_df,columns=list(data.keys())[3:-2])
df_cat_data

```

Out[31]:

	Elc_power_core	Elc_spectrum_corr	Kurtosis	Spect_flat	Spect_one_over_f	Y	elc_signal_corr
0	4.526766	1.092842	1.692281	4.505746	0.383041	0.0	4.812877
1	4.378875	1.078136	0.276236	1.419121	0.638194	0.0	4.589973
2	0.915102	-0.410050	-0.196671	-0.414440	-2.479875	0.0	0.930902
3	0.897985	0.918699	-0.170015	-0.151572	0.580709	1.0	1.889247
4	2.318681	0.866184	-0.362367	-0.356178	0.216521	1.0	0.632152
...
1419	-0.315888	-2.344171	-0.254116	-1.043731	-0.926009	1.0	-0.260976
1420	-0.396908	0.632625	1.069904	1.662334	0.380299	1.0	-0.505903
1421	-0.423537	0.650583	0.145950	0.733130	0.395341	1.0	-0.527208
1422	-0.255568	0.559551	0.845183	-0.404055	0.265418	1.0	-0.308661
1423	4.910486	0.961457	-0.039870	3.330681	0.501824	0.0	4.838424

1424 rows × 7 columns

In [32]: `data_df.shape`

Out[32]: (1424, 7)

Wizualizacja Danych

Korelacje zmiennych

Widac, że w większości przypadków zmienne mniej są ze sobą bardzo skorelowane. Jedynym wyjątkiem jest para `elc_signal_corr` oraz `Elc_power_core`, które są niezwykle silnie skorelowane (0.93) są to współczynniki korelacji mocy, oraz samego sygnału dla poszczególnego komponentu. Oba komponenty są fizycznie bardzo związane, także korelacja tutaj nie powinna dziwić.

Innymi słowy, gdyby model cierpał na niedokładność wynikającą z nadmiaru wymiarowości, można opuścić którąś z tych zmiennych

In [33]:

```

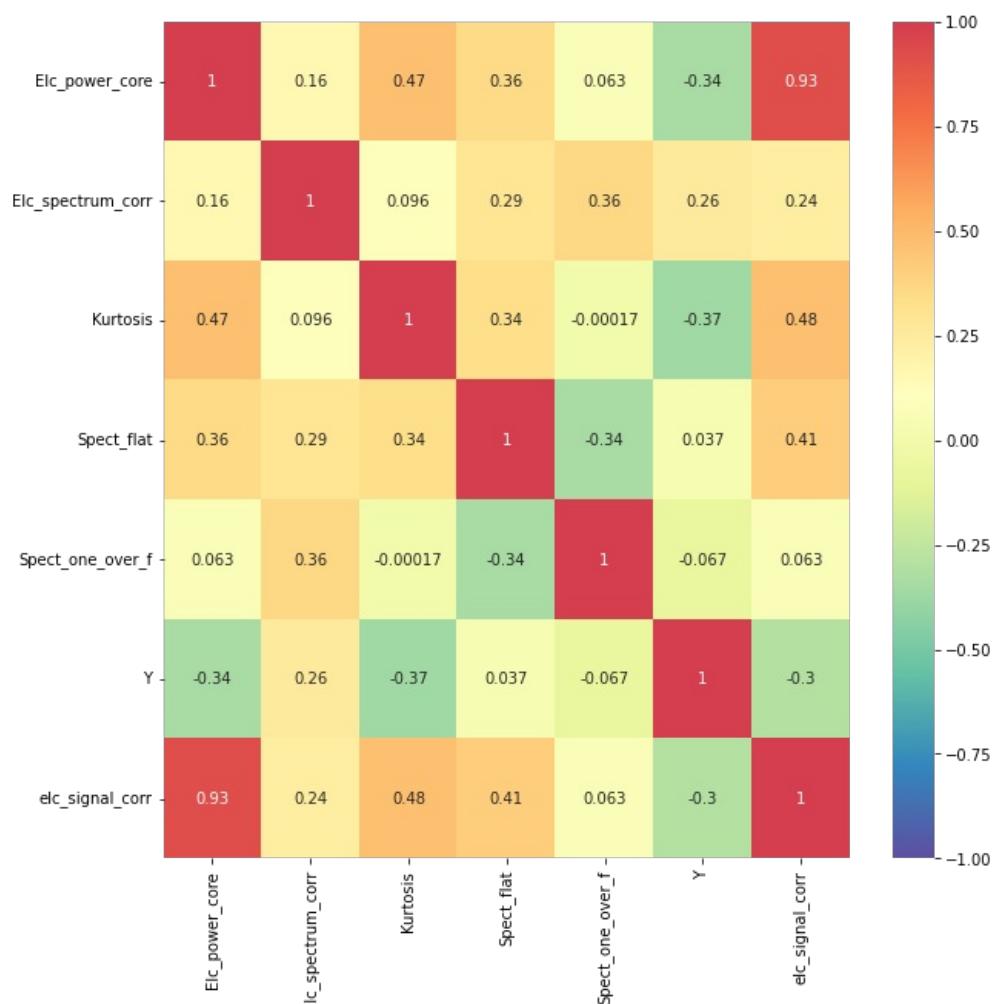
import seaborn as sns
from matplotlib import cm

from matplotlib.colors import ListedColormap, LinearSegmentedColormap
rainbow = cm.get_cmap('Spectral', 512).reversed()
newcmp = ListedColormap(rainbow(np.linspace(0.0, 0.9, 512)))

plt.figure(figsize=(10,10))
sns.heatmap(df_cat_data.corr(), annot=True, cmap=newcmp, vmin=-1, vmax=1)

```

Out[33]: <AxesSubplot:>



Rozkłady poszczególnych zmiennych

Można zauważyć, że poszczególne zmienne mają kształt prawie gaussowski, skoncentrowany w okół zera zazwyczaj jednak ich ogony są przesunięte w jedną lub drugą stronę.

Możemy jednak już teraz zauważać niezbalansowanie klas w przypadku zmiennej Y - czyli naszego targetu

```
In [34]: from matplotlib import cm
from matplotlib.colors import ListedColormap, LinearSegmentedColormap
viridisBig = cm.get_cmap('Spectral', 7)
newcmp = ListedColormap(viridisBig(np.linspace(0.1, 0.9, 7)))
newcmp

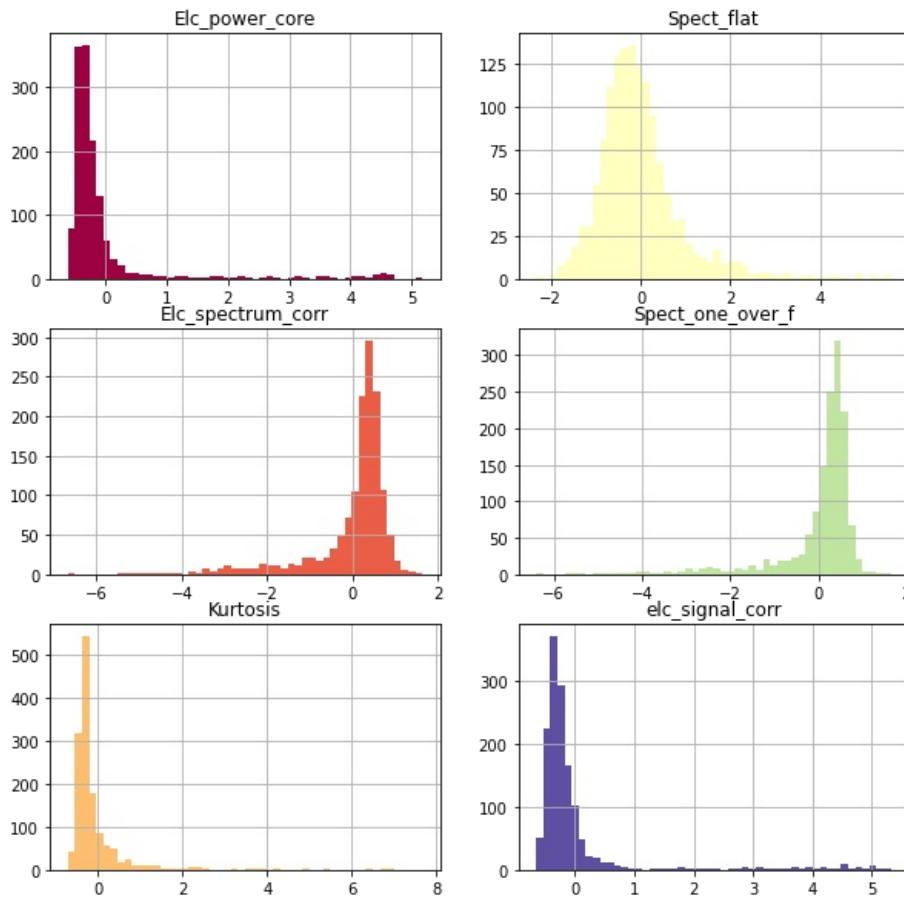
x_count = 0
y_count = 0
fig, axs = plt.subplots(3, 2, figsize=(10, 10))
for i, c in zip(df_cat_data.columns, newcmp.colors):
    if i != 'Y':
        bins = 50
```

```

if x_count ==3:
    x_count = 0;
    y_count+=1
axs[x_count,y_count].set_title('{}'.format(i))
axs[x_count,y_count].grid()

axs[x_count,y_count].hist(df_cat_data[i],color=c,bins=bins,histtype='stepfilled')
x_count +=1

```



```
In [35]: columns = list(df_cat_data.columns)
y = df_cat_data[columns.pop(columns.index('Y'))]
X = df_cat_data[columns]
X
```

```
Out[35]:
```

	Elc_power_core	Elc_spectrum_corr	Kurtosis	Spect_flat	Spect_one_over_f	elc_signal_corr
0	4.526766	1.092842	1.692281	4.505746	0.383041	4.812877
1	4.378875	1.078136	0.276236	1.419121	0.638194	4.589973
2	0.915102	-0.410050	-0.196671	-0.414440	-2.479875	0.930902
3	0.897985	0.918699	-0.170015	-0.151572	0.580709	1.889247
4	2.318681	0.866184	-0.362367	-0.356178	0.216521	0.632152
...
1419	-0.315888	-2.344171	-0.254116	-1.043731	-0.926009	-0.260976
1420	-0.396908	0.632625	1.069904	1.662334	0.380299	-0.505903
1421	-0.423537	0.650583	0.145950	0.733130	0.395341	-0.527208
1422	-0.255568	0.559551	0.845183	-0.404055	0.265418	-0.308661
1423	4.910486	0.961457	-0.039870	3.330681	0.501824	4.838424

1424 rows × 6 columns

Statystyki opisowe

Po statystykach opisowych można zobaczyć, że nie ma brakujących danych, oraz że wszystkie dane są już znormalizowane. Jest tak zapewne dlatego, że do wcześniejszych etapów analizy sygnału EEG podobne wartości musiały zostać już znormalizowane

```
In [36]: df_cat_data.describe()
```

	Elc_power_core	Elc_spectrum_corr	Kurtosis	Spect_flat	Spect_one_over_f	Y	elc_signal_corr
count	1424.000000	1424.000000	1424.000000	1424.000000	1424.000000	1424.000000	1424.000000
mean	0.003448	0.000675	-0.000028	0.002339	0.000352	0.773174	0.003398
std	0.999682	0.991504	0.991177	0.995099	0.991266	0.418926	0.999436
min	-0.615187	-6.668499	-0.710928	-2.326378	-6.406491	0.000000	-0.656688
25%	-0.408781	-0.065272	-0.376658	-0.581861	-0.013822	1.000000	-0.388645
50%	-0.301392	0.320280	-0.278876	-0.160632	0.312956	1.000000	-0.276072
75%	-0.119815	0.518118	-0.065211	0.328101	0.499670	1.000000	-0.089999
max	5.178304	1.648745	7.674776	5.568439	1.643076	1.000000	5.324390

Oversampling

Możemy jednak zauważyc, że mamy pewne niezbalansowanie klas i komponentów. Nie mózgowych jest niemalże 4-krotnie mniej niż mózgowych. By w takim razie taka dysproporcja nie zepsuła analizy, należy więc zrobić downsampling do takiej samej ilości.

```
In [37]: w_class0 = np.where(y == 0)[0]
w_class1 = np.where(y == 1)[0]
np.random.seed(42)
w_class1_downsampled = np.random.choice(w_class1, size=len(w_class0), replace=False,)

y_downsampled = y.T[list(w_class1_downsampled)+list(w_class0)].T
X_downsampled = X.T[list(w_class1_downsampled)+list(w_class0)].T
X_downsampled
```

	Elc_power_core	Elc_spectrum_corr	Kurtosis	Spect_flat	Spect_one_over_f	elc_signal_corr
424	-0.383156	0.312425	-0.395376	-0.029378	0.194582	-0.332317
890	-0.418842	0.295604	-0.064847	-0.006035	-0.161848	-0.276742
530	-0.398166	0.161468	-0.531966	-0.091394	-0.137076	-0.025037
930	-0.265137	-0.694364	-0.263941	0.490605	0.111724	-0.526616
316	-0.447911	0.636122	0.219626	0.270384	0.408550	-0.433138
...
1391	-0.350010	-2.075848	-0.331494	-0.856472	0.523360	-0.476979
1407	-0.285789	-1.890404	0.364231	-0.755692	0.142771	-0.286163
1409	-0.057344	-0.374161	-0.012187	-0.910260	-0.113822	-0.171705
1412	-0.377814	-0.039221	0.424918	-0.797873	0.372490	-0.084226
1423	4.910486	0.961457	-0.039870	3.330681	0.501824	4.838424

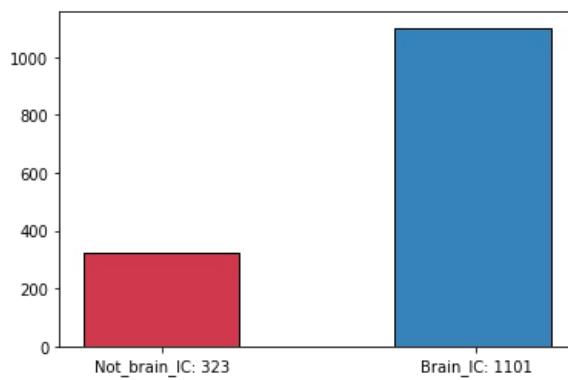
646 rows × 6 columns

```
In [38]: import numpy as np
import matplotlib.pyplot as plt

fig, ax = plt.subplots()

N, bins, patches = ax.hist(y, edgecolor='black', linewidth=1, bins=3)
rainbow = cm.get_cmap('Spectral', 12).reversed()
newcmp = ListedColormap(rainbow(np.linspace(0.1, 0.9, 12)))
newcmp
for i in range(0,1):
    patches[i].set_facecolor(newcmp.colors[-1])
for i in range(1,3):
    patches[i].set_facecolor(newcmp.colors[0])

ax.set_xticks((0.17,0.84))
ax.set_xticklabels(['Not_brain_IC: {}'.format(len(w_class0)), 'Brain_IC: {}'.format(len(w_class1))])
plt.show()
```

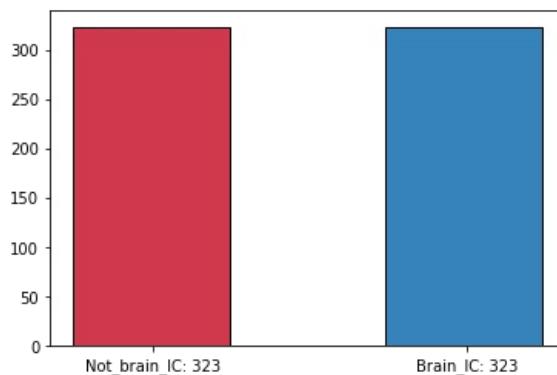


```
In [39]: import numpy as np
import matplotlib.pyplot as plt

fig, ax = plt.subplots()

N, bins, patches = ax.hist(y_downsampled, edgecolor='black', linewidth=1,bins=3)
rainbow = cm.get_cmap('Spectral', 12).reversed()
newcmp = ListedColormap(rainbow(np.linspace(0.1, 0.9, 12)))
newcmp
for i in range(0,1):
    patches[i].set_facecolor(newcmp.colors[-1])
for i in range(1,3):
    patches[i].set_facecolor(newcmp.colors[0])

ax.set_xticks((0.17,0.84))
ax.set_xticklabels(['Not_brain_IC: {}'.format(len(np.where(y_downsampled == 0)[0])), 'Brain_IC: {}'.format(len(
plt.show())
```



Teraz można spokojnie podzielić na zbiór treningowy i walidacyjny

```
In [40]: from sklearn.model_selection import train_test_split

X_train, X_val, y_train, y_val = train_test_split(X_downsampled, y_downsampled, test_size=0.33, random_state=42)
```

Uczenie i wybieranie modeli:

By nauczyć modele stwórzmy Pipeline normalizujący najpierw nasze dane (Na wselki wypadek), po czym elegancko Uczymy modele za pomocą Pipeline'ów następujące typy Klasyfikatorów:

- **SVC - rbf**
- **SVC - linear**
- **Regresję logistyczną**
- **Gradient Boosting**
- **AdaBoost**
- **Bagging Classifier'**
- **RandoForest**
- **Sieć neuronowa**

Na każdym staramy się dopasować parametry na Gridzie do maksymalnie 4 parametrów.

```
In [41]: from sklearn.model_selection import GridSearchCV
from sklearn.preprocessing import StandardScaler
from sklearn.pipeline import Pipeline
from sklearn.svm import SVC
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import StratifiedKFold
from sklearn.ensemble import GradientBoostingClassifier
from sklearn.ensemble import AdaBoostClassifier
```

```

from sklearn.ensemble import AdaBoostClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import BaggingClassifier
from sklearn.ensemble import RandomForestClassifier

kfold = StratifiedKFold(5)

pipe_1 = Pipeline([('preprocessing', StandardScaler()), ('classifier', SVC(kernel='rbf', probability=True))])
pipe_2 = Pipeline([('preprocessing', StandardScaler()), ('classifier', SVC(kernel='linear', probability=True))])
pipe_3 = Pipeline([('preprocessing', StandardScaler()), ('classifier', LogisticRegression())])
pipe_4 = Pipeline([('preprocessing', StandardScaler()), ('classifier', GradientBoostingClassifier())])
pipe_5 = Pipeline([('preprocessing', StandardScaler()), ('classifier', AdaBoostClassifier(
    DecisionTreeClassifier(max_depth=2,
                           n_estimators=2,
                           learning_rate=0.5,
                           algorithm="SAMME.R",
                           random_state=42)))])

pipe_6 = Pipeline([('preprocessing', StandardScaler()), ('classifier', BaggingClassifier(
    DecisionTreeClassifier(max_depth=1,
                           n_estimators=1)))]
pipe_7 = Pipeline([('preprocessing', StandardScaler()), ('classifier', RandomForestClassifier(n_estimators=1))])

param_grid = {
    'classifier__gamma': [0.001, 0.01, 0.1, 1, 10, 100],
    'classifier__C': [0.001, 0.01, 0.1, 1, 10, 100],
}
param_grid_2 = {
    'classifier__C': [0.001, 0.01, 0.1, 1, 10, 100]
}
param_grid_4 = {
    'classifier__n_estimators': [50, 100, 200, 500],
    'classifier__learning_rate': [0.001, 0.01, 0.1, 1],
    'classifier__max_depth': [3, 9, 18, 36, None],
    'classifier__max_leaf_nodes': [4, 8, 16, 32, 64, None],
}

param_grid_6 = {
    'classifier__n_estimators': [50, 100, 200, 500],
    'classifier__max_depth': [3, 9, 18, 36],
    'classifier__max_leaf_nodes': [4, 8, 16, 32, 64],
}

param_grid_3 = {
    'classifier__n_estimators': [10, 50, 100, 200, 500],
    'classifier__learning_rate': [0.001, 0.01, 0.1, 1],
    'classifier__base_estimator__max_depth': [3, 9, 18, 36],
    'classifier__base_estimator__max_leaf_nodes': [4, 8, 16, 32, 64],
}

param_grid_5 = {
    'classifier__n_estimators': [50, 100, 200, 500],
    'classifier__base_estimator__max_depth': [3, 9, 18, 36],
    'classifier__base_estimator__max_leaf_nodes': [4, 8, 16, 32, 64],
}

grid_1 = GridSearchCV(pipe_1, param_grid, cv=kfold, return_train_score=True)
grid_2 = GridSearchCV(pipe_2, param_grid, cv=kfold, return_train_score=True)
grid_3 = GridSearchCV(pipe_3, param_grid_2, cv=kfold, return_train_score=True)
grid_4 = GridSearchCV(pipe_4, param_grid_4, cv=kfold, return_train_score=True, verbose=1)
grid_5 = GridSearchCV(pipe_5, param_grid_3, cv=kfold, return_train_score=True)
grid_6 = GridSearchCV(pipe_6, param_grid_5, cv=kfold, return_train_score=True)
grid_7 = GridSearchCV(pipe_7, param_grid_6, cv=kfold, return_train_score=True)

```

In [15]: grid_1.fit(X_train, y_train)
grid_1.best_estimator_

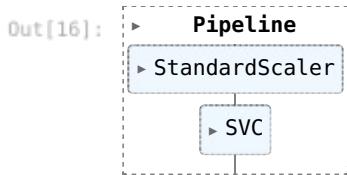
Out[15]:

```

▶ Pipeline
  ▶ StandardScaler
    ▶ SVC

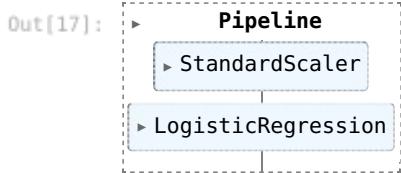
```

In [16]: grid_2.fit(X_train, y_train)
grid_2.best_estimator_



In [17]:

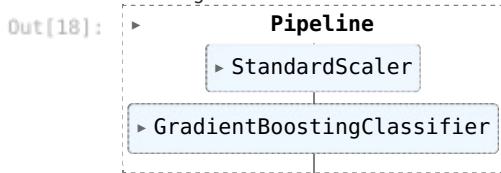
```
grid_3.fit(X_train, y_train)
grid_3.best_estimator_
```



In [18]:

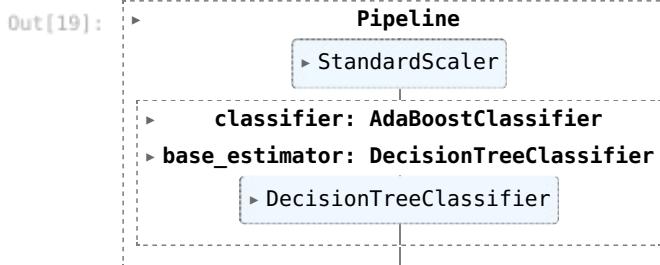
```
grid_4.fit(X_train, y_train)
grid_4.best_estimator_
```

Fitting 5 folds for each of 480 candidates, totalling 2400 fits



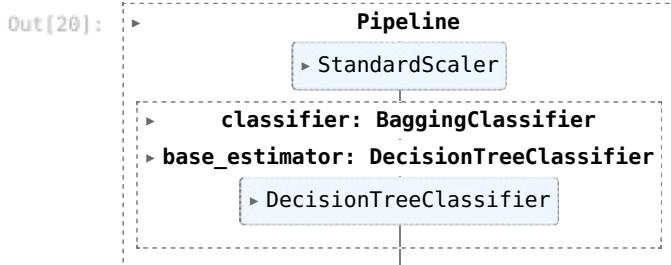
In [19]:

```
grid_5.fit(X_train, y_train)
grid_5.best_estimator_
```



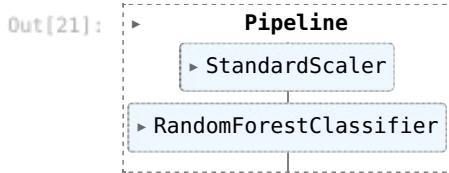
In [20]:

```
grid_6.fit(X_train, y_train)
grid_6.best_estimator_
```



In [21]:

```
grid_7.fit(X_train, y_train)
grid_7.best_estimator_
```



najlepsze modele

Tutaj poniżej mamy Screen z najlepszymi zachowanymi modelami:

```

Pipeline(steps=[('preprocessing', StandardScaler()),
               ('classifier', SVC(C=10, gamma=0.1, probability=True))])

Pipeline(steps=[('preprocessing', StandardScaler()),
               ('classifier',
                SVC(C=10, gamma=0.001, kernel='linear', probability=True))])

Pipeline(steps=[('preprocessing', StandardScaler()),
               ('classifier', LogisticRegression(C=0.1))])

Pipeline(steps=[('preprocessing', StandardScaler()),
               ('classifier',
                GradientBoostingClassifier(learning_rate=1, max_depth=36,
                                            max_leaf_nodes=64))])

Pipeline(steps=[('preprocessing', StandardScaler()),
               ('classifier',
                AdaBoostClassifier(base_estimator=DecisionTreeClassifier(max_depth=18,
                                                                           max_leaf_nodes=64),
                                    learning_rate=1, n_estimators=100,
                                    random_state=42))])

Pipeline(steps=[('preprocessing', StandardScaler()),
               ('classifier',
                BaggingClassifier(base_estimator=DecisionTreeClassifier(max_depth=18,
                                                                           max_leaf_nodes=64),
                                   n_estimators=500, n_jobs=-1,
                                   random_state=42))])

Pipeline(steps=[('preprocessing', StandardScaler()),
               ('classifier',
                RandomForestClassifier(max_depth=36, max_leaf_nodes=64,
                                       n_estimators=200, n_jobs=-1))])

```

Poniżej, realizujemy te modele

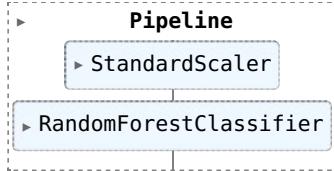
```
In [42]: ### Grid searched Classifiers:

from sklearn.model_selection import GridSearchCV
from sklearn.preprocessing import StandardScaler
from sklearn.pipeline import Pipeline
from sklearn.svm import SVC
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import StratifiedKFold
from sklearn.ensemble import GradientBoostingClassifier
from sklearn.ensemble import AdaBoostClassifier
from sklearn.ensemble import AdaBoostClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import BaggingClassifier
from sklearn.ensemble import RandomForestClassifier


model_1 = Pipeline([('preprocessing', StandardScaler()), ('classifier', SVC(kernel='rbf', C=10, gamma=0.1, probability=True))])
model_2 = Pipeline([('preprocessing', StandardScaler()), ('classifier', SVC(kernel='linear', C=10, gamma=0.001, probability=True))])
model_3 = Pipeline([('preprocessing', StandardScaler()), ('classifier', LogisticRegression(C=0.1))])
model_4 = Pipeline([('preprocessing', StandardScaler()), ('classifier', GradientBoostingClassifier(learning_rate=1, max_depth=36, max_leaf_nodes=64))])
model_5 = Pipeline([('preprocessing', StandardScaler()), ('classifier', AdaBoostClassifier(base_estimator=DecisionTreeClassifier(max_depth=18, max_leaf_nodes=64), learning_rate=1, n_estimators=100, random_state=42))])
model_6 = Pipeline([('preprocessing', StandardScaler()), ('classifier', BaggingClassifier(base_estimator=DecisionTreeClassifier(max_depth=18, max_leaf_nodes=64), n_estimators=500, n_jobs=-1, random_state=42))])
model_7 = Pipeline([('preprocessing', StandardScaler()), ('classifier', RandomForestClassifier(max_depth=36, max_leaf_nodes=64, n_estimators=200))])

model_1.fit(X_train, y_train)
model_2.fit(X_train, y_train)
model_3.fit(X_train, y_train)
model_4.fit(X_train, y_train)
model_5.fit(X_train, y_train)
model_6.fit(X_train, y_train)
model_7.fit(X_train, y_train)
```

Out[42]:



In [43]:

```

from keras.regularizers import l1,l2
from keras.callbacks import History

from keras.layers import Dense,BatchNormalization,Flatten

from keras.models import Sequential
from keras.layers import Dense
from keras.callbacks import LearningRateScheduler
from keras.callbacks import ModelCheckpoint
from keras.callbacks import EarlyStopping
from keras.layers import Dropout
from keras.layers import Activation
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import RandomizedSearchCV

from keras.callbacks import History

#Scaling
sc = StandardScaler()
sc.fit(X_train)
X_train = sc.transform(X_train)

history_Adam = History()

def build_model(Dense1=100,Dense2=50):
    model_cat = Sequential()
    model_cat.add(Dense(Dense1,activation="relu",input_shape=(X_train.shape[1],)))
    model_cat.add(BatchNormalization())
    model_cat.add(Activation("relu"))
    model_cat.add(Dense(Dense2,activation="relu"))
    model_cat.add(BatchNormalization())
    model_cat.add(Activation("relu"))

    model_cat.add(Dense(10,activation="relu"))
    model_cat.add(BatchNormalization())
    model_cat.add(Activation("relu"))
    model_cat.add(Dense(2,activation="relu"))
    model_cat.summary()

    model_cat.compile(loss="binary_crossentropy",optimizer="Rmsprop", metrics=["accuracy"])

    return model_cat

keras_class = tf.keras.wrappers.scikit_learn.KerasClassifier(build_model)

param_distrib = {
    "Dense1": [25,50,100],
    "Dense2": [10,25,50]
}

rnd_search_cv = RandomizedSearchCV(keras_class, param_distrib, n_iter=10, cv=10, verbose=2)

early_stopping = EarlyStopping(monitor='val_accuracy', patience=150, mode='max', verbose=1, restore_best_weights=True)
rnd_search_cv.fit(X_train, y_train, validation_data=(sc.transform(X_val), y_val), batch_size=128, epochs=1000,
  
```

Fitting 10 folds for each of 9 candidates, totalling 90 fits
Model: "sequential_9"

Layer (type)	Output Shape	Param #
dense_36 (Dense)	(None, 25)	175
batch_normalization_27 (BatchNormalization)	(None, 25)	100
activation_27 (Activation)	(None, 25)	0
dense_37 (Dense)	(None, 10)	260
batch_normalization_28 (BatchNormalization)	(None, 10)	40
activation_28 (Activation)	(None, 10)	0
dense_38 (Dense)	(None, 10)	110
batch_normalization_29 (BatchNormalization)	(None, 10)	40
activation_29 (Activation)	(None, 10)	0
dense_39 (Dense)	(None, 2)	22

Total params: 747
Trainable params: 657
Non-trainable params: 90

Epoch 1/1000

C:\Users\barak\AppData\Local\Temp\ipykernel_22372\2829582959.py:44: DeprecationWarning: KerasClassifier is deprecated, use Sci-Keras (<https://github.com/adriangb/scikeras>) instead. See <https://www.adriangb.com/scikeras/stable/migration.html> for help migrating.

keras_class = tf.keras.wrappers.scikit_learn.KerasClassifier(build_model)
C:\Users\barak\anaconda3\lib\site-packages\sklearn\model_selection_search.py:306: UserWarning: The total space of parameters 9 is smaller than n_iter=10. Running 9 iterations. For exhaustive searches, use GridSearchCV.
warnings.warn(

4/4 [=====] - 1s 59ms/step - loss: 5.9592 - accuracy: 0.6443 - val_loss: 4.6338 - val_accuracy: 0.6121

Epoch 2/1000

4/4 [=====] - 0s 15ms/step - loss: 5.0329 - accuracy: 0.7294 - val_loss: 5.0528 - val_accuracy: 0.6916

Epoch 3/1000

4/4 [=====] - 0s 15ms/step - loss: 5.0088 - accuracy: 0.7010 - val_loss: 4.8018 - val_accuracy: 0.7477

Epoch 4/1000

4/4 [=====] - 0s 14ms/step - loss: 4.8473 - accuracy: 0.7036 - val_loss: 4.7967 - val_accuracy: 0.7523

Epoch 5/1000

4/4 [=====] - 0s 14ms/step - loss: 4.7142 - accuracy: 0.7268 - val_loss: 5.0561 - val_accuracy: 0.7290

Epoch 6/1000

4/4 [=====] - 0s 13ms/step - loss: 4.6574 - accuracy: 0.7294 - val_loss: 5.0142 - val_accuracy: 0.7243

Epoch 7/1000

4/4 [=====] - 0s 13ms/step - loss: 4.5856 - accuracy: 0.7088 - val_loss: 5.1174 - val_accuracy: 0.7056

Epoch 8/1000

4/4 [=====] - 0s 13ms/step - loss: 4.5972 - accuracy: 0.6881 - val_loss: 5.1883 - val_accuracy: 0.6963

Epoch 9/1000

4/4 [=====] - 0s 13ms/step - loss: 4.5324 - accuracy: 0.6985 - val_loss: 5.1430 - val_accuracy: 0.6822

Epoch 10/1000

4/4 [=====] - 0s 13ms/step - loss: 4.3286 - accuracy: 0.7113 - val_loss: 5.1115 - val_accuracy: 0.6729

Epoch 11/1000

4/4 [=====] - 0s 12ms/step - loss: 4.4031 - accuracy: 0.7062 - val_loss: 5.1624 - val_accuracy: 0.6822

Epoch 12/1000

4/4 [=====] - 0s 14ms/step - loss: 4.2880 - accuracy: 0.7191 - val_loss: 5.1584 - val_accuracy: 0.6776

Epoch 13/1000

4/4 [=====] - 0s 12ms/step - loss: 4.0675 - accuracy: 0.6959 - val_loss: 4.8379 - val_accuracy: 0.6822

Epoch 14/1000

4/4 [=====] - 0s 13ms/step - loss: 3.8446 - accuracy: 0.7062 - val_loss: 4.5929 - val_accuracy: 0.6822

Epoch 15/1000

4/4 [=====] - 0s 12ms/step - loss: 3.9016 - accuracy: 0.7139 - val_loss: 4.4776 - val_accuracy: 0.6776

Epoch 16/1000

4/4 [=====] - 0s 12ms/step - loss: 3.8634 - accuracy: 0.7036 - val_loss: 4.4796 - val_accuracy: 0.6729

Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6032 - accuracy: 0.6933 - val_loss: 4.2285 - val_accuracy: 0.6682
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7107 - accuracy: 0.7036 - val_loss: 4.1225 - val_accuracy: 0.6682
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5911 - accuracy: 0.7010 - val_loss: 3.9722 - val_accuracy: 0.6682
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6748 - accuracy: 0.7010 - val_loss: 3.7863 - val_accuracy: 0.6682
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6286 - accuracy: 0.7010 - val_loss: 2.7255 - val_accuracy: 0.6729
Epoch 22/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4401 - accuracy: 0.6933 - val_loss: 2.6436 - val_accuracy: 0.6729
Epoch 23/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4987 - accuracy: 0.7088 - val_loss: 2.6610 - val_accuracy: 0.6729
Epoch 24/1000
4/4 [=====] - 0s 15ms/step - loss: 3.5797 - accuracy: 0.7010 - val_loss: 2.5878 - val_accuracy: 0.6729
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4902 - accuracy: 0.6907 - val_loss: 2.5024 - val_accuracy: 0.6729
Epoch 26/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5330 - accuracy: 0.6856 - val_loss: 2.4182 - val_accuracy: 0.6682
Epoch 27/1000
4/4 [=====] - 0s 14ms/step - loss: 3.6405 - accuracy: 0.6933 - val_loss: 2.4225 - val_accuracy: 0.6776
Epoch 28/1000
4/4 [=====] - 0s 15ms/step - loss: 3.4266 - accuracy: 0.7036 - val_loss: 2.3882 - val_accuracy: 0.6822
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4922 - accuracy: 0.7062 - val_loss: 2.3753 - val_accuracy: 0.6869
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5376 - accuracy: 0.6985 - val_loss: 2.3748 - val_accuracy: 0.6869
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4601 - accuracy: 0.7088 - val_loss: 2.3613 - val_accuracy: 0.6869
Epoch 32/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4781 - accuracy: 0.6985 - val_loss: 2.3612 - val_accuracy: 0.6822
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4215 - accuracy: 0.6907 - val_loss: 2.3547 - val_accuracy: 0.6822
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5173 - accuracy: 0.7036 - val_loss: 2.2863 - val_accuracy: 0.6729
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5115 - accuracy: 0.6907 - val_loss: 2.2392 - val_accuracy: 0.6729
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4166 - accuracy: 0.7010 - val_loss: 2.2274 - val_accuracy: 0.6729
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4466 - accuracy: 0.7062 - val_loss: 2.2158 - val_accuracy: 0.6776
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4268 - accuracy: 0.6933 - val_loss: 2.2173 - val_accuracy: 0.6776
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4167 - accuracy: 0.7036 - val_loss: 2.2429 - val_accuracy: 0.6776
Epoch 40/1000
4/4 [=====] - 0s 15ms/step - loss: 3.5180 - accuracy: 0.6907 - val_loss: 2.2424 - val_accuracy: 0.6776
Epoch 41/1000
4/4 [=====] - 0s 15ms/step - loss: 3.4888 - accuracy: 0.7010 - val_loss: 2.2113 - val_accuracy: 0.6822
Epoch 42/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4046 - accuracy: 0.7010 - val_loss: 2.1544 - val_accuracy: 0.6869
Epoch 43/1000
4/4 [=====] - 0s 15ms/step - loss: 3.4563 - accuracy: 0.6985 - val_loss: 2.1478 - val_accuracy: 0.6822
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3691 - accuracy: 0.7088 - val_loss: 2.1418 - val_accuracy: 0.6822
Epoch 45/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4085 - accuracy: 0.7010 - val_loss: 2.1064 - val_accuracy: 0.6916
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2776 - accuracy: 0.6881 - val_loss: 2.1326 - val_accuracy: 0.6881

```
accuracy: 0.6916
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3078 - accuracy: 0.6985 - val_loss: 2.1216 - val_accuracy: 0.6916
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3427 - accuracy: 0.7010 - val_loss: 2.0725 - val_accuracy: 0.6822
Epoch 49/1000
4/4 [=====] - 0s 14ms/step - loss: 3.3402 - accuracy: 0.6985 - val_loss: 2.1152 - val_accuracy: 0.6822
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3279 - accuracy: 0.7010 - val_loss: 2.0066 - val_accuracy: 0.6916
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2084 - accuracy: 0.6933 - val_loss: 1.9886 - val_accuracy: 0.6869
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2489 - accuracy: 0.6881 - val_loss: 1.9737 - val_accuracy: 0.6869
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0392 - accuracy: 0.6985 - val_loss: 1.9430 - val_accuracy: 0.6822
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 3.1126 - accuracy: 0.6985 - val_loss: 1.9220 - val_accuracy: 0.6776
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 3.0159 - accuracy: 0.6856 - val_loss: 1.8444 - val_accuracy: 0.6869
Epoch 56/1000
4/4 [=====] - 0s 15ms/step - loss: 3.0242 - accuracy: 0.6933 - val_loss: 1.8366 - val_accuracy: 0.6916
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 3.0329 - accuracy: 0.7010 - val_loss: 1.8165 - val_accuracy: 0.6916
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9795 - accuracy: 0.6959 - val_loss: 1.7969 - val_accuracy: 0.6916
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8552 - accuracy: 0.6985 - val_loss: 1.8489 - val_accuracy: 0.7009
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9762 - accuracy: 0.7036 - val_loss: 1.8368 - val_accuracy: 0.6963
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7323 - accuracy: 0.6804 - val_loss: 1.8172 - val_accuracy: 0.6963
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3585 - accuracy: 0.6907 - val_loss: 1.7975 - val_accuracy: 0.6963
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5999 - accuracy: 0.6881 - val_loss: 1.7053 - val_accuracy: 0.6963
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4771 - accuracy: 0.6804 - val_loss: 1.6949 - val_accuracy: 0.6963
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9747 - accuracy: 0.6753 - val_loss: 1.6746 - val_accuracy: 0.6963
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8281 - accuracy: 0.6907 - val_loss: 1.6697 - val_accuracy: 0.6963
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8396 - accuracy: 0.6753 - val_loss: 1.6182 - val_accuracy: 0.6963
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7427 - accuracy: 0.6907 - val_loss: 1.6126 - val_accuracy: 0.6963
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6681 - accuracy: 0.6804 - val_loss: 1.6008 - val_accuracy: 0.6963
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8285 - accuracy: 0.6959 - val_loss: 1.5897 - val_accuracy: 0.6963
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7235 - accuracy: 0.6933 - val_loss: 1.5565 - val_accuracy: 0.6963
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6517 - accuracy: 0.6881 - val_loss: 1.5676 - val_accuracy: 0.6963
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6037 - accuracy: 0.6830 - val_loss: 1.5252 - val_accuracy: 0.6963
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5777 - accuracy: 0.6830 - val_loss: 1.4740 - val_accuracy: 0.6916
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6562 - accuracy: 0.6778 - val_loss: 1.4327 - val_accuracy: 0.7056
Epoch 76/1000
```

```
4/4 [=====] - 0s 11ms/step - loss: 1.5513 - accuracy: 0.6881 - val_loss: 1.4195 - val_accuracy: 0.7103
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3668 - accuracy: 0.6830 - val_loss: 1.4357 - val_accuracy: 0.7103
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5312 - accuracy: 0.6881 - val_loss: 1.3972 - val_accuracy: 0.7103
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4785 - accuracy: 0.6985 - val_loss: 1.3844 - val_accuracy: 0.7103
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3097 - accuracy: 0.7036 - val_loss: 1.4021 - val_accuracy: 0.7103
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4031 - accuracy: 0.6856 - val_loss: 1.3955 - val_accuracy: 0.7009
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3710 - accuracy: 0.6881 - val_loss: 1.3896 - val_accuracy: 0.6963
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3316 - accuracy: 0.6598 - val_loss: 1.3587 - val_accuracy: 0.7056
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4008 - accuracy: 0.6753 - val_loss: 1.3518 - val_accuracy: 0.7150
Epoch 85/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3199 - accuracy: 0.6675 - val_loss: 1.3439 - val_accuracy: 0.7009
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2706 - accuracy: 0.6778 - val_loss: 1.3129 - val_accuracy: 0.6916
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3396 - accuracy: 0.6624 - val_loss: 1.3441 - val_accuracy: 0.7009
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3839 - accuracy: 0.6701 - val_loss: 1.3824 - val_accuracy: 0.6963
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3232 - accuracy: 0.6598 - val_loss: 1.3721 - val_accuracy: 0.6916
Epoch 90/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2249 - accuracy: 0.6778 - val_loss: 1.3685 - val_accuracy: 0.6916
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3681 - accuracy: 0.6649 - val_loss: 1.3646 - val_accuracy: 0.6916
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2564 - accuracy: 0.6778 - val_loss: 1.3571 - val_accuracy: 0.6916
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3682 - accuracy: 0.6778 - val_loss: 1.3534 - val_accuracy: 0.6916
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3062 - accuracy: 0.6753 - val_loss: 1.3459 - val_accuracy: 0.6963
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3816 - accuracy: 0.6727 - val_loss: 1.3424 - val_accuracy: 0.6963
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3131 - accuracy: 0.6804 - val_loss: 1.3388 - val_accuracy: 0.6963
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1729 - accuracy: 0.6701 - val_loss: 1.3057 - val_accuracy: 0.6916
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2724 - accuracy: 0.6598 - val_loss: 1.2991 - val_accuracy: 0.6822
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3680 - accuracy: 0.6778 - val_loss: 1.3022 - val_accuracy: 0.6916
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2250 - accuracy: 0.6753 - val_loss: 1.3230 - val_accuracy: 0.6822
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2380 - accuracy: 0.6572 - val_loss: 1.3458 - val_accuracy: 0.6869
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2168 - accuracy: 0.6778 - val_loss: 1.3427 - val_accuracy: 0.6869
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3412 - accuracy: 0.6649 - val_loss: 1.3394 - val_accuracy: 0.6916
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2678 - accuracy: 0.6881 - val_loss: 1.3382 - val_accuracy: 0.6916
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3130 - accuracy: 0.6572 - val_loss: 1.3369 - val_accuracy: 0.6963
```

Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2128 - accuracy: 0.6753 - val_loss: 1.3363 - val_accuracy: 0.6869
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2225 - accuracy: 0.6546 - val_loss: 1.3433 - val_accuracy: 0.6869
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2683 - accuracy: 0.6856 - val_loss: 1.3575 - val_accuracy: 0.6869
Epoch 109/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2451 - accuracy: 0.6675 - val_loss: 1.3527 - val_accuracy: 0.6869
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2263 - accuracy: 0.6701 - val_loss: 1.3519 - val_accuracy: 0.6822
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1727 - accuracy: 0.6572 - val_loss: 1.3480 - val_accuracy: 0.6822
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2804 - accuracy: 0.6727 - val_loss: 1.3491 - val_accuracy: 0.6869
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1755 - accuracy: 0.6804 - val_loss: 1.3465 - val_accuracy: 0.6869
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2106 - accuracy: 0.6546 - val_loss: 1.3491 - val_accuracy: 0.6869
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1764 - accuracy: 0.6778 - val_loss: 1.4035 - val_accuracy: 0.6822
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2085 - accuracy: 0.6856 - val_loss: 1.3981 - val_accuracy: 0.6822
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2717 - accuracy: 0.6778 - val_loss: 1.4030 - val_accuracy: 0.6822
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2101 - accuracy: 0.6959 - val_loss: 1.3928 - val_accuracy: 0.6869
Epoch 119/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2106 - accuracy: 0.6804 - val_loss: 1.3897 - val_accuracy: 0.6822
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1856 - accuracy: 0.6830 - val_loss: 1.3701 - val_accuracy: 0.6822
Epoch 121/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1130 - accuracy: 0.6933 - val_loss: 1.3698 - val_accuracy: 0.6822
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0774 - accuracy: 0.6778 - val_loss: 1.3892 - val_accuracy: 0.6869
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0600 - accuracy: 0.6881 - val_loss: 1.3869 - val_accuracy: 0.6776
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1304 - accuracy: 0.6985 - val_loss: 1.3834 - val_accuracy: 0.6776
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1316 - accuracy: 0.6856 - val_loss: 1.2986 - val_accuracy: 0.6822
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0978 - accuracy: 0.6959 - val_loss: 1.2918 - val_accuracy: 0.6869
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1105 - accuracy: 0.6778 - val_loss: 1.2645 - val_accuracy: 0.6869
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1491 - accuracy: 0.6907 - val_loss: 1.2794 - val_accuracy: 0.6729
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1103 - accuracy: 0.6985 - val_loss: 1.2756 - val_accuracy: 0.6776
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9979 - accuracy: 0.6830 - val_loss: 1.2698 - val_accuracy: 0.6776
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0157 - accuracy: 0.6959 - val_loss: 1.2073 - val_accuracy: 0.6729
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9675 - accuracy: 0.6933 - val_loss: 1.1808 - val_accuracy: 0.6682
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9677 - accuracy: 0.6830 - val_loss: 1.1661 - val_accuracy: 0.6682
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0122 - accuracy: 0.6881 - val_loss: 1.1795 - val_accuracy: 0.6729
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9075 - accuracy: 0.6907 - val_loss: 1.1405 - val_accuracy: 0.6729

```

accuracy: 0.6636
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8500 - accuracy: 0.6804 - val_loss: 1.1094 - val_accuracy: 0.6589
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8963 - accuracy: 0.6753 - val_loss: 1.0801 - val_accuracy: 0.6589
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9452 - accuracy: 0.6907 - val_loss: 1.0663 - val_accuracy: 0.6589
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9446 - accuracy: 0.6881 - val_loss: 1.0625 - val_accuracy: 0.6542
Epoch 140/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8770 - accuracy: 0.6881 - val_loss: 1.0594 - val_accuracy: 0.6495
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8485 - accuracy: 0.6701 - val_loss: 1.0615 - val_accuracy: 0.6355
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7911 - accuracy: 0.6778 - val_loss: 1.0232 - val_accuracy: 0.6402
Epoch 143/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9055 - accuracy: 0.6675 - val_loss: 1.0505 - val_accuracy: 0.6355
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7893 - accuracy: 0.6856 - val_loss: 1.0402 - val_accuracy: 0.6449
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7540 - accuracy: 0.6804 - val_loss: 1.0224 - val_accuracy: 0.6355
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7827 - accuracy: 0.6830 - val_loss: 1.0180 - val_accuracy: 0.6495
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9018 - accuracy: 0.6907 - val_loss: 0.9714 - val_accuracy: 0.6449
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8197 - accuracy: 0.6804 - val_loss: 0.9744 - val_accuracy: 0.6542
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7910 - accuracy: 0.6804 - val_loss: 0.9402 - val_accuracy: 0.6449
Epoch 150/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8403 - accuracy: 0.6778 - val_loss: 0.9306 - val_accuracy: 0.6308
Epoch 151/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8600 - accuracy: 0.6778 - val_loss: 0.9744 - val_accuracy: 0.6355
Epoch 152/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7412 - accuracy: 0.6598 - val_loss: 0.9755 - val_accuracy: 0.6402
Epoch 153/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7299 - accuracy: 0.6830 - val_loss: 0.9960 - val_accuracy: 0.6355
Epoch 154/1000
1/4 [====>.....] - ETA: 0s - loss: 0.7292 - accuracy: 0.6562Restoring model weights from the end of the best epoch: 4.
4/4 [=====] - 0s 15ms/step - loss: 0.7876 - accuracy: 0.6933 - val_loss: 0.9711 - val_accuracy: 0.6542
Epoch 154: early stopping
2/2 [=====] - 0s 3ms/step - loss: 5.7029 - accuracy: 0.5455
[CV] END .....Dense1=25, Dense2=10; total time= 8.5s
Model: "sequential_10"

```

Layer (type)	Output Shape	Param #
dense_40 (Dense)	(None, 25)	175
batch_normalization_30 (BatchNormalization)	(None, 25)	100
activation_30 (Activation)	(None, 25)	0
dense_41 (Dense)	(None, 10)	260
batch_normalization_31 (BatchNormalization)	(None, 10)	40
activation_31 (Activation)	(None, 10)	0
dense_42 (Dense)	(None, 10)	110
batch_normalization_32 (BatchNormalization)	(None, 10)	40
activation_32 (Activation)	(None, 10)	0
dense_43 (Dense)	(None, 2)	22

```
=====
Total params: 747
Trainable params: 657
Non-trainable params: 90

Epoch 1/1000
4/4 [=====] - 1s 55ms/step - loss: 4.5651 - accuracy: 0.4923 - val_loss: 5.2871 - val_accuracy: 0.6308
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 3.3071 - accuracy: 0.4124 - val_loss: 5.1739 - val_accuracy: 0.6355
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8634 - accuracy: 0.4510 - val_loss: 4.5703 - val_accuracy: 0.6262
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7472 - accuracy: 0.4149 - val_loss: 3.8454 - val_accuracy: 0.6121
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7488 - accuracy: 0.4330 - val_loss: 3.3747 - val_accuracy: 0.6168
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3635 - accuracy: 0.4510 - val_loss: 2.9835 - val_accuracy: 0.6215
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4635 - accuracy: 0.4485 - val_loss: 2.5800 - val_accuracy: 0.6262
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3334 - accuracy: 0.4742 - val_loss: 2.2624 - val_accuracy: 0.6308
Epoch 9/1000
4/4 [=====] - 0s 15ms/step - loss: 2.2481 - accuracy: 0.4562 - val_loss: 2.0878 - val_accuracy: 0.6449
Epoch 10/1000
4/4 [=====] - 0s 15ms/step - loss: 1.9435 - accuracy: 0.4485 - val_loss: 1.8753 - val_accuracy: 0.6776
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7097 - accuracy: 0.4665 - val_loss: 1.7721 - val_accuracy: 0.6449
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7149 - accuracy: 0.4871 - val_loss: 1.7443 - val_accuracy: 0.6402
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5904 - accuracy: 0.4485 - val_loss: 1.7013 - val_accuracy: 0.5981
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4612 - accuracy: 0.4716 - val_loss: 1.6719 - val_accuracy: 0.5794
Epoch 15/1000
4/4 [=====] - 0s 15ms/step - loss: 1.4553 - accuracy: 0.4742 - val_loss: 1.6884 - val_accuracy: 0.6308
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4626 - accuracy: 0.4742 - val_loss: 1.6439 - val_accuracy: 0.6168
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5136 - accuracy: 0.4820 - val_loss: 1.6324 - val_accuracy: 0.5701
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4198 - accuracy: 0.4923 - val_loss: 1.6730 - val_accuracy: 0.5701
Epoch 19/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3242 - accuracy: 0.4871 - val_loss: 1.6056 - val_accuracy: 0.5607
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3717 - accuracy: 0.4871 - val_loss: 1.5936 - val_accuracy: 0.5327
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2024 - accuracy: 0.5103 - val_loss: 1.5758 - val_accuracy: 0.5280
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2210 - accuracy: 0.4897 - val_loss: 1.5421 - val_accuracy: 0.5421
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2649 - accuracy: 0.4948 - val_loss: 1.5058 - val_accuracy: 0.5607
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2952 - accuracy: 0.4948 - val_loss: 1.4821 - val_accuracy: 0.5374
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1535 - accuracy: 0.5052 - val_loss: 1.4522 - val_accuracy: 0.5327
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1543 - accuracy: 0.4897 - val_loss: 1.4245 - val_accuracy: 0.5140
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1464 - accuracy: 0.5129 - val_loss: 1.3996 - val_accuracy: 0.5047
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1734 - accuracy: 0.5335 - val_loss: 1.3828 - val_accuracy: 0.5327
```

```
accuracy: 0.5421
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1637 - accuracy: 0.5077 - val_loss: 1.3431 - val_accuracy: 0.5140
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0111 - accuracy: 0.4974 - val_loss: 1.3016 - val_accuracy: 0.5000
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1169 - accuracy: 0.5284 - val_loss: 1.2842 - val_accuracy: 0.5000
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0852 - accuracy: 0.5000 - val_loss: 1.2381 - val_accuracy: 0.5047
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0525 - accuracy: 0.5747 - val_loss: 1.2066 - val_accuracy: 0.5000
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9650 - accuracy: 0.6778 - val_loss: 1.1964 - val_accuracy: 0.4953
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0167 - accuracy: 0.6804 - val_loss: 1.2030 - val_accuracy: 0.4626
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9730 - accuracy: 0.5335 - val_loss: 1.2027 - val_accuracy: 0.4673
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9458 - accuracy: 0.5335 - val_loss: 1.1837 - val_accuracy: 0.4720
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9304 - accuracy: 0.5155 - val_loss: 1.1761 - val_accuracy: 0.4579
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8462 - accuracy: 0.4871 - val_loss: 1.1872 - val_accuracy: 0.4439
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8392 - accuracy: 0.5284 - val_loss: 1.1676 - val_accuracy: 0.4393
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9083 - accuracy: 0.5387 - val_loss: 1.1438 - val_accuracy: 0.4252
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8495 - accuracy: 0.5335 - val_loss: 1.1365 - val_accuracy: 0.4206
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7987 - accuracy: 0.5309 - val_loss: 1.1278 - val_accuracy: 0.4393
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7130 - accuracy: 0.5309 - val_loss: 1.1151 - val_accuracy: 0.4393
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7370 - accuracy: 0.4974 - val_loss: 1.0992 - val_accuracy: 0.4486
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7141 - accuracy: 0.4948 - val_loss: 1.0794 - val_accuracy: 0.4393
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7527 - accuracy: 0.5180 - val_loss: 1.0340 - val_accuracy: 0.4346
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7093 - accuracy: 0.4691 - val_loss: 0.9943 - val_accuracy: 0.4393
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7245 - accuracy: 0.4845 - val_loss: 0.9807 - val_accuracy: 0.4393
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5954 - accuracy: 0.5026 - val_loss: 0.9866 - val_accuracy: 0.4393
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6613 - accuracy: 0.4974 - val_loss: 0.9686 - val_accuracy: 0.4486
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7015 - accuracy: 0.4974 - val_loss: 0.9548 - val_accuracy: 0.4393
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7160 - accuracy: 0.5026 - val_loss: 0.9333 - val_accuracy: 0.4346
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7064 - accuracy: 0.4897 - val_loss: 0.9356 - val_accuracy: 0.4346
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6161 - accuracy: 0.4768 - val_loss: 0.9181 - val_accuracy: 0.4299
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6568 - accuracy: 0.5000 - val_loss: 0.9024 - val_accuracy: 0.4112
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6263 - accuracy: 0.4613 - val_loss: 0.8840 - val_accuracy: 0.4159
Epoch 58/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.6289 - accuracy: 0.4716 - val_loss: 0.8732 - val_accuracy: 0.4112
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6135 - accuracy: 0.4871 - val_loss: 0.8912 - val_accuracy: 0.4112
Epoch 60/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5127 - accuracy: 0.4742 - val_loss: 0.8818 - val_accuracy: 0.4252
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5855 - accuracy: 0.4665 - val_loss: 0.8759 - val_accuracy: 0.4159
Epoch 62/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5537 - accuracy: 0.4742 - val_loss: 0.8670 - val_accuracy: 0.4206
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5465 - accuracy: 0.4742 - val_loss: 0.8541 - val_accuracy: 0.4299
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6436 - accuracy: 0.4794 - val_loss: 0.8528 - val_accuracy: 0.4346
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5704 - accuracy: 0.4665 - val_loss: 0.8497 - val_accuracy: 0.4346
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5077 - accuracy: 0.4536 - val_loss: 0.8305 - val_accuracy: 0.4299
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6682 - accuracy: 0.4845 - val_loss: 0.8272 - val_accuracy: 0.4299
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6605 - accuracy: 0.4768 - val_loss: 0.8202 - val_accuracy: 0.4393
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5939 - accuracy: 0.4742 - val_loss: 0.8117 - val_accuracy: 0.4206
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4653 - accuracy: 0.4716 - val_loss: 0.8161 - val_accuracy: 0.4299
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4948 - accuracy: 0.4562 - val_loss: 0.8071 - val_accuracy: 0.4206
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6006 - accuracy: 0.4948 - val_loss: 0.7944 - val_accuracy: 0.4112
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5656 - accuracy: 0.4613 - val_loss: 0.7841 - val_accuracy: 0.4159
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5305 - accuracy: 0.4433 - val_loss: 0.7806 - val_accuracy: 0.4112
Epoch 75/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4990 - accuracy: 0.4665 - val_loss: 0.7849 - val_accuracy: 0.4159
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5294 - accuracy: 0.4665 - val_loss: 0.7806 - val_accuracy: 0.4206
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5558 - accuracy: 0.4510 - val_loss: 0.7739 - val_accuracy: 0.4206
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4876 - accuracy: 0.4871 - val_loss: 0.7630 - val_accuracy: 0.4252
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6098 - accuracy: 0.4768 - val_loss: 0.7878 - val_accuracy: 0.4252
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6588 - accuracy: 0.4820 - val_loss: 0.7777 - val_accuracy: 0.4206
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5460 - accuracy: 0.4407 - val_loss: 0.7678 - val_accuracy: 0.4206
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5069 - accuracy: 0.4794 - val_loss: 0.7619 - val_accuracy: 0.4252
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6056 - accuracy: 0.4613 - val_loss: 0.7674 - val_accuracy: 0.4112
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5653 - accuracy: 0.4381 - val_loss: 0.7620 - val_accuracy: 0.4159
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4702 - accuracy: 0.4459 - val_loss: 0.7603 - val_accuracy: 0.4159
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5102 - accuracy: 0.4485 - val_loss: 0.7522 - val_accuracy: 0.4112
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5169 - accuracy: 0.4510 - val_loss: 0.7536 - val_accuracy: 0.4019
```

Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5086 - accuracy: 0.4562 - val_loss: 0.7449 - val_accuracy: 0.4019
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4861 - accuracy: 0.4613 - val_loss: 0.7710 - val_accuracy: 0.4065
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4769 - accuracy: 0.4304 - val_loss: 0.7861 - val_accuracy: 0.4112
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4698 - accuracy: 0.4742 - val_loss: 0.7760 - val_accuracy: 0.4112
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5320 - accuracy: 0.4820 - val_loss: 0.7390 - val_accuracy: 0.4065
Epoch 93/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4885 - accuracy: 0.4588 - val_loss: 0.7581 - val_accuracy: 0.4019
Epoch 94/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4729 - accuracy: 0.4433 - val_loss: 0.7541 - val_accuracy: 0.4019
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4525 - accuracy: 0.4536 - val_loss: 0.7772 - val_accuracy: 0.4019
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4820 - accuracy: 0.4742 - val_loss: 0.7739 - val_accuracy: 0.4065
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4463 - accuracy: 0.4562 - val_loss: 0.7757 - val_accuracy: 0.4019
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4910 - accuracy: 0.4433 - val_loss: 0.7762 - val_accuracy: 0.4065
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6604 - accuracy: 0.4562 - val_loss: 0.7702 - val_accuracy: 0.4112
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4345 - accuracy: 0.4588 - val_loss: 0.7370 - val_accuracy: 0.4206
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6092 - accuracy: 0.4562 - val_loss: 0.8004 - val_accuracy: 0.3879
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4965 - accuracy: 0.4742 - val_loss: 0.7879 - val_accuracy: 0.4065
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4771 - accuracy: 0.4433 - val_loss: 0.7834 - val_accuracy: 0.3972
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4720 - accuracy: 0.4536 - val_loss: 0.8136 - val_accuracy: 0.4019
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4247 - accuracy: 0.4665 - val_loss: 0.8362 - val_accuracy: 0.4299
Epoch 106/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5081 - accuracy: 0.4871 - val_loss: 0.8350 - val_accuracy: 0.4252
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5156 - accuracy: 0.5000 - val_loss: 0.8101 - val_accuracy: 0.4393
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4291 - accuracy: 0.4871 - val_loss: 0.7759 - val_accuracy: 0.4346
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5987 - accuracy: 0.4923 - val_loss: 0.7996 - val_accuracy: 0.4299
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4834 - accuracy: 0.4794 - val_loss: 0.8000 - val_accuracy: 0.4299
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5889 - accuracy: 0.4691 - val_loss: 0.8541 - val_accuracy: 0.4393
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4740 - accuracy: 0.4923 - val_loss: 0.8559 - val_accuracy: 0.4486
Epoch 113/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4641 - accuracy: 0.4794 - val_loss: 0.8538 - val_accuracy: 0.4439
Epoch 114/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5695 - accuracy: 0.5593 - val_loss: 0.8515 - val_accuracy: 0.4486
Epoch 115/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4782 - accuracy: 0.5155 - val_loss: 0.7386 - val_accuracy: 0.4346
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5412 - accuracy: 0.5180 - val_loss: 0.7415 - val_accuracy: 0.4299
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5532 - accuracy: 0.5567 - val_loss: 0.7602 - val_accuracy: 0.4299

```
accuracy: 0.4533
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4564 - accuracy: 0.5206 - val_loss: 0.7614 - val_accuracy: 0.4626
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4359 - accuracy: 0.5825 - val_loss: 0.7716 - val_accuracy: 0.4486
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4453 - accuracy: 0.5155 - val_loss: 0.8449 - val_accuracy: 0.4299
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4308 - accuracy: 0.5155 - val_loss: 0.8434 - val_accuracy: 0.4206
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4380 - accuracy: 0.4974 - val_loss: 0.8400 - val_accuracy: 0.4299
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5961 - accuracy: 0.4948 - val_loss: 0.8402 - val_accuracy: 0.4393
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4828 - accuracy: 0.5284 - val_loss: 0.8407 - val_accuracy: 0.6542
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4398 - accuracy: 0.6082 - val_loss: 0.8396 - val_accuracy: 0.6495
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4362 - accuracy: 0.6881 - val_loss: 0.8398 - val_accuracy: 0.6589
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4957 - accuracy: 0.6856 - val_loss: 0.8445 - val_accuracy: 0.6542
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4026 - accuracy: 0.6340 - val_loss: 0.8441 - val_accuracy: 0.6449
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4136 - accuracy: 0.6649 - val_loss: 0.8430 - val_accuracy: 0.6449
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4375 - accuracy: 0.6263 - val_loss: 0.8407 - val_accuracy: 0.6449
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4696 - accuracy: 0.5954 - val_loss: 0.8404 - val_accuracy: 0.6402
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4575 - accuracy: 0.5696 - val_loss: 0.8412 - val_accuracy: 0.6449
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5306 - accuracy: 0.5799 - val_loss: 0.8403 - val_accuracy: 0.4486
Epoch 134/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5626 - accuracy: 0.5464 - val_loss: 0.8413 - val_accuracy: 0.4439
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3954 - accuracy: 0.5309 - val_loss: 0.8439 - val_accuracy: 0.4299
Epoch 136/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6265 - accuracy: 0.4974 - val_loss: 0.8463 - val_accuracy: 0.4486
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4627 - accuracy: 0.4691 - val_loss: 0.8116 - val_accuracy: 0.4720
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4640 - accuracy: 0.5361 - val_loss: 0.8182 - val_accuracy: 0.4720
Epoch 139/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4904 - accuracy: 0.5155 - val_loss: 0.8384 - val_accuracy: 0.4907
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4286 - accuracy: 0.5515 - val_loss: 0.8398 - val_accuracy: 0.4953
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3888 - accuracy: 0.5747 - val_loss: 0.8466 - val_accuracy: 0.4626
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4241 - accuracy: 0.4716 - val_loss: 0.8479 - val_accuracy: 0.4720
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4895 - accuracy: 0.5387 - val_loss: 0.8516 - val_accuracy: 0.4720
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4790 - accuracy: 0.5825 - val_loss: 0.8417 - val_accuracy: 0.4579
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5156 - accuracy: 0.4845 - val_loss: 0.8503 - val_accuracy: 0.4579
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4373 - accuracy: 0.4716 - val_loss: 0.8446 - val_accuracy: 0.4579
Epoch 147/1000
```

```

4/4 [=====] - 0s 12ms/step - loss: 0.4352 - accuracy: 0.4820 - val_loss: 0.8430 - val_accuracy: 0.4813
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4169 - accuracy: 0.5000 - val_loss: 0.8403 - val_accuracy: 0.4720
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5425 - accuracy: 0.5000 - val_loss: 0.8668 - val_accuracy: 0.4766
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4172 - accuracy: 0.4845 - val_loss: 0.8648 - val_accuracy: 0.4766
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4212 - accuracy: 0.4845 - val_loss: 0.8657 - val_accuracy: 0.4720
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4013 - accuracy: 0.4871 - val_loss: 0.8671 - val_accuracy: 0.6682
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4473 - accuracy: 0.5206 - val_loss: 0.8643 - val_accuracy: 0.4766
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4963 - accuracy: 0.5696 - val_loss: 0.8633 - val_accuracy: 0.4720
Epoch 155/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4848 - accuracy: 0.4974 - val_loss: 0.8704 - val_accuracy: 0.4766
Epoch 156/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4918 - accuracy: 0.4845 - val_loss: 0.8732 - val_accuracy: 0.4813
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5029 - accuracy: 0.5052 - val_loss: 0.9251 - val_accuracy: 0.4813
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4532 - accuracy: 0.4974 - val_loss: 0.9016 - val_accuracy: 0.4813
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4446 - accuracy: 0.4820 - val_loss: 0.8981 - val_accuracy: 0.4673
Epoch 160/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3382 - accuracy: 0.5156Restoring model weights from the end of the best epoch: 10.
4/4 [=====] - 0s 13ms/step - loss: 0.4438 - accuracy: 0.5026 - val_loss: 0.9315 - val_accuracy: 0.4860
Epoch 160: early stopping
2/2 [=====] - 0s 3ms/step - loss: 1.6277 - accuracy: 0.6818
[CV] END .....Dense1=25, Dense2=10; total time= 8.6s
Model: "sequential_11"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_44 (Dense)	(None, 25)	175
<hr/>		
batch_normalization_33 (BatchNormalization)	(None, 25)	100
activation_33 (Activation)	(None, 25)	0
dense_45 (Dense)	(None, 10)	260
batch_normalization_34 (BatchNormalization)	(None, 10)	40
activation_34 (Activation)	(None, 10)	0
dense_46 (Dense)	(None, 10)	110
batch_normalization_35 (BatchNormalization)	(None, 10)	40
activation_35 (Activation)	(None, 10)	0
dense_47 (Dense)	(None, 2)	22
<hr/>		
Total params: 747		
Trainable params: 657		
Non-trainable params: 90		

```

Epoch 1/1000
4/4 [=====] - 2s 57ms/step - loss: 4.6441 - accuracy: 0.4267 - val_loss: 1.5065 - val_accuracy: 0.5514
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6332 - accuracy: 0.4576 - val_loss: 1.5454 - val_accuracy: 0.5047
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4509 - accuracy: 0.4396 - val_loss: 1.5909 - val_accuracy: 0.4720
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1751 - accuracy: 0.4447 - val_loss: 1.5970 - val_

```

```
accuracy: 0.4393
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0913 - accuracy: 0.4473 - val_loss: 1.6565 - val_accuracy: 0.3738
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8955 - accuracy: 0.4396 - val_loss: 1.6695 - val_accuracy: 0.3645
Epoch 7/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5368 - accuracy: 0.3985 - val_loss: 1.6577 - val_accuracy: 0.3458
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4744 - accuracy: 0.4602 - val_loss: 1.6615 - val_accuracy: 0.3271
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3490 - accuracy: 0.4499 - val_loss: 1.6554 - val_accuracy: 0.3271
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2746 - accuracy: 0.4036 - val_loss: 1.6811 - val_accuracy: 0.3084
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2490 - accuracy: 0.3753 - val_loss: 1.6535 - val_accuracy: 0.3084
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2093 - accuracy: 0.3933 - val_loss: 1.6520 - val_accuracy: 0.3178
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3008 - accuracy: 0.3702 - val_loss: 1.6590 - val_accuracy: 0.3224
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0460 - accuracy: 0.3650 - val_loss: 1.6516 - val_accuracy: 0.3505
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9879 - accuracy: 0.4293 - val_loss: 1.6465 - val_accuracy: 0.3178
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9868 - accuracy: 0.4087 - val_loss: 1.6316 - val_accuracy: 0.3364
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9447 - accuracy: 0.3882 - val_loss: 1.5697 - val_accuracy: 0.3178
Epoch 18/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8651 - accuracy: 0.3702 - val_loss: 1.5683 - val_accuracy: 0.3224
Epoch 19/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8519 - accuracy: 0.3470 - val_loss: 1.5432 - val_accuracy: 0.3178
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7867 - accuracy: 0.3753 - val_loss: 1.5163 - val_accuracy: 0.3178
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8219 - accuracy: 0.3573 - val_loss: 1.4976 - val_accuracy: 0.3084
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7309 - accuracy: 0.3573 - val_loss: 1.4780 - val_accuracy: 0.3084
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6950 - accuracy: 0.3625 - val_loss: 1.4484 - val_accuracy: 0.3037
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6218 - accuracy: 0.3779 - val_loss: 1.4285 - val_accuracy: 0.3037
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6369 - accuracy: 0.3702 - val_loss: 1.4120 - val_accuracy: 0.3131
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6166 - accuracy: 0.3728 - val_loss: 1.3966 - val_accuracy: 0.3178
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4922 - accuracy: 0.3650 - val_loss: 1.3791 - val_accuracy: 0.3178
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5173 - accuracy: 0.3728 - val_loss: 1.3585 - val_accuracy: 0.3131
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5005 - accuracy: 0.3805 - val_loss: 1.3422 - val_accuracy: 0.3131
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4008 - accuracy: 0.3599 - val_loss: 1.3274 - val_accuracy: 0.3131
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4007 - accuracy: 0.3599 - val_loss: 1.3106 - val_accuracy: 0.3178
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4027 - accuracy: 0.3805 - val_loss: 1.2950 - val_accuracy: 0.3224
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3674 - accuracy: 0.3882 - val_loss: 1.3146 - val_accuracy: 0.3318
Epoch 34/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 1.3451 - accuracy: 0.3933 - val_loss: 1.3135 - val_accuracy: 0.3318
Epoch 35/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2628 - accuracy: 0.3959 - val_loss: 1.3027 - val_accuracy: 0.3411
Epoch 36/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3890 - accuracy: 0.4190 - val_loss: 1.3202 - val_accuracy: 0.3411
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2636 - accuracy: 0.4113 - val_loss: 1.3083 - val_accuracy: 0.3364
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2537 - accuracy: 0.3933 - val_loss: 1.2957 - val_accuracy: 0.4206
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1694 - accuracy: 0.4267 - val_loss: 1.2844 - val_accuracy: 0.3458
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2467 - accuracy: 0.3753 - val_loss: 1.3000 - val_accuracy: 0.3411
Epoch 41/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1534 - accuracy: 0.3985 - val_loss: 1.2851 - val_accuracy: 0.3505
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2367 - accuracy: 0.4010 - val_loss: 1.2455 - val_accuracy: 0.3505
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1416 - accuracy: 0.4036 - val_loss: 1.2237 - val_accuracy: 0.3505
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1691 - accuracy: 0.3933 - val_loss: 1.1865 - val_accuracy: 0.3505
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0473 - accuracy: 0.4087 - val_loss: 1.1634 - val_accuracy: 0.3505
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0967 - accuracy: 0.3805 - val_loss: 1.1612 - val_accuracy: 0.3551
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1056 - accuracy: 0.3830 - val_loss: 1.1365 - val_accuracy: 0.3551
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0634 - accuracy: 0.3959 - val_loss: 1.1228 - val_accuracy: 0.4252
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0470 - accuracy: 0.3779 - val_loss: 1.1064 - val_accuracy: 0.4019
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0444 - accuracy: 0.3959 - val_loss: 1.0905 - val_accuracy: 0.3972
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1582 - accuracy: 0.3779 - val_loss: 1.0801 - val_accuracy: 0.4206
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9473 - accuracy: 0.3856 - val_loss: 1.0673 - val_accuracy: 0.4346
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9782 - accuracy: 0.3959 - val_loss: 1.0536 - val_accuracy: 0.4486
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0160 - accuracy: 0.3933 - val_loss: 1.0423 - val_accuracy: 0.4439
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0137 - accuracy: 0.4139 - val_loss: 1.0299 - val_accuracy: 0.4533
Epoch 56/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0176 - accuracy: 0.3753 - val_loss: 1.0175 - val_accuracy: 0.4626
Epoch 57/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0606 - accuracy: 0.3856 - val_loss: 1.0146 - val_accuracy: 0.4486
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9254 - accuracy: 0.3933 - val_loss: 1.0068 - val_accuracy: 0.4346
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9181 - accuracy: 0.3599 - val_loss: 1.0051 - val_accuracy: 0.4346
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8919 - accuracy: 0.3650 - val_loss: 0.9947 - val_accuracy: 0.4486
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8758 - accuracy: 0.3625 - val_loss: 0.9856 - val_accuracy: 0.4252
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8889 - accuracy: 0.3985 - val_loss: 0.9733 - val_accuracy: 0.4346
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8648 - accuracy: 0.3933 - val_loss: 0.9633 - val_accuracy: 0.4393
```

Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7993 - accuracy: 0.3856 - val_loss: 0.9538 - val_accuracy: 0.4486
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9037 - accuracy: 0.4139 - val_loss: 0.9184 - val_accuracy: 0.4626
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7755 - accuracy: 0.4139 - val_loss: 0.9060 - val_accuracy: 0.4766
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7711 - accuracy: 0.4087 - val_loss: 0.8963 - val_accuracy: 0.4720
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8130 - accuracy: 0.4190 - val_loss: 0.8755 - val_accuracy: 0.4626
Epoch 69/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8316 - accuracy: 0.4087 - val_loss: 0.8684 - val_accuracy: 0.4813
Epoch 70/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8422 - accuracy: 0.4344 - val_loss: 0.8643 - val_accuracy: 0.4907
Epoch 71/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7828 - accuracy: 0.4550 - val_loss: 0.8569 - val_accuracy: 0.4907
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7462 - accuracy: 0.4113 - val_loss: 0.8462 - val_accuracy: 0.4720
Epoch 73/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7974 - accuracy: 0.4165 - val_loss: 0.8382 - val_accuracy: 0.4533
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7399 - accuracy: 0.4473 - val_loss: 0.8215 - val_accuracy: 0.4673
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7830 - accuracy: 0.4344 - val_loss: 0.8156 - val_accuracy: 0.4626
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7543 - accuracy: 0.4524 - val_loss: 0.8032 - val_accuracy: 0.4813
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7148 - accuracy: 0.4396 - val_loss: 0.7836 - val_accuracy: 0.4860
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7951 - accuracy: 0.4602 - val_loss: 0.7721 - val_accuracy: 0.4813
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7465 - accuracy: 0.4653 - val_loss: 0.7668 - val_accuracy: 0.4907
Epoch 80/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7331 - accuracy: 0.4550 - val_loss: 0.7556 - val_accuracy: 0.4766
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7607 - accuracy: 0.4653 - val_loss: 0.7584 - val_accuracy: 0.4720
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7353 - accuracy: 0.4602 - val_loss: 0.7388 - val_accuracy: 0.4813
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7347 - accuracy: 0.4653 - val_loss: 0.7335 - val_accuracy: 0.4907
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6815 - accuracy: 0.4833 - val_loss: 0.7219 - val_accuracy: 0.4907
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7324 - accuracy: 0.4807 - val_loss: 0.7108 - val_accuracy: 0.4579
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7460 - accuracy: 0.4833 - val_loss: 0.7133 - val_accuracy: 0.4766
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7290 - accuracy: 0.4884 - val_loss: 0.7078 - val_accuracy: 0.4720
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7026 - accuracy: 0.5141 - val_loss: 0.7062 - val_accuracy: 0.5047
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7532 - accuracy: 0.5039 - val_loss: 0.7046 - val_accuracy: 0.5093
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7395 - accuracy: 0.4653 - val_loss: 0.7137 - val_accuracy: 0.5140
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7044 - accuracy: 0.5167 - val_loss: 0.7250 - val_accuracy: 0.5327
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6773 - accuracy: 0.5424 - val_loss: 0.6937 - val_accuracy: 0.5561
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6991 - accuracy: 0.5450 - val_loss: 0.6608 - val_accuracy: 0.5561

```
accuracy: 0.5374
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8094 - accuracy: 0.5398 - val_loss: 0.6873 - val_accuracy: 0.5327
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7397 - accuracy: 0.5553 - val_loss: 0.7083 - val_accuracy: 0.5561
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8034 - accuracy: 0.5398 - val_loss: 0.7300 - val_accuracy: 0.5701
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6987 - accuracy: 0.5527 - val_loss: 0.7351 - val_accuracy: 0.5701
Epoch 98/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7928 - accuracy: 0.5758 - val_loss: 0.7004 - val_accuracy: 0.5794
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6845 - accuracy: 0.5656 - val_loss: 0.7020 - val_accuracy: 0.5701
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6498 - accuracy: 0.5553 - val_loss: 0.7174 - val_accuracy: 0.5561
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7402 - accuracy: 0.5090 - val_loss: 0.7526 - val_accuracy: 0.4579
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7304 - accuracy: 0.5141 - val_loss: 0.7555 - val_accuracy: 0.4720
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6741 - accuracy: 0.4627 - val_loss: 0.7554 - val_accuracy: 0.4206
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6732 - accuracy: 0.5090 - val_loss: 0.7545 - val_accuracy: 0.5047
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6714 - accuracy: 0.5219 - val_loss: 0.7532 - val_accuracy: 0.5467
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6872 - accuracy: 0.5527 - val_loss: 0.7532 - val_accuracy: 0.5140
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7584 - accuracy: 0.5424 - val_loss: 0.7311 - val_accuracy: 0.5607
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6911 - accuracy: 0.5733 - val_loss: 0.7537 - val_accuracy: 0.5654
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6615 - accuracy: 0.5553 - val_loss: 0.7571 - val_accuracy: 0.5654
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6803 - accuracy: 0.5707 - val_loss: 0.7290 - val_accuracy: 0.5514
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6412 - accuracy: 0.5219 - val_loss: 0.7267 - val_accuracy: 0.5280
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7411 - accuracy: 0.5141 - val_loss: 0.7524 - val_accuracy: 0.5093
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6761 - accuracy: 0.5167 - val_loss: 0.7561 - val_accuracy: 0.4907
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6770 - accuracy: 0.5321 - val_loss: 0.7035 - val_accuracy: 0.4953
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6058 - accuracy: 0.5321 - val_loss: 0.6982 - val_accuracy: 0.4907
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6448 - accuracy: 0.5373 - val_loss: 0.7175 - val_accuracy: 0.5000
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6903 - accuracy: 0.5296 - val_loss: 0.6752 - val_accuracy: 0.5047
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6818 - accuracy: 0.5373 - val_loss: 0.6638 - val_accuracy: 0.5467
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6586 - accuracy: 0.5604 - val_loss: 0.6868 - val_accuracy: 0.5421
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6554 - accuracy: 0.5476 - val_loss: 0.6572 - val_accuracy: 0.5561
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6550 - accuracy: 0.5835 - val_loss: 0.6461 - val_accuracy: 0.5327
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5833 - accuracy: 0.5630 - val_loss: 0.6401 - val_accuracy: 0.5374
Epoch 123/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.5807 - accuracy: 0.5784 - val_loss: 0.6411 - val_accuracy: 0.5327
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6537 - accuracy: 0.5887 - val_loss: 0.6551 - val_accuracy: 0.5701
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6474 - accuracy: 0.5861 - val_loss: 0.6810 - val_accuracy: 0.5841
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6129 - accuracy: 0.6041 - val_loss: 0.6776 - val_accuracy: 0.5654
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5907 - accuracy: 0.5373 - val_loss: 0.6743 - val_accuracy: 0.5187
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5730 - accuracy: 0.5296 - val_loss: 0.6702 - val_accuracy: 0.5047
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5896 - accuracy: 0.5450 - val_loss: 0.6702 - val_accuracy: 0.4907
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6162 - accuracy: 0.5270 - val_loss: 0.6690 - val_accuracy: 0.4860
Epoch 131/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5708 - accuracy: 0.4936 - val_loss: 0.6957 - val_accuracy: 0.4860
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5564 - accuracy: 0.4807 - val_loss: 0.6963 - val_accuracy: 0.5000
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6156 - accuracy: 0.4987 - val_loss: 0.6688 - val_accuracy: 0.4673
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5251 - accuracy: 0.5219 - val_loss: 0.6676 - val_accuracy: 0.4813
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5307 - accuracy: 0.4884 - val_loss: 0.6953 - val_accuracy: 0.4813
Epoch 136/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5320 - accuracy: 0.5116 - val_loss: 0.6699 - val_accuracy: 0.4860
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5661 - accuracy: 0.4910 - val_loss: 0.6702 - val_accuracy: 0.4813
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6258 - accuracy: 0.4910 - val_loss: 0.6699 - val_accuracy: 0.4860
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5971 - accuracy: 0.4602 - val_loss: 0.6690 - val_accuracy: 0.4813
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5506 - accuracy: 0.4961 - val_loss: 0.6705 - val_accuracy: 0.4626
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6100 - accuracy: 0.5013 - val_loss: 0.6702 - val_accuracy: 0.4673
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5837 - accuracy: 0.5116 - val_loss: 0.6684 - val_accuracy: 0.4626
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5388 - accuracy: 0.5347 - val_loss: 0.6674 - val_accuracy: 0.4579
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5900 - accuracy: 0.5296 - val_loss: 0.6669 - val_accuracy: 0.5093
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5082 - accuracy: 0.5707 - val_loss: 0.6654 - val_accuracy: 0.5187
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5257 - accuracy: 0.5578 - val_loss: 0.6591 - val_accuracy: 0.5000
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5264 - accuracy: 0.5373 - val_loss: 0.6867 - val_accuracy: 0.5047
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5057 - accuracy: 0.5373 - val_loss: 0.7178 - val_accuracy: 0.4579
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5040 - accuracy: 0.5039 - val_loss: 0.7663 - val_accuracy: 0.5000
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4750 - accuracy: 0.5219 - val_loss: 0.7844 - val_accuracy: 0.5047
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4996 - accuracy: 0.5167 - val_loss: 0.7827 - val_accuracy: 0.5047
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4808 - accuracy: 0.5039 - val_loss: 0.8027 - val_accuracy: 0.5140
```

Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5250 - accuracy: 0.5219 - val_loss: 0.8004 - val_accuracy: 0.5187
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5279 - accuracy: 0.5296 - val_loss: 0.7836 - val_accuracy: 0.5187
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5191 - accuracy: 0.5244 - val_loss: 0.8033 - val_accuracy: 0.4953
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5001 - accuracy: 0.5501 - val_loss: 0.8048 - val_accuracy: 0.4953
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5038 - accuracy: 0.4987 - val_loss: 0.7329 - val_accuracy: 0.5047
Epoch 158/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4511 - accuracy: 0.5244 - val_loss: 0.7808 - val_accuracy: 0.5000
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5152 - accuracy: 0.5039 - val_loss: 0.7719 - val_accuracy: 0.5047
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4632 - accuracy: 0.5450 - val_loss: 0.7497 - val_accuracy: 0.5000
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4589 - accuracy: 0.5116 - val_loss: 0.7234 - val_accuracy: 0.5000
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4908 - accuracy: 0.5141 - val_loss: 0.7497 - val_accuracy: 0.4860
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4747 - accuracy: 0.5116 - val_loss: 0.7769 - val_accuracy: 0.4860
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5207 - accuracy: 0.5116 - val_loss: 0.7979 - val_accuracy: 0.4860
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4610 - accuracy: 0.5141 - val_loss: 0.7744 - val_accuracy: 0.5093
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4547 - accuracy: 0.5013 - val_loss: 0.7199 - val_accuracy: 0.5140
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5175 - accuracy: 0.5424 - val_loss: 0.6942 - val_accuracy: 0.5000
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4852 - accuracy: 0.5193 - val_loss: 0.6865 - val_accuracy: 0.4907
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4888 - accuracy: 0.5501 - val_loss: 0.6870 - val_accuracy: 0.4907
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4737 - accuracy: 0.5553 - val_loss: 0.6855 - val_accuracy: 0.5000
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4699 - accuracy: 0.5656 - val_loss: 0.6856 - val_accuracy: 0.5187
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4820 - accuracy: 0.5450 - val_loss: 0.7178 - val_accuracy: 0.5140
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4707 - accuracy: 0.5296 - val_loss: 0.6895 - val_accuracy: 0.5280
Epoch 174/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5008 - accuracy: 0.5630 - val_loss: 0.7739 - val_accuracy: 0.5234
Epoch 175/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4778 - accuracy: 0.5476 - val_loss: 0.7404 - val_accuracy: 0.5234
Epoch 176/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4379 - accuracy: 0.5424 - val_loss: 0.7365 - val_accuracy: 0.5327
Epoch 177/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4988 - accuracy: 0.5450 - val_loss: 0.7144 - val_accuracy: 0.5514
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4553 - accuracy: 0.5373 - val_loss: 0.7030 - val_accuracy: 0.5234
Epoch 179/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5184 - accuracy: 0.5604 - val_loss: 0.7697 - val_accuracy: 0.5280
Epoch 180/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4778 - accuracy: 0.5733 - val_loss: 0.7738 - val_accuracy: 0.5467
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4780 - accuracy: 0.5450 - val_loss: 0.7453 - val_accuracy: 0.5327
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4928 - accuracy: 0.5553 - val_loss: 0.7202 - val_accuracy: 0.5553

```
accuracy: 0.5327
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4601 - accuracy: 0.5784 - val_loss: 0.7138 - val_accuracy: 0.5280
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4554 - accuracy: 0.5630 - val_loss: 0.6856 - val_accuracy: 0.5140
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4298 - accuracy: 0.5527 - val_loss: 0.6611 - val_accuracy: 0.5093
Epoch 186/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4926 - accuracy: 0.5501 - val_loss: 0.6333 - val_accuracy: 0.5187
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5367 - accuracy: 0.5373 - val_loss: 0.6459 - val_accuracy: 0.4953
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5113 - accuracy: 0.5707 - val_loss: 0.6977 - val_accuracy: 0.5140
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4390 - accuracy: 0.5450 - val_loss: 0.6957 - val_accuracy: 0.5047
Epoch 190/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4529 - accuracy: 0.5656 - val_loss: 0.6960 - val_accuracy: 0.5187
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4856 - accuracy: 0.5656 - val_loss: 0.6245 - val_accuracy: 0.5047
Epoch 192/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4587 - accuracy: 0.5398 - val_loss: 0.6215 - val_accuracy: 0.5093
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4883 - accuracy: 0.5296 - val_loss: 0.6279 - val_accuracy: 0.5047
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4663 - accuracy: 0.5270 - val_loss: 0.6485 - val_accuracy: 0.5140
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5050 - accuracy: 0.5476 - val_loss: 0.6195 - val_accuracy: 0.5140
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4345 - accuracy: 0.5398 - val_loss: 0.6208 - val_accuracy: 0.5234
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5501 - accuracy: 0.5630 - val_loss: 0.6711 - val_accuracy: 0.5234
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4857 - accuracy: 0.5501 - val_loss: 0.7002 - val_accuracy: 0.5327
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4253 - accuracy: 0.5578 - val_loss: 0.6993 - val_accuracy: 0.5280
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4749 - accuracy: 0.5450 - val_loss: 0.7250 - val_accuracy: 0.5327
Epoch 201/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4240 - accuracy: 0.5347 - val_loss: 0.7210 - val_accuracy: 0.5140
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4294 - accuracy: 0.5424 - val_loss: 0.7201 - val_accuracy: 0.5140
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4051 - accuracy: 0.5244 - val_loss: 0.6664 - val_accuracy: 0.5047
Epoch 204/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4247 - accuracy: 0.5450 - val_loss: 0.6668 - val_accuracy: 0.5093
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4527 - accuracy: 0.5296 - val_loss: 0.6397 - val_accuracy: 0.5140
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4940 - accuracy: 0.5553 - val_loss: 0.6602 - val_accuracy: 0.5280
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4631 - accuracy: 0.5835 - val_loss: 0.6612 - val_accuracy: 0.5234
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4237 - accuracy: 0.6015 - val_loss: 0.6621 - val_accuracy: 0.5234
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4384 - accuracy: 0.6170 - val_loss: 0.6619 - val_accuracy: 0.5374
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4622 - accuracy: 0.5990 - val_loss: 0.6632 - val_accuracy: 0.5561
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4922 - accuracy: 0.5938 - val_loss: 0.6626 - val_accuracy: 0.5234
Epoch 212/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.5383 - accuracy: 0.5835 - val_loss: 0.6620 - val_accuracy: 0.5467
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4572 - accuracy: 0.5938 - val_loss: 0.6631 - val_accuracy: 0.5561
Epoch 214/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4717 - accuracy: 0.5964 - val_loss: 0.6637 - val_accuracy: 0.5467
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4588 - accuracy: 0.6144 - val_loss: 0.6643 - val_accuracy: 0.5467
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4452 - accuracy: 0.6041 - val_loss: 0.6666 - val_accuracy: 0.5467
Epoch 217/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4576 - accuracy: 0.5964 - val_loss: 0.6668 - val_accuracy: 0.5841
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4349 - accuracy: 0.6632 - val_loss: 0.6667 - val_accuracy: 0.6168
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4317 - accuracy: 0.6427 - val_loss: 0.6935 - val_accuracy: 0.6729
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4229 - accuracy: 0.6478 - val_loss: 0.6737 - val_accuracy: 0.6776
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4835 - accuracy: 0.6530 - val_loss: 0.6637 - val_accuracy: 0.6822
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4584 - accuracy: 0.6607 - val_loss: 0.6778 - val_accuracy: 0.6822
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4380 - accuracy: 0.6632 - val_loss: 0.6909 - val_accuracy: 0.6822
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4213 - accuracy: 0.6504 - val_loss: 0.6912 - val_accuracy: 0.6869
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5188 - accuracy: 0.6478 - val_loss: 0.6935 - val_accuracy: 0.6822
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4654 - accuracy: 0.6864 - val_loss: 0.6935 - val_accuracy: 0.6822
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4690 - accuracy: 0.6607 - val_loss: 0.6935 - val_accuracy: 0.6869
Epoch 228/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4323 - accuracy: 0.6735 - val_loss: 0.6941 - val_accuracy: 0.6916
Epoch 229/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4295 - accuracy: 0.6941 - val_loss: 0.6952 - val_accuracy: 0.7009
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4581 - accuracy: 0.6375 - val_loss: 0.6949 - val_accuracy: 0.6916
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4767 - accuracy: 0.6607 - val_loss: 0.7463 - val_accuracy: 0.6729
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4664 - accuracy: 0.6632 - val_loss: 0.7255 - val_accuracy: 0.6776
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5219 - accuracy: 0.6452 - val_loss: 0.7428 - val_accuracy: 0.6729
Epoch 234/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4576 - accuracy: 0.6658 - val_loss: 0.7364 - val_accuracy: 0.6682
Epoch 235/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4425 - accuracy: 0.6710 - val_loss: 0.7315 - val_accuracy: 0.6636
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4357 - accuracy: 0.6812 - val_loss: 0.7326 - val_accuracy: 0.6636
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4123 - accuracy: 0.6889 - val_loss: 0.7271 - val_accuracy: 0.6636
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5031 - accuracy: 0.6684 - val_loss: 0.7280 - val_accuracy: 0.6682
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4013 - accuracy: 0.6478 - val_loss: 0.7288 - val_accuracy: 0.6729
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4209 - accuracy: 0.6684 - val_loss: 0.7221 - val_accuracy: 0.6589
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4482 - accuracy: 0.6812 - val_loss: 0.7208 - val_accuracy: 0.6636
```

Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4694 - accuracy: 0.6684 - val_loss: 0.7207 - val_accuracy: 0.6682
Epoch 243/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4367 - accuracy: 0.6710 - val_loss: 0.6972 - val_accuracy: 0.6636
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4533 - accuracy: 0.6710 - val_loss: 0.6663 - val_accuracy: 0.6589
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4084 - accuracy: 0.6710 - val_loss: 0.6655 - val_accuracy: 0.6495
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4271 - accuracy: 0.6710 - val_loss: 0.6654 - val_accuracy: 0.6542
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4595 - accuracy: 0.6632 - val_loss: 0.6642 - val_accuracy: 0.6542
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4252 - accuracy: 0.6504 - val_loss: 0.6622 - val_accuracy: 0.6542
Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4421 - accuracy: 0.6632 - val_loss: 0.6616 - val_accuracy: 0.6308
Epoch 250/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4295 - accuracy: 0.6581 - val_loss: 0.6623 - val_accuracy: 0.6355
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4332 - accuracy: 0.6401 - val_loss: 0.6571 - val_accuracy: 0.6262
Epoch 252/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4794 - accuracy: 0.6555 - val_loss: 0.6736 - val_accuracy: 0.6402
Epoch 253/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3929 - accuracy: 0.6247 - val_loss: 0.6799 - val_accuracy: 0.6449
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4487 - accuracy: 0.6195 - val_loss: 0.6757 - val_accuracy: 0.6402
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4096 - accuracy: 0.6324 - val_loss: 0.6650 - val_accuracy: 0.6262
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4236 - accuracy: 0.6350 - val_loss: 0.6846 - val_accuracy: 0.6121
Epoch 257/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4037 - accuracy: 0.6427 - val_loss: 0.6564 - val_accuracy: 0.6121
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4158 - accuracy: 0.6607 - val_loss: 0.6571 - val_accuracy: 0.6308
Epoch 259/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4027 - accuracy: 0.6555 - val_loss: 0.6531 - val_accuracy: 0.5981
Epoch 260/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3969 - accuracy: 0.6452 - val_loss: 0.6598 - val_accuracy: 0.5888
Epoch 261/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4123 - accuracy: 0.6555 - val_loss: 0.6461 - val_accuracy: 0.5888
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4273 - accuracy: 0.6632 - val_loss: 0.6482 - val_accuracy: 0.5935
Epoch 263/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4278 - accuracy: 0.6684 - val_loss: 0.6714 - val_accuracy: 0.5888
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4113 - accuracy: 0.6710 - val_loss: 0.6761 - val_accuracy: 0.6121
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4043 - accuracy: 0.6735 - val_loss: 0.6599 - val_accuracy: 0.6168
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4724 - accuracy: 0.6992 - val_loss: 0.6765 - val_accuracy: 0.6121
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4233 - accuracy: 0.6530 - val_loss: 0.6482 - val_accuracy: 0.6075
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3879 - accuracy: 0.6735 - val_loss: 0.6469 - val_accuracy: 0.6121
Epoch 269/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4142 - accuracy: 0.7018 - val_loss: 0.6393 - val_accuracy: 0.6262
Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4099 - accuracy: 0.6941 - val_loss: 0.6347 - val_accuracy: 0.6215
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4696 - accuracy: 0.6607 - val_loss: 0.6339 - val_accuracy: 0.6215

```
accuracy: 0.6121
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4156 - accuracy: 0.6632 - val_loss: 0.6369 - val_
accuracy: 0.6075
Epoch 273/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3927 - accuracy: 0.6632 - val_loss: 0.6399 - val_
accuracy: 0.5888
Epoch 274/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4167 - accuracy: 0.6170 - val_loss: 0.6410 - val_
accuracy: 0.5794
Epoch 275/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4585 - accuracy: 0.6298 - val_loss: 0.6393 - val_
accuracy: 0.5794
Epoch 276/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3994 - accuracy: 0.6427 - val_loss: 0.6377 - val_
accuracy: 0.5748
Epoch 277/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4584 - accuracy: 0.6555 - val_loss: 0.6389 - val_
accuracy: 0.5748
Epoch 278/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4289 - accuracy: 0.5758 - val_loss: 0.6445 - val_
accuracy: 0.5467
Epoch 279/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4506 - accuracy: 0.6041 - val_loss: 0.6431 - val_
accuracy: 0.5794
Epoch 280/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4671 - accuracy: 0.6530 - val_loss: 0.6425 - val_
accuracy: 0.5654
Epoch 281/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4577 - accuracy: 0.6452 - val_loss: 0.6455 - val_
accuracy: 0.5794
Epoch 282/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4025 - accuracy: 0.6350 - val_loss: 0.6461 - val_
accuracy: 0.5421
Epoch 283/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4527 - accuracy: 0.6350 - val_loss: 0.6476 - val_
accuracy: 0.5467
Epoch 284/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4671 - accuracy: 0.6093 - val_loss: 0.6506 - val_
accuracy: 0.5280
Epoch 285/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4818 - accuracy: 0.6041 - val_loss: 0.6475 - val_
accuracy: 0.5187
Epoch 286/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4330 - accuracy: 0.5964 - val_loss: 0.6836 - val_
accuracy: 0.4953
Epoch 287/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5137 - accuracy: 0.5810 - val_loss: 0.7035 - val_
accuracy: 0.5093
Epoch 288/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4508 - accuracy: 0.5887 - val_loss: 0.6795 - val_
accuracy: 0.5374
Epoch 289/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4206 - accuracy: 0.6093 - val_loss: 0.7042 - val_
accuracy: 0.5234
Epoch 290/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4047 - accuracy: 0.5964 - val_loss: 0.7074 - val_
accuracy: 0.5187
Epoch 291/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3994 - accuracy: 0.5604 - val_loss: 0.7161 - val_
accuracy: 0.4907
Epoch 292/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4569 - accuracy: 0.5861 - val_loss: 0.6999 - val_
accuracy: 0.5047
Epoch 293/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4337 - accuracy: 0.5938 - val_loss: 0.7290 - val_
accuracy: 0.4953
Epoch 294/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4490 - accuracy: 0.5656 - val_loss: 0.6869 - val_
accuracy: 0.4907
Epoch 295/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4198 - accuracy: 0.5707 - val_loss: 0.6782 - val_
accuracy: 0.4953
Epoch 296/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4652 - accuracy: 0.5553 - val_loss: 0.8511 - val_
accuracy: 0.5000
Epoch 297/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3928 - accuracy: 0.5630 - val_loss: 0.7976 - val_
accuracy: 0.4953
Epoch 298/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3966 - accuracy: 0.5347 - val_loss: 0.7052 - val_
accuracy: 0.5187
Epoch 299/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4397 - accuracy: 0.6144 - val_loss: 0.7375 - val_
accuracy: 0.5047
Epoch 300/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4674 - accuracy: 0.5758 - val_loss: 0.6777 - val_
accuracy: 0.5000
Epoch 301/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.4842 - accuracy: 0.5656 - val_loss: 0.7292 - val_accuracy: 0.5187
Epoch 302/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4159 - accuracy: 0.5656 - val_loss: 0.6834 - val_accuracy: 0.5093
Epoch 303/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4402 - accuracy: 0.5861 - val_loss: 0.7076 - val_accuracy: 0.5093
Epoch 304/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3811 - accuracy: 0.5656 - val_loss: 0.6781 - val_accuracy: 0.5093
Epoch 305/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4623 - accuracy: 0.5784 - val_loss: 0.7019 - val_accuracy: 0.5093
Epoch 306/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4212 - accuracy: 0.5784 - val_loss: 0.6996 - val_accuracy: 0.5187
Epoch 307/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3904 - accuracy: 0.5758 - val_loss: 0.7839 - val_accuracy: 0.5047
Epoch 308/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3898 - accuracy: 0.5887 - val_loss: 0.7873 - val_accuracy: 0.5187
Epoch 309/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3883 - accuracy: 0.5501 - val_loss: 0.7225 - val_accuracy: 0.5140
Epoch 310/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3715 - accuracy: 0.5398 - val_loss: 0.7772 - val_accuracy: 0.5280
Epoch 311/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4681 - accuracy: 0.5578 - val_loss: 0.7733 - val_accuracy: 0.5280
Epoch 312/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4692 - accuracy: 0.5167 - val_loss: 0.7096 - val_accuracy: 0.5280
Epoch 313/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4328 - accuracy: 0.5604 - val_loss: 0.7640 - val_accuracy: 0.5280
Epoch 314/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4243 - accuracy: 0.5244 - val_loss: 0.7636 - val_accuracy: 0.5374
Epoch 315/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4609 - accuracy: 0.5578 - val_loss: 0.7562 - val_accuracy: 0.5327
Epoch 316/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3543 - accuracy: 0.5630 - val_loss: 0.7327 - val_accuracy: 0.5234
Epoch 317/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4002 - accuracy: 0.5604 - val_loss: 0.7601 - val_accuracy: 0.5234
Epoch 318/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3965 - accuracy: 0.5630 - val_loss: 0.8835 - val_accuracy: 0.5187
Epoch 319/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4505 - accuracy: 0.5398 - val_loss: 0.8801 - val_accuracy: 0.5234
Epoch 320/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4186 - accuracy: 0.5321 - val_loss: 0.8608 - val_accuracy: 0.5093
Epoch 321/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4537 - accuracy: 0.5553 - val_loss: 0.8656 - val_accuracy: 0.5327
Epoch 322/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4625 - accuracy: 0.5656 - val_loss: 0.8915 - val_accuracy: 0.5514
Epoch 323/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3968 - accuracy: 0.5681 - val_loss: 0.8845 - val_accuracy: 0.5421
Epoch 324/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3993 - accuracy: 0.5810 - val_loss: 0.9164 - val_accuracy: 0.5561
Epoch 325/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4035 - accuracy: 0.5938 - val_loss: 0.8865 - val_accuracy: 0.5374
Epoch 326/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4132 - accuracy: 0.5861 - val_loss: 0.8064 - val_accuracy: 0.5374
Epoch 327/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4646 - accuracy: 0.6093 - val_loss: 0.7782 - val_accuracy: 0.5467
Epoch 328/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3794 - accuracy: 0.5887 - val_loss: 0.8415 - val_accuracy: 0.5701
Epoch 329/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4011 - accuracy: 0.6298 - val_loss: 0.8417 - val_accuracy: 0.5654
Epoch 330/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4440 - accuracy: 0.6195 - val_loss: 0.7755 - val_accuracy: 0.5701
```

Epoch 331/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3560 - accuracy: 0.6247 - val_loss: 0.7507 - val_accuracy: 0.5654
Epoch 332/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3835 - accuracy: 0.6375 - val_loss: 0.7587 - val_accuracy: 0.5748
Epoch 333/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4141 - accuracy: 0.6041 - val_loss: 0.8298 - val_accuracy: 0.5794
Epoch 334/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3777 - accuracy: 0.6375 - val_loss: 0.8896 - val_accuracy: 0.5748
Epoch 335/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3669 - accuracy: 0.6350 - val_loss: 0.8026 - val_accuracy: 0.5841
Epoch 336/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3743 - accuracy: 0.6375 - val_loss: 0.7757 - val_accuracy: 0.5748
Epoch 337/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3917 - accuracy: 0.6144 - val_loss: 0.8532 - val_accuracy: 0.5607
Epoch 338/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3706 - accuracy: 0.5938 - val_loss: 0.8320 - val_accuracy: 0.5701
Epoch 339/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4536 - accuracy: 0.6221 - val_loss: 0.8260 - val_accuracy: 0.5748
Epoch 340/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4452 - accuracy: 0.5861 - val_loss: 0.8213 - val_accuracy: 0.5607
Epoch 341/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3585 - accuracy: 0.6144 - val_loss: 0.8210 - val_accuracy: 0.5561
Epoch 342/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3846 - accuracy: 0.5887 - val_loss: 0.8217 - val_accuracy: 0.5748
Epoch 343/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3765 - accuracy: 0.5861 - val_loss: 0.8127 - val_accuracy: 0.5654
Epoch 344/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4020 - accuracy: 0.5604 - val_loss: 0.8123 - val_accuracy: 0.5607
Epoch 345/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3695 - accuracy: 0.5784 - val_loss: 0.8082 - val_accuracy: 0.5654
Epoch 346/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3852 - accuracy: 0.6195 - val_loss: 0.8283 - val_accuracy: 0.5888
Epoch 347/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3540 - accuracy: 0.6041 - val_loss: 0.8199 - val_accuracy: 0.5701
Epoch 348/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4222 - accuracy: 0.6015 - val_loss: 0.8161 - val_accuracy: 0.5888
Epoch 349/1000
4/4 [=====] - 0s 22ms/step - loss: 0.4832 - accuracy: 0.6015 - val_loss: 0.8107 - val_accuracy: 0.5888
Epoch 350/1000
4/4 [=====] - 0s 26ms/step - loss: 0.3736 - accuracy: 0.6144 - val_loss: 0.8065 - val_accuracy: 0.5748
Epoch 351/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3814 - accuracy: 0.5835 - val_loss: 0.8056 - val_accuracy: 0.5607
Epoch 352/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3488 - accuracy: 0.5887 - val_loss: 0.7711 - val_accuracy: 0.5607
Epoch 353/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3990 - accuracy: 0.5938 - val_loss: 0.7487 - val_accuracy: 0.5654
Epoch 354/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3796 - accuracy: 0.6324 - val_loss: 0.8125 - val_accuracy: 0.6028
Epoch 355/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3882 - accuracy: 0.6684 - val_loss: 0.8097 - val_accuracy: 0.6215
Epoch 356/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4259 - accuracy: 0.6632 - val_loss: 0.8106 - val_accuracy: 0.6168
Epoch 357/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3473 - accuracy: 0.6555 - val_loss: 0.8138 - val_accuracy: 0.6121
Epoch 358/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3612 - accuracy: 0.6632 - val_loss: 0.8435 - val_accuracy: 0.6262
Epoch 359/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4118 - accuracy: 0.6607 - val_loss: 0.8360 - val_accuracy: 0.6215
Epoch 360/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3851 - accuracy: 0.6555 - val_loss: 0.8374 - val_accuracy: 0.6215

```
accuracy: 0.6262
Epoch 361/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4419 - accuracy: 0.6607 - val_loss: 0.8338 - val_accuracy: 0.6822
Epoch 362/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4416 - accuracy: 0.7018 - val_loss: 0.7843 - val_accuracy: 0.6262
Epoch 363/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3570 - accuracy: 0.6530 - val_loss: 0.7481 - val_accuracy: 0.6822
Epoch 364/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3739 - accuracy: 0.6889 - val_loss: 0.7990 - val_accuracy: 0.6682
Epoch 365/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3834 - accuracy: 0.6864 - val_loss: 0.8031 - val_accuracy: 0.6963
Epoch 366/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3676 - accuracy: 0.6787 - val_loss: 0.8073 - val_accuracy: 0.7056
Epoch 367/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3940 - accuracy: 0.6915 - val_loss: 0.7738 - val_accuracy: 0.7009
Epoch 368/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3749 - accuracy: 0.6812 - val_loss: 0.7762 - val_accuracy: 0.7056
Epoch 369/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4041 - accuracy: 0.6967 - val_loss: 0.7755 - val_accuracy: 0.7009
Epoch 370/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3870 - accuracy: 0.7069 - val_loss: 0.7780 - val_accuracy: 0.6916
Epoch 371/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3984 - accuracy: 0.6941 - val_loss: 0.7748 - val_accuracy: 0.7009
Epoch 372/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3485 - accuracy: 0.7121 - val_loss: 0.8166 - val_accuracy: 0.6542
Epoch 373/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4594 - accuracy: 0.6812 - val_loss: 0.7653 - val_accuracy: 0.6636
Epoch 374/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3635 - accuracy: 0.6838 - val_loss: 0.7987 - val_accuracy: 0.6449
Epoch 375/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3760 - accuracy: 0.6684 - val_loss: 0.7659 - val_accuracy: 0.6729
Epoch 376/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4240 - accuracy: 0.6555 - val_loss: 0.7627 - val_accuracy: 0.6589
Epoch 377/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3832 - accuracy: 0.6324 - val_loss: 0.7608 - val_accuracy: 0.6636
Epoch 378/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3885 - accuracy: 0.6350 - val_loss: 0.7590 - val_accuracy: 0.6589
Epoch 379/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3815 - accuracy: 0.6581 - val_loss: 0.7647 - val_accuracy: 0.6449
Epoch 380/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3945 - accuracy: 0.6530 - val_loss: 0.7607 - val_accuracy: 0.6495
Epoch 381/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4170 - accuracy: 0.6427 - val_loss: 0.7614 - val_accuracy: 0.6449
Epoch 382/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4038 - accuracy: 0.6427 - val_loss: 0.7681 - val_accuracy: 0.6542
Epoch 383/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3838 - accuracy: 0.6324 - val_loss: 0.7886 - val_accuracy: 0.6589
Epoch 384/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3748 - accuracy: 0.6427 - val_loss: 0.7615 - val_accuracy: 0.6355
Epoch 385/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3972 - accuracy: 0.6144 - val_loss: 0.7592 - val_accuracy: 0.6308
Epoch 386/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4291 - accuracy: 0.6889 - val_loss: 0.8080 - val_accuracy: 0.6262
Epoch 387/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4131 - accuracy: 0.6761 - val_loss: 0.8043 - val_accuracy: 0.6402
Epoch 388/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4333 - accuracy: 0.7147 - val_loss: 0.7579 - val_accuracy: 0.6636
Epoch 389/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3697 - accuracy: 0.6864 - val_loss: 0.7620 - val_accuracy: 0.6636
Epoch 390/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.3589 - accuracy: 0.7095 - val_loss: 0.7882 - val_accuracy: 0.6682
Epoch 391/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4069 - accuracy: 0.6632 - val_loss: 0.8804 - val_accuracy: 0.6495
Epoch 392/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3751 - accuracy: 0.6812 - val_loss: 0.8795 - val_accuracy: 0.6589
Epoch 393/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4445 - accuracy: 0.6787 - val_loss: 0.8772 - val_accuracy: 0.6495
Epoch 394/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3561 - accuracy: 0.6761 - val_loss: 0.8480 - val_accuracy: 0.6449
Epoch 395/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3675 - accuracy: 0.6864 - val_loss: 0.8212 - val_accuracy: 0.6682
Epoch 396/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4375 - accuracy: 0.6941 - val_loss: 0.8221 - val_accuracy: 0.6542
Epoch 397/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3662 - accuracy: 0.6684 - val_loss: 0.8368 - val_accuracy: 0.6636
Epoch 398/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3989 - accuracy: 0.6504 - val_loss: 0.8363 - val_accuracy: 0.6542
Epoch 399/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3797 - accuracy: 0.6530 - val_loss: 0.8315 - val_accuracy: 0.6449
Epoch 400/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3609 - accuracy: 0.6427 - val_loss: 0.8051 - val_accuracy: 0.6449
Epoch 401/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4390 - accuracy: 0.6298 - val_loss: 0.8033 - val_accuracy: 0.6449
Epoch 402/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3735 - accuracy: 0.6607 - val_loss: 0.8049 - val_accuracy: 0.6449
Epoch 403/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4182 - accuracy: 0.6298 - val_loss: 0.8073 - val_accuracy: 0.6308
Epoch 404/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4023 - accuracy: 0.6607 - val_loss: 0.8119 - val_accuracy: 0.6402
Epoch 405/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3842 - accuracy: 0.6247 - val_loss: 0.8290 - val_accuracy: 0.6075
Epoch 406/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3904 - accuracy: 0.5835 - val_loss: 0.8275 - val_accuracy: 0.6402
Epoch 407/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3803 - accuracy: 0.6298 - val_loss: 0.8006 - val_accuracy: 0.6402
Epoch 408/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4068 - accuracy: 0.6195 - val_loss: 0.8014 - val_accuracy: 0.6308
Epoch 409/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3515 - accuracy: 0.6118 - val_loss: 0.8055 - val_accuracy: 0.6168
Epoch 410/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3346 - accuracy: 0.6324 - val_loss: 0.8373 - val_accuracy: 0.6028
Epoch 411/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3366 - accuracy: 0.6478 - val_loss: 0.8350 - val_accuracy: 0.6028
Epoch 412/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3933 - accuracy: 0.5990 - val_loss: 0.8362 - val_accuracy: 0.5607
Epoch 413/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3829 - accuracy: 0.6067 - val_loss: 0.9058 - val_accuracy: 0.5561
Epoch 414/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3654 - accuracy: 0.6041 - val_loss: 0.9302 - val_accuracy: 0.5374
Epoch 415/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3850 - accuracy: 0.6015 - val_loss: 1.0030 - val_accuracy: 0.5374
Epoch 416/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3891 - accuracy: 0.5887 - val_loss: 0.9987 - val_accuracy: 0.5327
Epoch 417/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3790 - accuracy: 0.6015 - val_loss: 1.0035 - val_accuracy: 0.5140
Epoch 418/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3743 - accuracy: 0.5758 - val_loss: 1.0329 - val_accuracy: 0.5187
Epoch 419/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3581 - accuracy: 0.5656 - val_loss: 1.0198 - val_accuracy: 0.5327
```

Epoch 420/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3772 - accuracy: 0.6067 - val_loss: 1.0016 - val_accuracy: 0.5514
Epoch 421/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4309 - accuracy: 0.6067 - val_loss: 0.9904 - val_accuracy: 0.5234
Epoch 422/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3408 - accuracy: 0.5758 - val_loss: 0.9288 - val_accuracy: 0.5421
Epoch 423/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3552 - accuracy: 0.5630 - val_loss: 0.9376 - val_accuracy: 0.5467
Epoch 424/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3688 - accuracy: 0.5887 - val_loss: 0.9809 - val_accuracy: 0.5514
Epoch 425/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3415 - accuracy: 0.6015 - val_loss: 0.9878 - val_accuracy: 0.5374
Epoch 426/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3635 - accuracy: 0.5758 - val_loss: 0.9889 - val_accuracy: 0.5187
Epoch 427/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3955 - accuracy: 0.5861 - val_loss: 0.8954 - val_accuracy: 0.5327
Epoch 428/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3373 - accuracy: 0.5861 - val_loss: 0.8909 - val_accuracy: 0.5467
Epoch 429/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3815 - accuracy: 0.5887 - val_loss: 0.9215 - val_accuracy: 0.5327
Epoch 430/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3463 - accuracy: 0.5964 - val_loss: 0.9735 - val_accuracy: 0.5421
Epoch 431/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3671 - accuracy: 0.6015 - val_loss: 0.9642 - val_accuracy: 0.5421
Epoch 432/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4104 - accuracy: 0.5758 - val_loss: 0.9389 - val_accuracy: 0.5421
Epoch 433/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3392 - accuracy: 0.5630 - val_loss: 0.9122 - val_accuracy: 0.5374
Epoch 434/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3956 - accuracy: 0.5913 - val_loss: 0.8779 - val_accuracy: 0.5607
Epoch 435/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3788 - accuracy: 0.6041 - val_loss: 0.9048 - val_accuracy: 0.5467
Epoch 436/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3538 - accuracy: 0.5964 - val_loss: 0.8630 - val_accuracy: 0.5421
Epoch 437/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3584 - accuracy: 0.5604 - val_loss: 0.8466 - val_accuracy: 0.5561
Epoch 438/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3999 - accuracy: 0.5861 - val_loss: 0.8206 - val_accuracy: 0.5140
Epoch 439/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3388 - accuracy: 0.5604 - val_loss: 0.8495 - val_accuracy: 0.5374
Epoch 440/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3212 - accuracy: 0.5450 - val_loss: 0.8233 - val_accuracy: 0.5234
Epoch 441/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3245 - accuracy: 0.5578 - val_loss: 0.8171 - val_accuracy: 0.5327
Epoch 442/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3239 - accuracy: 0.5450 - val_loss: 0.7875 - val_accuracy: 0.5280
Epoch 443/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3291 - accuracy: 0.5553 - val_loss: 0.7898 - val_accuracy: 0.5327
Epoch 444/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3298 - accuracy: 0.5373 - val_loss: 0.8161 - val_accuracy: 0.5234
Epoch 445/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3511 - accuracy: 0.5578 - val_loss: 0.8206 - val_accuracy: 0.5234
Epoch 446/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4010 - accuracy: 0.5835 - val_loss: 0.7888 - val_accuracy: 0.5234
Epoch 447/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3240 - accuracy: 0.5450 - val_loss: 0.8147 - val_accuracy: 0.5280
Epoch 448/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3667 - accuracy: 0.5527 - val_loss: 0.8140 - val_accuracy: 0.5187
Epoch 449/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3784 - accuracy: 0.5373 - val_loss: 0.8156 - val_accuracy: 0.5187

```
accuracy: 0.5374
Epoch 450/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5059 - accuracy: 0.5733 - val_loss: 0.8162 - val_
accuracy: 0.5841
Epoch 451/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3638 - accuracy: 0.6067 - val_loss: 0.8206 - val_
accuracy: 0.6028
Epoch 452/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3426 - accuracy: 0.6170 - val_loss: 0.7965 - val_
accuracy: 0.5888
Epoch 453/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3535 - accuracy: 0.6041 - val_loss: 0.8303 - val_
accuracy: 0.6168
Epoch 454/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3730 - accuracy: 0.6298 - val_loss: 0.8844 - val_
accuracy: 0.6215
Epoch 455/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3616 - accuracy: 0.6170 - val_loss: 0.8555 - val_
accuracy: 0.6028
Epoch 456/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3136 - accuracy: 0.6324 - val_loss: 0.7928 - val_
accuracy: 0.5935
Epoch 457/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3574 - accuracy: 0.5964 - val_loss: 0.8007 - val_
accuracy: 0.5841
Epoch 458/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3598 - accuracy: 0.5835 - val_loss: 0.8011 - val_
accuracy: 0.5654
Epoch 459/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3639 - accuracy: 0.5476 - val_loss: 0.8186 - val_
accuracy: 0.6215
Epoch 460/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3243 - accuracy: 0.6324 - val_loss: 0.8185 - val_
accuracy: 0.6262
Epoch 461/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3412 - accuracy: 0.6015 - val_loss: 0.8208 - val_
accuracy: 0.6589
Epoch 462/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3344 - accuracy: 0.6530 - val_loss: 0.8282 - val_
accuracy: 0.6542
Epoch 463/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3301 - accuracy: 0.6401 - val_loss: 0.8302 - val_
accuracy: 0.6262
Epoch 464/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3425 - accuracy: 0.6324 - val_loss: 0.9103 - val_
accuracy: 0.6168
Epoch 465/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3910 - accuracy: 0.6555 - val_loss: 0.8318 - val_
accuracy: 0.6028
Epoch 466/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3271 - accuracy: 0.6221 - val_loss: 0.8236 - val_
accuracy: 0.6075
Epoch 467/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4219 - accuracy: 0.5990 - val_loss: 0.8287 - val_
accuracy: 0.6075
Epoch 468/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3946 - accuracy: 0.6093 - val_loss: 0.8899 - val_
accuracy: 0.6682
Epoch 469/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3833 - accuracy: 0.6195 - val_loss: 0.8389 - val_
accuracy: 0.6636
Epoch 470/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4017 - accuracy: 0.6478 - val_loss: 0.8605 - val_
accuracy: 0.6682
Epoch 471/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3679 - accuracy: 0.6735 - val_loss: 0.8837 - val_
accuracy: 0.6495
Epoch 472/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3723 - accuracy: 0.6504 - val_loss: 0.9118 - val_
accuracy: 0.6449
Epoch 473/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4192 - accuracy: 0.6530 - val_loss: 0.9133 - val_
accuracy: 0.6682
Epoch 474/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5119 - accuracy: 0.6504 - val_loss: 0.9414 - val_
accuracy: 0.6308
Epoch 475/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3664 - accuracy: 0.6658 - val_loss: 0.9381 - val_
accuracy: 0.6215
Epoch 476/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3284 - accuracy: 0.6684 - val_loss: 0.9384 - val_
accuracy: 0.6308
Epoch 477/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3871 - accuracy: 0.6555 - val_loss: 0.9143 - val_
accuracy: 0.6308
Epoch 478/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3646 - accuracy: 0.6812 - val_loss: 0.9143 - val_
accuracy: 0.6589
Epoch 479/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.3094 - accuracy: 0.6658 - val_loss: 0.8826 - val_accuracy: 0.6449
Epoch 480/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4571 - accuracy: 0.6324 - val_loss: 0.9507 - val_accuracy: 0.6121
Epoch 481/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3659 - accuracy: 0.6555 - val_loss: 0.9174 - val_accuracy: 0.6262
Epoch 482/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3995 - accuracy: 0.6375 - val_loss: 0.9467 - val_accuracy: 0.6262
Epoch 483/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4212 - accuracy: 0.6041 - val_loss: 0.9751 - val_accuracy: 0.6075
Epoch 484/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3514 - accuracy: 0.6041 - val_loss: 0.8731 - val_accuracy: 0.6262
Epoch 485/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4931 - accuracy: 0.6350 - val_loss: 0.8516 - val_accuracy: 0.6262
Epoch 486/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4190 - accuracy: 0.6170 - val_loss: 0.8222 - val_accuracy: 0.6308
Epoch 487/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3599 - accuracy: 0.6375 - val_loss: 0.8182 - val_accuracy: 0.6355
Epoch 488/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3738 - accuracy: 0.6401 - val_loss: 0.7897 - val_accuracy: 0.6542
Epoch 489/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3091 - accuracy: 0.6015 - val_loss: 0.7916 - val_accuracy: 0.6402
Epoch 490/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3340 - accuracy: 0.6324 - val_loss: 0.7868 - val_accuracy: 0.6449
Epoch 491/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3215 - accuracy: 0.6195 - val_loss: 0.8509 - val_accuracy: 0.6215
Epoch 492/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3814 - accuracy: 0.6221 - val_loss: 0.8916 - val_accuracy: 0.6121
Epoch 493/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3339 - accuracy: 0.6221 - val_loss: 0.8780 - val_accuracy: 0.5794
Epoch 494/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3853 - accuracy: 0.6221 - val_loss: 0.8528 - val_accuracy: 0.5935
Epoch 495/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3749 - accuracy: 0.6170 - val_loss: 0.8828 - val_accuracy: 0.5841
Epoch 496/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3265 - accuracy: 0.6195 - val_loss: 0.8843 - val_accuracy: 0.5935
Epoch 497/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3521 - accuracy: 0.6324 - val_loss: 0.9457 - val_accuracy: 0.5888
Epoch 498/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3489 - accuracy: 0.6247 - val_loss: 0.8902 - val_accuracy: 0.5654
Epoch 499/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3581 - accuracy: 0.5656 - val_loss: 0.8752 - val_accuracy: 0.5701
Epoch 500/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3868 - accuracy: 0.5501 - val_loss: 0.8940 - val_accuracy: 0.5654
Epoch 501/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4595 - accuracy: 0.6067 - val_loss: 0.8362 - val_accuracy: 0.5607
Epoch 502/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3357 - accuracy: 0.5553 - val_loss: 0.8066 - val_accuracy: 0.5607
Epoch 503/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3373 - accuracy: 0.5553 - val_loss: 0.7923 - val_accuracy: 0.5280
Epoch 504/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3940 - accuracy: 0.5630 - val_loss: 0.8641 - val_accuracy: 0.5561
Epoch 505/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3936 - accuracy: 0.5604 - val_loss: 0.9532 - val_accuracy: 0.5374
Epoch 506/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3271 - accuracy: 0.5193 - val_loss: 0.8754 - val_accuracy: 0.5421
Epoch 507/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3862 - accuracy: 0.5321 - val_loss: 0.8943 - val_accuracy: 0.5421
Epoch 508/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3518 - accuracy: 0.5244 - val_loss: 0.9113 - val_accuracy: 0.5327
```

Epoch 509/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.4519 - accuracy: 0.5424 - val_loss: 0.9025 - val_accuracy: 0.5467
 Epoch 510/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3680 - accuracy: 0.5219 - val_loss: 0.9067 - val_accuracy: 0.5421
 Epoch 511/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3060 - accuracy: 0.5116 - val_loss: 0.9327 - val_accuracy: 0.5467
 Epoch 512/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3949 - accuracy: 0.5244 - val_loss: 0.8741 - val_accuracy: 0.5421
 Epoch 513/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.4265 - accuracy: 0.5373 - val_loss: 0.8725 - val_accuracy: 0.5421
 Epoch 514/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3001 - accuracy: 0.5193 - val_loss: 0.9282 - val_accuracy: 0.5421
 Epoch 515/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3605 - accuracy: 0.5321 - val_loss: 0.9321 - val_accuracy: 0.5374
 Epoch 516/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.4026 - accuracy: 0.4922 Restoring model weights from the end of the best epoch: 366.
 4/4 [=====] - 0s 13ms/step - loss: 0.3451 - accuracy: 0.5244 - val_loss: 1.0106 - val_accuracy: 0.5280
 Epoch 516: early stopping
 2/2 [=====] - 0s 3ms/step - loss: 0.5068 - accuracy: 0.7907
 [CV] END Dense1=25, Dense2=10; total time= 25.6s
 Model: "sequential_12"

Layer (type)	Output Shape	Param #
<hr/>		
dense_48 (Dense)	(None, 25)	175
batch_normalization_36 (BatchNormalization)	(None, 25)	100
activation_36 (Activation)	(None, 25)	0
dense_49 (Dense)	(None, 10)	260
batch_normalization_37 (BatchNormalization)	(None, 10)	40
activation_37 (Activation)	(None, 10)	0
dense_50 (Dense)	(None, 10)	110
batch_normalization_38 (BatchNormalization)	(None, 10)	40
activation_38 (Activation)	(None, 10)	0
dense_51 (Dense)	(None, 2)	22
<hr/>		
Total params:	747	
Trainable params:	657	
Non-trainable params:	90	

Epoch 1/1000
 4/4 [=====] - 1s 58ms/step - loss: 5.0796 - accuracy: 0.4627 - val_loss: 2.1904 - val_accuracy: 0.5561
 Epoch 2/1000
 4/4 [=====] - 0s 19ms/step - loss: 4.6885 - accuracy: 0.4936 - val_loss: 2.0974 - val_accuracy: 0.5561
 Epoch 3/1000
 4/4 [=====] - 0s 15ms/step - loss: 4.3233 - accuracy: 0.5013 - val_loss: 1.9774 - val_accuracy: 0.5654
 Epoch 4/1000
 4/4 [=====] - 0s 13ms/step - loss: 4.0784 - accuracy: 0.4730 - val_loss: 1.9570 - val_accuracy: 0.5514
 Epoch 5/1000
 4/4 [=====] - 0s 12ms/step - loss: 3.8096 - accuracy: 0.4653 - val_loss: 1.9237 - val_accuracy: 0.5140
 Epoch 6/1000
 4/4 [=====] - 0s 14ms/step - loss: 3.6886 - accuracy: 0.4653 - val_loss: 1.9584 - val_accuracy: 0.4439
 Epoch 7/1000
 4/4 [=====] - 0s 13ms/step - loss: 3.6809 - accuracy: 0.4936 - val_loss: 1.9832 - val_accuracy: 0.4393
 Epoch 8/1000
 4/4 [=====] - 0s 12ms/step - loss: 3.5255 - accuracy: 0.4910 - val_loss: 2.0042 - val_accuracy: 0.4673
 Epoch 9/1000
 4/4 [=====] - 0s 13ms/step - loss: 3.2547 - accuracy: 0.4730 - val_loss: 1.9715 - val_accuracy: 0.4626
 Epoch 10/1000

4/4 [=====] - 0s 12ms/step - loss: 3.3587 - accuracy: 0.4884 - val_loss: 1.8738 - val_accuracy: 0.4860
Epoch 11/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3487 - accuracy: 0.4447 - val_loss: 1.8622 - val_accuracy: 0.5327
Epoch 12/1000
4/4 [=====] - 0s 12ms/step - loss: 3.1673 - accuracy: 0.4627 - val_loss: 1.7980 - val_accuracy: 0.5421
Epoch 13/1000
4/4 [=====] - 0s 12ms/step - loss: 3.0206 - accuracy: 0.4987 - val_loss: 1.7758 - val_accuracy: 0.5280
Epoch 14/1000
4/4 [=====] - 0s 12ms/step - loss: 3.0486 - accuracy: 0.4859 - val_loss: 1.7468 - val_accuracy: 0.5467
Epoch 15/1000
4/4 [=====] - 0s 11ms/step - loss: 2.8732 - accuracy: 0.4730 - val_loss: 1.7216 - val_accuracy: 0.5561
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8200 - accuracy: 0.5039 - val_loss: 1.6953 - val_accuracy: 0.5607
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6618 - accuracy: 0.5013 - val_loss: 1.6607 - val_accuracy: 0.5561
Epoch 18/1000
4/4 [=====] - 0s 11ms/step - loss: 2.6400 - accuracy: 0.5244 - val_loss: 1.6338 - val_accuracy: 0.5561
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4779 - accuracy: 0.5116 - val_loss: 1.6064 - val_accuracy: 0.4299
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3338 - accuracy: 0.5090 - val_loss: 1.5401 - val_accuracy: 0.4252
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3636 - accuracy: 0.5116 - val_loss: 1.5150 - val_accuracy: 0.4252
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3422 - accuracy: 0.5013 - val_loss: 1.4938 - val_accuracy: 0.4299
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2637 - accuracy: 0.5013 - val_loss: 1.4672 - val_accuracy: 0.4299
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0886 - accuracy: 0.5090 - val_loss: 1.4632 - val_accuracy: 0.5561
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9734 - accuracy: 0.4987 - val_loss: 1.4521 - val_accuracy: 0.5561
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0635 - accuracy: 0.5244 - val_loss: 1.4472 - val_accuracy: 0.5514
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8828 - accuracy: 0.4936 - val_loss: 1.4370 - val_accuracy: 0.5561
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9116 - accuracy: 0.5090 - val_loss: 1.4282 - val_accuracy: 0.5561
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8469 - accuracy: 0.4987 - val_loss: 1.4260 - val_accuracy: 0.5607
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7788 - accuracy: 0.5064 - val_loss: 1.4171 - val_accuracy: 0.5654
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8972 - accuracy: 0.5013 - val_loss: 1.4053 - val_accuracy: 0.5654
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8549 - accuracy: 0.4936 - val_loss: 1.3954 - val_accuracy: 0.5654
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6734 - accuracy: 0.5039 - val_loss: 1.3846 - val_accuracy: 0.5607
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7376 - accuracy: 0.5064 - val_loss: 1.3722 - val_accuracy: 0.5607
Epoch 35/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6367 - accuracy: 0.5064 - val_loss: 1.3681 - val_accuracy: 0.5701
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6680 - accuracy: 0.4987 - val_loss: 1.3652 - val_accuracy: 0.5654
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6632 - accuracy: 0.5090 - val_loss: 1.3597 - val_accuracy: 0.5701
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7468 - accuracy: 0.5064 - val_loss: 1.3552 - val_accuracy: 0.5701
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4945 - accuracy: 0.4884 - val_loss: 1.3530 - val_accuracy: 0.5701

Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6041 - accuracy: 0.4987 - val_loss: 1.3712 - val_accuracy: 0.5748
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6064 - accuracy: 0.4833 - val_loss: 1.3599 - val_accuracy: 0.5654
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6550 - accuracy: 0.4884 - val_loss: 1.3295 - val_accuracy: 0.5794
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5799 - accuracy: 0.5090 - val_loss: 1.3132 - val_accuracy: 0.5748
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5188 - accuracy: 0.4679 - val_loss: 1.2985 - val_accuracy: 0.5654
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6166 - accuracy: 0.4833 - val_loss: 1.2949 - val_accuracy: 0.5654
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5117 - accuracy: 0.4781 - val_loss: 1.2780 - val_accuracy: 0.5607
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5795 - accuracy: 0.4936 - val_loss: 1.3045 - val_accuracy: 0.5607
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5611 - accuracy: 0.4936 - val_loss: 1.2947 - val_accuracy: 0.5607
Epoch 49/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4509 - accuracy: 0.4781 - val_loss: 1.2832 - val_accuracy: 0.5561
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3793 - accuracy: 0.4704 - val_loss: 1.2764 - val_accuracy: 0.5561
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4602 - accuracy: 0.4653 - val_loss: 1.2702 - val_accuracy: 0.5561
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3565 - accuracy: 0.4884 - val_loss: 1.2521 - val_accuracy: 0.5607
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4140 - accuracy: 0.4961 - val_loss: 1.2337 - val_accuracy: 0.5654
Epoch 54/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4664 - accuracy: 0.4730 - val_loss: 1.2211 - val_accuracy: 0.5701
Epoch 55/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4334 - accuracy: 0.4704 - val_loss: 1.2107 - val_accuracy: 0.5748
Epoch 56/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4066 - accuracy: 0.4704 - val_loss: 1.2029 - val_accuracy: 0.5654
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3576 - accuracy: 0.4704 - val_loss: 1.1820 - val_accuracy: 0.5748
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3259 - accuracy: 0.4859 - val_loss: 1.1690 - val_accuracy: 0.5794
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3994 - accuracy: 0.4756 - val_loss: 1.1568 - val_accuracy: 0.5841
Epoch 60/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2374 - accuracy: 0.4807 - val_loss: 1.1464 - val_accuracy: 0.5888
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2929 - accuracy: 0.4859 - val_loss: 1.1426 - val_accuracy: 0.5841
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2536 - accuracy: 0.4781 - val_loss: 1.1390 - val_accuracy: 0.5841
Epoch 63/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2723 - accuracy: 0.4987 - val_loss: 1.1266 - val_accuracy: 0.5841
Epoch 64/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2776 - accuracy: 0.4627 - val_loss: 1.1278 - val_accuracy: 0.5794
Epoch 65/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1907 - accuracy: 0.4859 - val_loss: 1.1398 - val_accuracy: 0.5794
Epoch 66/1000
4/4 [=====] - 0s 16ms/step - loss: 1.2237 - accuracy: 0.4781 - val_loss: 1.1237 - val_accuracy: 0.5794
Epoch 67/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1616 - accuracy: 0.5039 - val_loss: 1.1164 - val_accuracy: 0.5561
Epoch 68/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1558 - accuracy: 0.4627 - val_loss: 1.0697 - val_accuracy: 0.5467
Epoch 69/1000
4/4 [=====] - 0s 16ms/step - loss: 1.1063 - accuracy: 0.4730 - val_loss: 1.0629 - val_accuracy: 0.5467

accuracy: 0.5467
Epoch 70/1000
4/4 [=====] - 0s 16ms/step - loss: 1.1161 - accuracy: 0.4524 - val_loss: 1.0518 - val_accuracy: 0.5421
Epoch 71/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0758 - accuracy: 0.5013 - val_loss: 1.0419 - val_accuracy: 0.5327
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0711 - accuracy: 0.4447 - val_loss: 1.0308 - val_accuracy: 0.5234
Epoch 73/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0543 - accuracy: 0.4422 - val_loss: 1.0084 - val_accuracy: 0.5280
Epoch 74/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1209 - accuracy: 0.4499 - val_loss: 0.9941 - val_accuracy: 0.5234
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0713 - accuracy: 0.4859 - val_loss: 0.9829 - val_accuracy: 0.5280
Epoch 76/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0769 - accuracy: 0.5039 - val_loss: 1.0325 - val_accuracy: 0.5187
Epoch 77/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0432 - accuracy: 0.4859 - val_loss: 0.9619 - val_accuracy: 0.5234
Epoch 78/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0383 - accuracy: 0.4910 - val_loss: 0.9571 - val_accuracy: 0.5280
Epoch 79/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9780 - accuracy: 0.5167 - val_loss: 0.9460 - val_accuracy: 0.5280
Epoch 80/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9855 - accuracy: 0.4781 - val_loss: 0.9426 - val_accuracy: 0.5187
Epoch 81/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9284 - accuracy: 0.4910 - val_loss: 0.9409 - val_accuracy: 0.5234
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0166 - accuracy: 0.4936 - val_loss: 1.0005 - val_accuracy: 0.5047
Epoch 83/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9426 - accuracy: 0.4704 - val_loss: 0.9641 - val_accuracy: 0.5093
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8889 - accuracy: 0.4730 - val_loss: 0.9451 - val_accuracy: 0.5047
Epoch 85/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9055 - accuracy: 0.4704 - val_loss: 0.9379 - val_accuracy: 0.5000
Epoch 86/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9175 - accuracy: 0.4653 - val_loss: 0.9011 - val_accuracy: 0.4907
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8788 - accuracy: 0.4910 - val_loss: 0.9042 - val_accuracy: 0.4766
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8382 - accuracy: 0.4473 - val_loss: 0.8831 - val_accuracy: 0.4813
Epoch 89/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9190 - accuracy: 0.4473 - val_loss: 0.8727 - val_accuracy: 0.4860
Epoch 90/1000
4/4 [=====] - 0s 16ms/step - loss: 0.8365 - accuracy: 0.4550 - val_loss: 0.8870 - val_accuracy: 0.4439
Epoch 91/1000
4/4 [=====] - 0s 16ms/step - loss: 0.8755 - accuracy: 0.4499 - val_loss: 0.8733 - val_accuracy: 0.4393
Epoch 92/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8501 - accuracy: 0.4859 - val_loss: 0.8582 - val_accuracy: 0.4439
Epoch 93/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8144 - accuracy: 0.4319 - val_loss: 0.8286 - val_accuracy: 0.4159
Epoch 94/1000
4/4 [=====] - 0s 16ms/step - loss: 0.8424 - accuracy: 0.4422 - val_loss: 0.8057 - val_accuracy: 0.4065
Epoch 95/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7891 - accuracy: 0.4344 - val_loss: 0.8057 - val_accuracy: 0.3832
Epoch 96/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7583 - accuracy: 0.4396 - val_loss: 0.8385 - val_accuracy: 0.3598
Epoch 97/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7680 - accuracy: 0.4293 - val_loss: 0.8328 - val_accuracy: 0.3598
Epoch 98/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7939 - accuracy: 0.4422 - val_loss: 0.8269 - val_accuracy: 0.3645
Epoch 99/1000

```
4/4 [=====] - 0s 13ms/step - loss: 0.7409 - accuracy: 0.4884 - val_loss: 0.7631 - val_accuracy: 0.3505
Epoch 100/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7746 - accuracy: 0.4396 - val_loss: 0.8154 - val_accuracy: 0.3598
Epoch 101/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7634 - accuracy: 0.4807 - val_loss: 0.8202 - val_accuracy: 0.3551
Epoch 102/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7702 - accuracy: 0.4344 - val_loss: 0.7311 - val_accuracy: 0.3692
Epoch 103/1000
4/4 [=====] - 0s 17ms/step - loss: 0.6860 - accuracy: 0.4396 - val_loss: 0.7391 - val_accuracy: 0.3645
Epoch 104/1000
4/4 [=====] - 0s 16ms/step - loss: 0.7649 - accuracy: 0.4370 - val_loss: 0.7816 - val_accuracy: 0.3645
Epoch 105/1000
4/4 [=====] - 0s 18ms/step - loss: 0.7188 - accuracy: 0.4550 - val_loss: 0.7696 - val_accuracy: 0.3692
Epoch 106/1000
4/4 [=====] - 0s 18ms/step - loss: 0.7264 - accuracy: 0.4319 - val_loss: 0.7710 - val_accuracy: 0.3738
Epoch 107/1000
4/4 [=====] - 0s 17ms/step - loss: 0.7686 - accuracy: 0.4602 - val_loss: 0.7376 - val_accuracy: 0.3738
Epoch 108/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7001 - accuracy: 0.4807 - val_loss: 0.7294 - val_accuracy: 0.3738
Epoch 109/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6513 - accuracy: 0.4781 - val_loss: 0.7245 - val_accuracy: 0.4019
Epoch 110/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6907 - accuracy: 0.4679 - val_loss: 0.6341 - val_accuracy: 0.4019
Epoch 111/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6217 - accuracy: 0.4679 - val_loss: 0.6475 - val_accuracy: 0.4346
Epoch 112/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6168 - accuracy: 0.5219 - val_loss: 0.6199 - val_accuracy: 0.4673
Epoch 113/1000
4/4 [=====] - 0s 18ms/step - loss: 0.6546 - accuracy: 0.5039 - val_loss: 0.6138 - val_accuracy: 0.4720
Epoch 114/1000
4/4 [=====] - 0s 19ms/step - loss: 0.6139 - accuracy: 0.5219 - val_loss: 0.6177 - val_accuracy: 0.4579
Epoch 115/1000
4/4 [=====] - 0s 18ms/step - loss: 0.5739 - accuracy: 0.4833 - val_loss: 0.6643 - val_accuracy: 0.4579
Epoch 116/1000
4/4 [=====] - 0s 16ms/step - loss: 0.6033 - accuracy: 0.4961 - val_loss: 0.6605 - val_accuracy: 0.4112
Epoch 117/1000
4/4 [=====] - 0s 16ms/step - loss: 0.6394 - accuracy: 0.4473 - val_loss: 0.6320 - val_accuracy: 0.3738
Epoch 118/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6190 - accuracy: 0.4267 - val_loss: 0.6520 - val_accuracy: 0.3925
Epoch 119/1000
4/4 [=====] - 0s 17ms/step - loss: 0.6469 - accuracy: 0.4653 - val_loss: 0.6481 - val_accuracy: 0.3925
Epoch 120/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5646 - accuracy: 0.4473 - val_loss: 0.6531 - val_accuracy: 0.4112
Epoch 121/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5836 - accuracy: 0.4653 - val_loss: 0.7901 - val_accuracy: 0.4486
Epoch 122/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5861 - accuracy: 0.4447 - val_loss: 0.7581 - val_accuracy: 0.4206
Epoch 123/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4872 - accuracy: 0.4190 - val_loss: 0.6406 - val_accuracy: 0.3879
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5302 - accuracy: 0.4242 - val_loss: 0.6703 - val_accuracy: 0.4019
Epoch 125/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5279 - accuracy: 0.4267 - val_loss: 0.6882 - val_accuracy: 0.4019
Epoch 126/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4689 - accuracy: 0.4113 - val_loss: 0.6909 - val_accuracy: 0.4159
Epoch 127/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4668 - accuracy: 0.4036 - val_loss: 0.6678 - val_accuracy: 0.4019
Epoch 128/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4809 - accuracy: 0.4524 - val_loss: 0.7452 - val_accuracy: 0.4112
```

Epoch 129/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5016 - accuracy: 0.4473 - val_loss: 0.7473 - val_accuracy: 0.4252
Epoch 130/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4823 - accuracy: 0.4370 - val_loss: 0.7078 - val_accuracy: 0.4346
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4521 - accuracy: 0.4679 - val_loss: 0.6469 - val_accuracy: 0.4346
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4710 - accuracy: 0.4473 - val_loss: 0.6980 - val_accuracy: 0.4393
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4495 - accuracy: 0.4756 - val_loss: 0.7017 - val_accuracy: 0.4206
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4658 - accuracy: 0.4627 - val_loss: 0.7192 - val_accuracy: 0.4346
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5085 - accuracy: 0.4267 - val_loss: 0.7657 - val_accuracy: 0.4346
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4678 - accuracy: 0.4524 - val_loss: 0.7512 - val_accuracy: 0.4813
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4298 - accuracy: 0.4704 - val_loss: 0.7500 - val_accuracy: 0.5000
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4335 - accuracy: 0.4756 - val_loss: 0.7257 - val_accuracy: 0.4953
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5078 - accuracy: 0.4987 - val_loss: 0.7028 - val_accuracy: 0.4860
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4659 - accuracy: 0.4576 - val_loss: 0.7111 - val_accuracy: 0.4953
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5165 - accuracy: 0.4910 - val_loss: 0.7743 - val_accuracy: 0.4626
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4427 - accuracy: 0.4781 - val_loss: 0.7758 - val_accuracy: 0.4766
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4836 - accuracy: 0.4653 - val_loss: 0.7511 - val_accuracy: 0.4579
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4895 - accuracy: 0.4550 - val_loss: 0.7649 - val_accuracy: 0.4533
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4635 - accuracy: 0.4756 - val_loss: 0.7105 - val_accuracy: 0.4252
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4571 - accuracy: 0.4139 - val_loss: 0.6824 - val_accuracy: 0.4112
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4006 - accuracy: 0.4087 - val_loss: 0.6804 - val_accuracy: 0.4019
Epoch 148/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4515 - accuracy: 0.4422 - val_loss: 0.6812 - val_accuracy: 0.4112
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5257 - accuracy: 0.3985 - val_loss: 0.7040 - val_accuracy: 0.4159
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5597 - accuracy: 0.4473 - val_loss: 0.7033 - val_accuracy: 0.3925
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4030 - accuracy: 0.4319 - val_loss: 0.7117 - val_accuracy: 0.4159
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4221 - accuracy: 0.4910 - val_loss: 0.7169 - val_accuracy: 0.4206
Epoch 153/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4110 - accuracy: 0.4499 - val_loss: 0.7168 - val_accuracy: 0.4720
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4981 - accuracy: 0.5141 - val_loss: 0.7089 - val_accuracy: 0.4813
Epoch 155/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4307 - accuracy: 0.5064 - val_loss: 0.7073 - val_accuracy: 0.4766
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4190 - accuracy: 0.5219 - val_loss: 0.6715 - val_accuracy: 0.4766
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3918 - accuracy: 0.5476 - val_loss: 0.6754 - val_accuracy: 0.5187
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4265 - accuracy: 0.5476 - val_loss: 0.7401 - val_accuracy: 0.5187

```
accuracy: 0.5047
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4027 - accuracy: 0.5398 - val_loss: 0.7976 - val_
accuracy: 0.5093
Epoch 160/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4482 - accuracy: 0.5398 - val_loss: 0.7986 - val_
accuracy: 0.5000
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4494 - accuracy: 0.5476 - val_loss: 0.8210 - val_
accuracy: 0.4486
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4791 - accuracy: 0.4833 - val_loss: 0.8491 - val_
accuracy: 0.5047
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4048 - accuracy: 0.5296 - val_loss: 0.8443 - val_
accuracy: 0.4579
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3894 - accuracy: 0.5167 - val_loss: 0.8913 - val_
accuracy: 0.4907
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4520 - accuracy: 0.5527 - val_loss: 0.7929 - val_
accuracy: 0.4439
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3714 - accuracy: 0.4807 - val_loss: 0.7939 - val_
accuracy: 0.4299
Epoch 167/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4154 - accuracy: 0.4242 - val_loss: 0.7934 - val_
accuracy: 0.4393
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3976 - accuracy: 0.4422 - val_loss: 0.7673 - val_
accuracy: 0.4346
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4042 - accuracy: 0.4679 - val_loss: 0.7463 - val_
accuracy: 0.4673
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3980 - accuracy: 0.4833 - val_loss: 0.7730 - val_
accuracy: 0.4626
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3950 - accuracy: 0.4859 - val_loss: 0.7717 - val_
accuracy: 0.4626
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4522 - accuracy: 0.5039 - val_loss: 0.7668 - val_
accuracy: 0.4720
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4208 - accuracy: 0.4859 - val_loss: 0.7947 - val_
accuracy: 0.4579
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3744 - accuracy: 0.5321 - val_loss: 0.7327 - val_
accuracy: 0.4439
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3847 - accuracy: 0.4833 - val_loss: 0.7661 - val_
accuracy: 0.4626
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3791 - accuracy: 0.5296 - val_loss: 0.7937 - val_
accuracy: 0.4673
Epoch 177/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3711 - accuracy: 0.5167 - val_loss: 0.7619 - val_
accuracy: 0.4579
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4246 - accuracy: 0.5090 - val_loss: 0.7611 - val_
accuracy: 0.4626
Epoch 179/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3950 - accuracy: 0.4884 - val_loss: 0.7921 - val_
accuracy: 0.4065
Epoch 180/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4066 - accuracy: 0.4499 - val_loss: 0.7931 - val_
accuracy: 0.4112
Epoch 181/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3951 - accuracy: 0.4781 - val_loss: 0.7356 - val_
accuracy: 0.4112
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4134 - accuracy: 0.4781 - val_loss: 0.7388 - val_
accuracy: 0.4065
Epoch 183/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3687 - accuracy: 0.4807 - val_loss: 0.7432 - val_
accuracy: 0.4112
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4445 - accuracy: 0.4987 - val_loss: 0.7628 - val_
accuracy: 0.4299
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3987 - accuracy: 0.5347 - val_loss: 0.8161 - val_
accuracy: 0.4579
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4610 - accuracy: 0.5398 - val_loss: 0.8207 - val_
accuracy: 0.4766
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3761 - accuracy: 0.5373 - val_loss: 0.7667 - val_
accuracy: 0.4766
Epoch 188/1000
```

4/4 [=====] - 0s 12ms/step - loss: 0.3720 - accuracy: 0.4961 - val_loss: 0.7879 - val_accuracy: 0.4813
 Epoch 189/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4289 - accuracy: 0.5527 - val_loss: 0.6983 - val_accuracy: 0.4486
 Epoch 190/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3743 - accuracy: 0.5193 - val_loss: 0.7154 - val_accuracy: 0.4533
 Epoch 191/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4187 - accuracy: 0.4859 - val_loss: 0.6848 - val_accuracy: 0.4766
 Epoch 192/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4618 - accuracy: 0.5424 - val_loss: 0.7554 - val_accuracy: 0.4673
 Epoch 193/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3535 - accuracy: 0.5604 - val_loss: 0.7798 - val_accuracy: 0.4953
 Epoch 194/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4050 - accuracy: 0.5450 - val_loss: 0.7782 - val_accuracy: 0.5000
 Epoch 195/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4072 - accuracy: 0.5398 - val_loss: 0.7666 - val_accuracy: 0.4720
 Epoch 196/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3484 - accuracy: 0.5758 - val_loss: 0.7751 - val_accuracy: 0.5000
 Epoch 197/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3361 - accuracy: 0.5810 - val_loss: 0.7761 - val_accuracy: 0.4953
 Epoch 198/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.4257 - accuracy: 0.5398 - val_loss: 0.7733 - val_accuracy: 0.4860
 Epoch 199/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3778 - accuracy: 0.5116 - val_loss: 0.8122 - val_accuracy: 0.4907
 Epoch 200/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3498 - accuracy: 0.5501 - val_loss: 0.7960 - val_accuracy: 0.4579
 Epoch 201/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3919 - accuracy: 0.5398 - val_loss: 0.8334 - val_accuracy: 0.4486
 Epoch 202/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.4440 - accuracy: 0.5193 - val_loss: 0.8044 - val_accuracy: 0.4860
 Epoch 203/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3432 - accuracy: 0.5219 - val_loss: 0.8014 - val_accuracy: 0.5234
 Epoch 204/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3441 - accuracy: 0.5681 - val_loss: 0.7738 - val_accuracy: 0.4907
 Epoch 205/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.4075 - accuracy: 0.5476 - val_loss: 0.8073 - val_accuracy: 0.4579
 Epoch 206/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.5045 - accuracy: 0.5064 - val_loss: 0.7550 - val_accuracy: 0.4579
 Epoch 207/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3356 - accuracy: 0.5219 - val_loss: 0.8154 - val_accuracy: 0.4766
 Epoch 208/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3730 - accuracy: 0.5373 - val_loss: 0.8439 - val_accuracy: 0.4766
 Epoch 209/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3374 - accuracy: 0.5578 - val_loss: 0.8033 - val_accuracy: 0.5000
 Epoch 210/1000
 1/4 [=====] - ETA: 0s - loss: 0.3337 - accuracy: 0.5234 Restoring model weights from the end of the best epoch: 60.
 4/4 [=====] - 0s 14ms/step - loss: 0.3657 - accuracy: 0.5424 - val_loss: 0.8335 - val_accuracy: 0.5000
 Epoch 210: early stopping
 2/2 [=====] - 0s 3ms/step - loss: 0.9789 - accuracy: 0.4884
 [CV] ENDDense1=25, Dense2=10; total time= 11.5s
 Model: "sequential_13"

Layer (type)	Output Shape	Param #
dense_52 (Dense)	(None, 25)	175
batch_normalization_39 (Batch Normalization)	(None, 25)	100
activation_39 (Activation)	(None, 25)	0
dense_53 (Dense)	(None, 10)	260
batch_normalization_40 (Batch Normalization)	(None, 10)	40

activation_40 (Activation)	(None, 10)	0
dense_54 (Dense)	(None, 10)	110
batch_normalization_41 (BatchNormalization)	(None, 10)	40
activation_41 (Activation)	(None, 10)	0
dense_55 (Dense)	(None, 2)	22

=====

Total params: 747
Trainable params: 657
Non-trainable params: 90

Epoch 1/1000
4/4 [=====] - 1s 56ms/step - loss: 5.2118 - accuracy: 0.5039 - val_loss: 5.6871 - val_accuracy: 0.4673
Epoch 2/1000
4/4 [=====] - 0s 18ms/step - loss: 4.1968 - accuracy: 0.4807 - val_loss: 5.1696 - val_accuracy: 0.4579
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 4.0337 - accuracy: 0.5219 - val_loss: 4.7741 - val_accuracy: 0.4720
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9937 - accuracy: 0.4987 - val_loss: 4.2916 - val_accuracy: 0.4860
Epoch 5/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8189 - accuracy: 0.5039 - val_loss: 3.9915 - val_accuracy: 0.4860
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5444 - accuracy: 0.4859 - val_loss: 3.5327 - val_accuracy: 0.4813
Epoch 7/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7689 - accuracy: 0.4781 - val_loss: 3.0831 - val_accuracy: 0.4626
Epoch 8/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5308 - accuracy: 0.4859 - val_loss: 2.7269 - val_accuracy: 0.4533
Epoch 9/1000
4/4 [=====] - 0s 11ms/step - loss: 3.5682 - accuracy: 0.5398 - val_loss: 2.3846 - val_accuracy: 0.4019
Epoch 10/1000
4/4 [=====] - 0s 11ms/step - loss: 3.4088 - accuracy: 0.4884 - val_loss: 2.2217 - val_accuracy: 0.4486
Epoch 11/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3122 - accuracy: 0.4961 - val_loss: 2.0775 - val_accuracy: 0.4533
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3629 - accuracy: 0.5064 - val_loss: 1.9590 - val_accuracy: 0.3879
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2741 - accuracy: 0.5604 - val_loss: 1.8605 - val_accuracy: 0.3925
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1249 - accuracy: 0.5270 - val_loss: 1.8230 - val_accuracy: 0.4019
Epoch 15/1000
4/4 [=====] - 0s 15ms/step - loss: 3.0927 - accuracy: 0.5604 - val_loss: 1.7678 - val_accuracy: 0.3972
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 2.9112 - accuracy: 0.5373 - val_loss: 1.7581 - val_accuracy: 0.4019
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8714 - accuracy: 0.5347 - val_loss: 1.7251 - val_accuracy: 0.4112
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9353 - accuracy: 0.5296 - val_loss: 1.7106 - val_accuracy: 0.4252
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7455 - accuracy: 0.5219 - val_loss: 1.6720 - val_accuracy: 0.4159
Epoch 20/1000
4/4 [=====] - 0s 11ms/step - loss: 2.6582 - accuracy: 0.4859 - val_loss: 1.6537 - val_accuracy: 0.4065
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5464 - accuracy: 0.5296 - val_loss: 1.6279 - val_accuracy: 0.4019
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6823 - accuracy: 0.5321 - val_loss: 1.6146 - val_accuracy: 0.4252
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5163 - accuracy: 0.5707 - val_loss: 1.5962 - val_accuracy: 0.4252
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3657 - accuracy: 0.5244 - val_loss: 1.5713 - val_accuracy: 0.4393
Epoch 25/1000

```
4/4 [=====] - 0s 12ms/step - loss: 2.3230 - accuracy: 0.5321 - val_loss: 1.5565 - val_accuracy: 0.4346
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1841 - accuracy: 0.5116 - val_loss: 1.5370 - val_accuracy: 0.4393
Epoch 27/1000
4/4 [=====] - 0s 11ms/step - loss: 2.0258 - accuracy: 0.5604 - val_loss: 1.5204 - val_accuracy: 0.4533
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0710 - accuracy: 0.5321 - val_loss: 1.5029 - val_accuracy: 0.4533
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9817 - accuracy: 0.4936 - val_loss: 1.4825 - val_accuracy: 0.4439
Epoch 30/1000
4/4 [=====] - 0s 11ms/step - loss: 1.9236 - accuracy: 0.4859 - val_loss: 1.4621 - val_accuracy: 0.4673
Epoch 31/1000
4/4 [=====] - 0s 11ms/step - loss: 1.9312 - accuracy: 0.4807 - val_loss: 1.4490 - val_accuracy: 0.4673
Epoch 32/1000
4/4 [=====] - 0s 11ms/step - loss: 1.9337 - accuracy: 0.4653 - val_loss: 1.4334 - val_accuracy: 0.4673
Epoch 33/1000
4/4 [=====] - 0s 11ms/step - loss: 1.8692 - accuracy: 0.4884 - val_loss: 1.4157 - val_accuracy: 0.4673
Epoch 34/1000
4/4 [=====] - 0s 11ms/step - loss: 1.8385 - accuracy: 0.4447 - val_loss: 1.3915 - val_accuracy: 0.4626
Epoch 35/1000
4/4 [=====] - 0s 11ms/step - loss: 1.7501 - accuracy: 0.4344 - val_loss: 1.3781 - val_accuracy: 0.4673
Epoch 36/1000
4/4 [=====] - 0s 11ms/step - loss: 1.6405 - accuracy: 0.4524 - val_loss: 1.3657 - val_accuracy: 0.4673
Epoch 37/1000
4/4 [=====] - 0s 11ms/step - loss: 1.7056 - accuracy: 0.4627 - val_loss: 1.3469 - val_accuracy: 0.4673
Epoch 38/1000
4/4 [=====] - 0s 10ms/step - loss: 1.7025 - accuracy: 0.4216 - val_loss: 1.3007 - val_accuracy: 0.4673
Epoch 39/1000
4/4 [=====] - 0s 11ms/step - loss: 1.6203 - accuracy: 0.4524 - val_loss: 1.2735 - val_accuracy: 0.4626
Epoch 40/1000
4/4 [=====] - 0s 11ms/step - loss: 1.5616 - accuracy: 0.4473 - val_loss: 1.2561 - val_accuracy: 0.4626
Epoch 41/1000
4/4 [=====] - 0s 11ms/step - loss: 1.5208 - accuracy: 0.4550 - val_loss: 1.2446 - val_accuracy: 0.4626
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5591 - accuracy: 0.4653 - val_loss: 1.2244 - val_accuracy: 0.4533
Epoch 43/1000
4/4 [=====] - 0s 11ms/step - loss: 1.5532 - accuracy: 0.4602 - val_loss: 1.2141 - val_accuracy: 0.4533
Epoch 44/1000
4/4 [=====] - 0s 11ms/step - loss: 1.4295 - accuracy: 0.4524 - val_loss: 1.1971 - val_accuracy: 0.4579
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5187 - accuracy: 0.4576 - val_loss: 1.1819 - val_accuracy: 0.4579
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3844 - accuracy: 0.4396 - val_loss: 1.1621 - val_accuracy: 0.4533
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4035 - accuracy: 0.4627 - val_loss: 1.1552 - val_accuracy: 0.4486
Epoch 48/1000
4/4 [=====] - 0s 11ms/step - loss: 1.4144 - accuracy: 0.4653 - val_loss: 1.1284 - val_accuracy: 0.4579
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2787 - accuracy: 0.4730 - val_loss: 1.1367 - val_accuracy: 0.4626
Epoch 50/1000
4/4 [=====] - 0s 11ms/step - loss: 1.3589 - accuracy: 0.4499 - val_loss: 1.1603 - val_accuracy: 0.4579
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2686 - accuracy: 0.4653 - val_loss: 1.0996 - val_accuracy: 0.4626
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3905 - accuracy: 0.4602 - val_loss: 1.1390 - val_accuracy: 0.4393
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2986 - accuracy: 0.4781 - val_loss: 1.1259 - val_accuracy: 0.4393
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3514 - accuracy: 0.4910 - val_loss: 1.1197 - val_accuracy: 0.4346
```

Epoch 55/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2627 - accuracy: 0.4499 - val_loss: 1.1186 - val_accuracy: 0.4299
Epoch 56/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2256 - accuracy: 0.4524 - val_loss: 1.1048 - val_accuracy: 0.4252
Epoch 57/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2429 - accuracy: 0.4653 - val_loss: 1.1013 - val_accuracy: 0.4206
Epoch 58/1000
4/4 [=====] - 0s 11ms/step - loss: 1.3061 - accuracy: 0.4704 - val_loss: 1.0686 - val_accuracy: 0.4206
Epoch 59/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2941 - accuracy: 0.4576 - val_loss: 1.0363 - val_accuracy: 0.4299
Epoch 60/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2931 - accuracy: 0.4550 - val_loss: 0.9579 - val_accuracy: 0.4439
Epoch 61/1000
4/4 [=====] - 0s 10ms/step - loss: 1.1931 - accuracy: 0.4370 - val_loss: 0.9839 - val_accuracy: 0.4439
Epoch 62/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1992 - accuracy: 0.4524 - val_loss: 0.9783 - val_accuracy: 0.4393
Epoch 63/1000
4/4 [=====] - 0s 10ms/step - loss: 1.1975 - accuracy: 0.4216 - val_loss: 0.9473 - val_accuracy: 0.4393
Epoch 64/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1657 - accuracy: 0.4524 - val_loss: 0.9276 - val_accuracy: 0.4346
Epoch 65/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2324 - accuracy: 0.4473 - val_loss: 0.9278 - val_accuracy: 0.4393
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2024 - accuracy: 0.4473 - val_loss: 0.9430 - val_accuracy: 0.4393
Epoch 67/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2353 - accuracy: 0.4499 - val_loss: 0.9336 - val_accuracy: 0.4346
Epoch 68/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2010 - accuracy: 0.4422 - val_loss: 0.9248 - val_accuracy: 0.4346
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1749 - accuracy: 0.4704 - val_loss: 0.9173 - val_accuracy: 0.4346
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0592 - accuracy: 0.4447 - val_loss: 0.9065 - val_accuracy: 0.4252
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0597 - accuracy: 0.4653 - val_loss: 0.8981 - val_accuracy: 0.4159
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1255 - accuracy: 0.4422 - val_loss: 0.8905 - val_accuracy: 0.3972
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0807 - accuracy: 0.4576 - val_loss: 0.8513 - val_accuracy: 0.3972
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0829 - accuracy: 0.4550 - val_loss: 0.8381 - val_accuracy: 0.3925
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1020 - accuracy: 0.4242 - val_loss: 0.8534 - val_accuracy: 0.4019
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0736 - accuracy: 0.4113 - val_loss: 0.8490 - val_accuracy: 0.4065
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0604 - accuracy: 0.4653 - val_loss: 0.8384 - val_accuracy: 0.3972
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0640 - accuracy: 0.4396 - val_loss: 0.8025 - val_accuracy: 0.3925
Epoch 79/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1021 - accuracy: 0.4550 - val_loss: 0.7949 - val_accuracy: 0.3785
Epoch 80/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0119 - accuracy: 0.4062 - val_loss: 0.7884 - val_accuracy: 0.3785
Epoch 81/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0257 - accuracy: 0.4422 - val_loss: 0.7789 - val_accuracy: 0.3879
Epoch 82/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0264 - accuracy: 0.4087 - val_loss: 0.7739 - val_accuracy: 0.3879
Epoch 83/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9813 - accuracy: 0.4422 - val_loss: 0.7707 - val_accuracy: 0.3785
Epoch 84/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9840 - accuracy: 0.4242 - val_loss: 0.7681 - val_accuracy: 0.3785

```
accuracy: 0.3738
Epoch 85/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9375 - accuracy: 0.4396 - val_loss: 0.7633 - val_
accuracy: 0.3645
Epoch 86/1000
4/4 [=====] - 0s 10ms/step - loss: 1.0690 - accuracy: 0.4344 - val_loss: 0.7515 - val_
accuracy: 0.3645
Epoch 87/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0072 - accuracy: 0.4267 - val_loss: 0.7512 - val_
accuracy: 0.3692
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0102 - accuracy: 0.4062 - val_loss: 0.7483 - val_
accuracy: 0.3692
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9609 - accuracy: 0.4165 - val_loss: 0.7725 - val_
accuracy: 0.3692
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9069 - accuracy: 0.4087 - val_loss: 0.7713 - val_
accuracy: 0.3692
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9829 - accuracy: 0.4319 - val_loss: 0.7604 - val_
accuracy: 0.3738
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9259 - accuracy: 0.4139 - val_loss: 0.7646 - val_
accuracy: 0.3738
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9300 - accuracy: 0.4242 - val_loss: 0.7734 - val_
accuracy: 0.3598
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9165 - accuracy: 0.4524 - val_loss: 0.7672 - val_
accuracy: 0.3505
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9419 - accuracy: 0.4242 - val_loss: 0.7600 - val_
accuracy: 0.3645
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9154 - accuracy: 0.4781 - val_loss: 0.7647 - val_
accuracy: 0.4019
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8557 - accuracy: 0.4242 - val_loss: 0.7577 - val_
accuracy: 0.3972
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8085 - accuracy: 0.4370 - val_loss: 0.7569 - val_
accuracy: 0.3832
Epoch 99/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8382 - accuracy: 0.4396 - val_loss: 0.7525 - val_
accuracy: 0.3738
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8701 - accuracy: 0.4216 - val_loss: 0.7451 - val_
accuracy: 0.3785
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8730 - accuracy: 0.4344 - val_loss: 0.7403 - val_
accuracy: 0.3738
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8943 - accuracy: 0.4422 - val_loss: 0.7385 - val_
accuracy: 0.3738
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8317 - accuracy: 0.4344 - val_loss: 0.7381 - val_
accuracy: 0.3785
Epoch 104/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8159 - accuracy: 0.4576 - val_loss: 0.7289 - val_
accuracy: 0.3832
Epoch 105/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8747 - accuracy: 0.4627 - val_loss: 0.7243 - val_
accuracy: 0.3832
Epoch 106/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7880 - accuracy: 0.4370 - val_loss: 0.7311 - val_
accuracy: 0.3832
Epoch 107/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7944 - accuracy: 0.4473 - val_loss: 0.7242 - val_
accuracy: 0.3832
Epoch 108/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8027 - accuracy: 0.4422 - val_loss: 0.7281 - val_
accuracy: 0.3692
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7675 - accuracy: 0.4190 - val_loss: 0.7261 - val_
accuracy: 0.3598
Epoch 110/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9041 - accuracy: 0.4447 - val_loss: 0.7191 - val_
accuracy: 0.3505
Epoch 111/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7796 - accuracy: 0.4370 - val_loss: 0.7128 - val_
accuracy: 0.3505
Epoch 112/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8683 - accuracy: 0.4499 - val_loss: 0.7321 - val_
accuracy: 0.3551
Epoch 113/1000
4/4 [=====] - 0s 10ms/step - loss: 0.7997 - accuracy: 0.4499 - val_loss: 0.7263 - val_
accuracy: 0.3505
Epoch 114/1000
```

```
4/4 [=====] - 0s 11ms/step - loss: 0.8129 - accuracy: 0.5064 - val_loss: 0.7228 - val_accuracy: 0.3551
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7481 - accuracy: 0.4447 - val_loss: 0.7206 - val_accuracy: 0.3598
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7700 - accuracy: 0.4216 - val_loss: 0.7139 - val_accuracy: 0.3551
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7414 - accuracy: 0.4447 - val_loss: 0.7048 - val_accuracy: 0.3551
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7086 - accuracy: 0.4550 - val_loss: 0.7027 - val_accuracy: 0.3551
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7490 - accuracy: 0.4113 - val_loss: 0.7026 - val_accuracy: 0.3411
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6708 - accuracy: 0.4833 - val_loss: 0.7042 - val_accuracy: 0.3598
Epoch 121/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6899 - accuracy: 0.4447 - val_loss: 0.7040 - val_accuracy: 0.3692
Epoch 122/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7063 - accuracy: 0.4396 - val_loss: 0.7017 - val_accuracy: 0.3645
Epoch 123/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6717 - accuracy: 0.4344 - val_loss: 0.7055 - val_accuracy: 0.3832
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6452 - accuracy: 0.4139 - val_loss: 0.7056 - val_accuracy: 0.3879
Epoch 125/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6425 - accuracy: 0.4473 - val_loss: 0.7003 - val_accuracy: 0.3832
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6686 - accuracy: 0.4344 - val_loss: 0.6987 - val_accuracy: 0.3785
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6896 - accuracy: 0.4344 - val_loss: 0.6998 - val_accuracy: 0.3645
Epoch 128/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6123 - accuracy: 0.4473 - val_loss: 0.6784 - val_accuracy: 0.3645
Epoch 129/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6332 - accuracy: 0.4473 - val_loss: 0.6844 - val_accuracy: 0.3832
Epoch 130/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6600 - accuracy: 0.4602 - val_loss: 0.6712 - val_accuracy: 0.3785
Epoch 131/1000
4/4 [=====] - 0s 10ms/step - loss: 0.6367 - accuracy: 0.4884 - val_loss: 0.6858 - val_accuracy: 0.3738
Epoch 132/1000
4/4 [=====] - 0s 10ms/step - loss: 0.5656 - accuracy: 0.4447 - val_loss: 0.6585 - val_accuracy: 0.3785
Epoch 133/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6697 - accuracy: 0.4370 - val_loss: 0.6585 - val_accuracy: 0.3832
Epoch 134/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7301 - accuracy: 0.4370 - val_loss: 0.6531 - val_accuracy: 0.3785
Epoch 135/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6080 - accuracy: 0.4910 - val_loss: 0.6801 - val_accuracy: 0.3879
Epoch 136/1000
4/4 [=====] - 0s 10ms/step - loss: 0.6900 - accuracy: 0.5270 - val_loss: 0.6792 - val_accuracy: 0.3879
Epoch 137/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5854 - accuracy: 0.5064 - val_loss: 0.6981 - val_accuracy: 0.3879
Epoch 138/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6994 - accuracy: 0.4807 - val_loss: 0.6920 - val_accuracy: 0.3738
Epoch 139/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5859 - accuracy: 0.4910 - val_loss: 0.6919 - val_accuracy: 0.3738
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5856 - accuracy: 0.5090 - val_loss: 0.7037 - val_accuracy: 0.3692
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6783 - accuracy: 0.5733 - val_loss: 0.7049 - val_accuracy: 0.3785
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5702 - accuracy: 0.4807 - val_loss: 0.7021 - val_accuracy: 0.3832
Epoch 143/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6041 - accuracy: 0.5398 - val_loss: 0.7072 - val_accuracy: 0.3785
```

Epoch 144/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.5354 - accuracy: 0.4756 - val_loss: 0.6831 - val_accuracy: 0.3925
 Epoch 145/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.5807 - accuracy: 0.5039 - val_loss: 0.7113 - val_accuracy: 0.3832
 Epoch 146/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.6244 - accuracy: 0.4679 - val_loss: 0.7074 - val_accuracy: 0.3925
 Epoch 147/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.5671 - accuracy: 0.4756 - val_loss: 0.7024 - val_accuracy: 0.3972
 Epoch 148/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.6423 - accuracy: 0.4884 - val_loss: 0.7300 - val_accuracy: 0.4299
 Epoch 149/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.6070 - accuracy: 0.4987 - val_loss: 0.7044 - val_accuracy: 0.4206
 Epoch 150/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.5983 - accuracy: 0.5090 - val_loss: 0.7101 - val_accuracy: 0.4299
 Epoch 151/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.6453 - accuracy: 0.4961 - val_loss: 0.6864 - val_accuracy: 0.4393
 Epoch 152/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.5607 - accuracy: 0.4653 - val_loss: 0.6881 - val_accuracy: 0.4579
 Epoch 153/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.5418 - accuracy: 0.4859 - val_loss: 0.6818 - val_accuracy: 0.4673
 Epoch 154/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.5249 - accuracy: 0.4609 Restoring model weights from the end of the best epoch: 4.
 4/4 [=====] - 0s 12ms/step - loss: 0.5851 - accuracy: 0.4859 - val_loss: 0.6634 - val_accuracy: 0.4486
 Epoch 154: early stopping
 2/2 [=====] - 0s 3ms/step - loss: 3.5141 - accuracy: 0.5814
 [CV] ENDDense1=25, Dense2=10; total time= 7.7s
 Model: "sequential_14"

Layer (type)	Output Shape	Param #
<hr/>		
dense_56 (Dense)	(None, 25)	175
<hr/>		
batch_normalization_42 (BatchNormalization)	(None, 25)	100
activation_42 (Activation)	(None, 25)	0
dense_57 (Dense)	(None, 10)	260
batch_normalization_43 (BatchNormalization)	(None, 10)	40
activation_43 (Activation)	(None, 10)	0
dense_58 (Dense)	(None, 10)	110
batch_normalization_44 (BatchNormalization)	(None, 10)	40
activation_44 (Activation)	(None, 10)	0
dense_59 (Dense)	(None, 2)	22
<hr/>		

Total params: 747
 Trainable params: 657
 Non-trainable params: 90

Epoch 1/1000
 4/4 [=====] - 1s 194ms/step - loss: 4.3537 - accuracy: 0.4833 - val_loss: 5.1035 - val_accuracy: 0.6168
 Epoch 2/1000
 4/4 [=====] - 0s 13ms/step - loss: 3.8449 - accuracy: 0.4602 - val_loss: 4.8969 - val_accuracy: 0.6168
 Epoch 3/1000
 4/4 [=====] - 0s 13ms/step - loss: 3.6370 - accuracy: 0.4859 - val_loss: 3.8019 - val_accuracy: 0.6028
 Epoch 4/1000
 4/4 [=====] - 0s 13ms/step - loss: 3.4165 - accuracy: 0.4756 - val_loss: 3.2517 - val_accuracy: 0.6075
 Epoch 5/1000
 4/4 [=====] - 0s 14ms/step - loss: 3.2952 - accuracy: 0.4884 - val_loss: 2.8218 - val_accuracy: 0.5981
 Epoch 6/1000
 4/4 [=====] - 0s 13ms/step - loss: 3.0104 - accuracy: 0.5013 - val_loss: 2.4913 - val_accuracy: 0.5748
 Epoch 7/1000

4/4 [=====] - 0s 13ms/step - loss: 2.9871 - accuracy: 0.5476 - val_loss: 2.4362 - val_accuracy: 0.5701
Epoch 8/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9892 - accuracy: 0.5501 - val_loss: 2.2904 - val_accuracy: 0.5701
Epoch 9/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9715 - accuracy: 0.5321 - val_loss: 2.2515 - val_accuracy: 0.5794
Epoch 10/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8099 - accuracy: 0.5193 - val_loss: 2.2577 - val_accuracy: 0.5841
Epoch 11/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6994 - accuracy: 0.5064 - val_loss: 2.2801 - val_accuracy: 0.5935
Epoch 12/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7883 - accuracy: 0.5116 - val_loss: 2.2768 - val_accuracy: 0.5327
Epoch 13/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6989 - accuracy: 0.4910 - val_loss: 2.3085 - val_accuracy: 0.5093
Epoch 14/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8418 - accuracy: 0.4833 - val_loss: 2.3255 - val_accuracy: 0.4860
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7254 - accuracy: 0.5270 - val_loss: 2.3385 - val_accuracy: 0.4766
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5405 - accuracy: 0.5141 - val_loss: 2.2908 - val_accuracy: 0.4579
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6306 - accuracy: 0.5039 - val_loss: 2.3318 - val_accuracy: 0.4252
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5169 - accuracy: 0.5013 - val_loss: 2.2692 - val_accuracy: 0.4112
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4243 - accuracy: 0.5039 - val_loss: 2.2093 - val_accuracy: 0.3832
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4833 - accuracy: 0.5064 - val_loss: 2.1889 - val_accuracy: 0.4159
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2487 - accuracy: 0.5398 - val_loss: 2.1882 - val_accuracy: 0.4252
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4781 - accuracy: 0.5167 - val_loss: 2.1963 - val_accuracy: 0.4346
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3509 - accuracy: 0.5013 - val_loss: 2.1745 - val_accuracy: 0.4393
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3905 - accuracy: 0.4961 - val_loss: 2.1335 - val_accuracy: 0.4439
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2222 - accuracy: 0.5373 - val_loss: 2.0812 - val_accuracy: 0.4533
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2887 - accuracy: 0.5296 - val_loss: 2.0262 - val_accuracy: 0.4626
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1754 - accuracy: 0.5141 - val_loss: 2.0056 - val_accuracy: 0.4626
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1263 - accuracy: 0.5450 - val_loss: 1.9755 - val_accuracy: 0.4813
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0667 - accuracy: 0.5270 - val_loss: 1.9564 - val_accuracy: 0.4673
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0277 - accuracy: 0.5450 - val_loss: 1.9394 - val_accuracy: 0.4626
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0327 - accuracy: 0.5604 - val_loss: 1.9264 - val_accuracy: 0.4673
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9285 - accuracy: 0.5373 - val_loss: 1.9102 - val_accuracy: 0.4673
Epoch 33/1000
4/4 [=====] - 0s 17ms/step - loss: 1.9528 - accuracy: 0.5861 - val_loss: 1.8859 - val_accuracy: 0.4720
Epoch 34/1000
4/4 [=====] - 0s 17ms/step - loss: 1.8720 - accuracy: 0.5656 - val_loss: 1.8671 - val_accuracy: 0.4766
Epoch 35/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9076 - accuracy: 0.5347 - val_loss: 1.8196 - val_accuracy: 0.4907
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8575 - accuracy: 0.5347 - val_loss: 1.7732 - val_accuracy: 0.4953

Epoch 37/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8082 - accuracy: 0.5553 - val_loss: 1.7219 - val_accuracy: 0.4953
Epoch 38/1000
4/4 [=====] - 0s 16ms/step - loss: 1.7696 - accuracy: 0.5398 - val_loss: 1.7042 - val_accuracy: 0.4766
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8658 - accuracy: 0.5321 - val_loss: 1.6862 - val_accuracy: 0.4766
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6921 - accuracy: 0.5861 - val_loss: 1.6710 - val_accuracy: 0.4953
Epoch 41/1000
4/4 [=====] - 0s 15ms/step - loss: 1.7003 - accuracy: 0.5681 - val_loss: 1.6323 - val_accuracy: 0.5047
Epoch 42/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7103 - accuracy: 0.5604 - val_loss: 1.6290 - val_accuracy: 0.4953
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7487 - accuracy: 0.5501 - val_loss: 1.6078 - val_accuracy: 0.4907
Epoch 44/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8218 - accuracy: 0.5656 - val_loss: 1.5891 - val_accuracy: 0.4953
Epoch 45/1000
4/4 [=====] - 0s 16ms/step - loss: 1.7129 - accuracy: 0.5758 - val_loss: 1.5145 - val_accuracy: 0.4766
Epoch 46/1000
4/4 [=====] - 0s 15ms/step - loss: 1.7200 - accuracy: 0.5707 - val_loss: 1.4723 - val_accuracy: 0.4813
Epoch 47/1000
4/4 [=====] - 0s 15ms/step - loss: 1.6827 - accuracy: 0.5656 - val_loss: 1.4461 - val_accuracy: 0.5000
Epoch 48/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6692 - accuracy: 0.5527 - val_loss: 1.4205 - val_accuracy: 0.5000
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6078 - accuracy: 0.5398 - val_loss: 1.3680 - val_accuracy: 0.5140
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6537 - accuracy: 0.5424 - val_loss: 1.3529 - val_accuracy: 0.5140
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5771 - accuracy: 0.5810 - val_loss: 1.3433 - val_accuracy: 0.5187
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6633 - accuracy: 0.5913 - val_loss: 1.3281 - val_accuracy: 0.5187
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5989 - accuracy: 0.5707 - val_loss: 1.3179 - val_accuracy: 0.5234
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6484 - accuracy: 0.5964 - val_loss: 1.2946 - val_accuracy: 0.5140
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7043 - accuracy: 0.5681 - val_loss: 1.2948 - val_accuracy: 0.5000
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5105 - accuracy: 0.5810 - val_loss: 1.2719 - val_accuracy: 0.5280
Epoch 57/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4394 - accuracy: 0.5707 - val_loss: 1.2626 - val_accuracy: 0.5093
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4666 - accuracy: 0.5887 - val_loss: 1.2503 - val_accuracy: 0.5187
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5057 - accuracy: 0.5604 - val_loss: 1.2369 - val_accuracy: 0.5280
Epoch 60/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4562 - accuracy: 0.5758 - val_loss: 1.2268 - val_accuracy: 0.5234
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5512 - accuracy: 0.5733 - val_loss: 1.2140 - val_accuracy: 0.5234
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4577 - accuracy: 0.5913 - val_loss: 1.2027 - val_accuracy: 0.5374
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3707 - accuracy: 0.5913 - val_loss: 1.1926 - val_accuracy: 0.5514
Epoch 64/1000
4/4 [=====] - 0s 15ms/step - loss: 1.5244 - accuracy: 0.5630 - val_loss: 1.1765 - val_accuracy: 0.5607
Epoch 65/1000
4/4 [=====] - 0s 16ms/step - loss: 1.3573 - accuracy: 0.6041 - val_loss: 1.1726 - val_accuracy: 0.5514
Epoch 66/1000
4/4 [=====] - 0s 16ms/step - loss: 1.3912 - accuracy: 0.6093 - val_loss: 1.1778 - val_accuracy: 0.5514

```
accuracy: 0.5561
Epoch 67/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4494 - accuracy: 0.6221 - val_loss: 1.1980 - val_accuracy: 0.5654
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3557 - accuracy: 0.6041 - val_loss: 1.1929 - val_accuracy: 0.5607
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4037 - accuracy: 0.5835 - val_loss: 1.1882 - val_accuracy: 0.5654
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3959 - accuracy: 0.5758 - val_loss: 1.2330 - val_accuracy: 0.5748
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3868 - accuracy: 0.5784 - val_loss: 1.2378 - val_accuracy: 0.5888
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3350 - accuracy: 0.5964 - val_loss: 1.2539 - val_accuracy: 0.5888
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3779 - accuracy: 0.6067 - val_loss: 1.2401 - val_accuracy: 0.5841
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3729 - accuracy: 0.5784 - val_loss: 1.2364 - val_accuracy: 0.5748
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3561 - accuracy: 0.5990 - val_loss: 1.2318 - val_accuracy: 0.5794
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3063 - accuracy: 0.6118 - val_loss: 1.2262 - val_accuracy: 0.5935
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2781 - accuracy: 0.6015 - val_loss: 1.2444 - val_accuracy: 0.5935
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4135 - accuracy: 0.5887 - val_loss: 1.2440 - val_accuracy: 0.5935
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3166 - accuracy: 0.6221 - val_loss: 1.2384 - val_accuracy: 0.5981
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3797 - accuracy: 0.5964 - val_loss: 1.2331 - val_accuracy: 0.6168
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3676 - accuracy: 0.6041 - val_loss: 1.2296 - val_accuracy: 0.6121
Epoch 82/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2855 - accuracy: 0.5990 - val_loss: 1.2277 - val_accuracy: 0.6168
Epoch 83/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3118 - accuracy: 0.5938 - val_loss: 1.2479 - val_accuracy: 0.6168
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3289 - accuracy: 0.6195 - val_loss: 1.2439 - val_accuracy: 0.6075
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4150 - accuracy: 0.6015 - val_loss: 1.2417 - val_accuracy: 0.5888
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2595 - accuracy: 0.6350 - val_loss: 1.2360 - val_accuracy: 0.5981
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4257 - accuracy: 0.5913 - val_loss: 1.2307 - val_accuracy: 0.6121
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3317 - accuracy: 0.6195 - val_loss: 1.2225 - val_accuracy: 0.6028
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3213 - accuracy: 0.6195 - val_loss: 1.2177 - val_accuracy: 0.6028
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2646 - accuracy: 0.6350 - val_loss: 1.2141 - val_accuracy: 0.6075
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2971 - accuracy: 0.6427 - val_loss: 1.2107 - val_accuracy: 0.6075
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2137 - accuracy: 0.6272 - val_loss: 1.2294 - val_accuracy: 0.5981
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2649 - accuracy: 0.6144 - val_loss: 1.2236 - val_accuracy: 0.6075
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2260 - accuracy: 0.6144 - val_loss: 1.2129 - val_accuracy: 0.6215
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2633 - accuracy: 0.6118 - val_loss: 1.2148 - val_accuracy: 0.5794
Epoch 96/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 1.3357 - accuracy: 0.6195 - val_loss: 1.2086 - val_accuracy: 0.5841
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2753 - accuracy: 0.6041 - val_loss: 1.2084 - val_accuracy: 0.6028
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1884 - accuracy: 0.6324 - val_loss: 1.2053 - val_accuracy: 0.6215
Epoch 99/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1573 - accuracy: 0.6401 - val_loss: 1.2236 - val_accuracy: 0.6308
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2162 - accuracy: 0.6221 - val_loss: 1.2193 - val_accuracy: 0.6355
Epoch 101/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1822 - accuracy: 0.6452 - val_loss: 1.2086 - val_accuracy: 0.6495
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1328 - accuracy: 0.6298 - val_loss: 1.2029 - val_accuracy: 0.6449
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2259 - accuracy: 0.6350 - val_loss: 1.1684 - val_accuracy: 0.6495
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1119 - accuracy: 0.6324 - val_loss: 1.1619 - val_accuracy: 0.6355
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1769 - accuracy: 0.6324 - val_loss: 1.1532 - val_accuracy: 0.6449
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1216 - accuracy: 0.6375 - val_loss: 1.1763 - val_accuracy: 0.6542
Epoch 107/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1167 - accuracy: 0.6272 - val_loss: 1.1382 - val_accuracy: 0.6355
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1004 - accuracy: 0.6144 - val_loss: 1.1676 - val_accuracy: 0.6402
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0793 - accuracy: 0.6555 - val_loss: 1.1443 - val_accuracy: 0.6402
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1667 - accuracy: 0.6401 - val_loss: 1.1643 - val_accuracy: 0.6542
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9984 - accuracy: 0.6684 - val_loss: 1.1601 - val_accuracy: 0.6589
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0707 - accuracy: 0.6478 - val_loss: 1.1796 - val_accuracy: 0.6636
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1458 - accuracy: 0.6555 - val_loss: 1.1548 - val_accuracy: 0.6729
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0235 - accuracy: 0.6350 - val_loss: 1.1762 - val_accuracy: 0.6869
Epoch 115/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0322 - accuracy: 0.6427 - val_loss: 1.1719 - val_accuracy: 0.6542
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1530 - accuracy: 0.6247 - val_loss: 1.1515 - val_accuracy: 0.6822
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0160 - accuracy: 0.6607 - val_loss: 1.1093 - val_accuracy: 0.6822
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1430 - accuracy: 0.6350 - val_loss: 1.1119 - val_accuracy: 0.6869
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0245 - accuracy: 0.6478 - val_loss: 1.1115 - val_accuracy: 0.6729
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9839 - accuracy: 0.6350 - val_loss: 1.1861 - val_accuracy: 0.6636
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0333 - accuracy: 0.6684 - val_loss: 1.1575 - val_accuracy: 0.6636
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0865 - accuracy: 0.6504 - val_loss: 1.1540 - val_accuracy: 0.6636
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1386 - accuracy: 0.6684 - val_loss: 1.1356 - val_accuracy: 0.6776
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0484 - accuracy: 0.6632 - val_loss: 1.1574 - val_accuracy: 0.6822
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0176 - accuracy: 0.6684 - val_loss: 1.1495 - val_accuracy: 0.6682
```

Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0121 - accuracy: 0.6504 - val_loss: 1.1154 - val_accuracy: 0.6776
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9617 - accuracy: 0.6581 - val_loss: 1.1163 - val_accuracy: 0.6589
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9247 - accuracy: 0.7018 - val_loss: 1.0837 - val_accuracy: 0.6963
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9715 - accuracy: 0.6761 - val_loss: 0.9771 - val_accuracy: 0.6916
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9390 - accuracy: 0.6555 - val_loss: 0.9886 - val_accuracy: 0.6869
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8679 - accuracy: 0.6298 - val_loss: 0.9575 - val_accuracy: 0.6916
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8419 - accuracy: 0.6607 - val_loss: 0.9725 - val_accuracy: 0.6776
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8478 - accuracy: 0.6401 - val_loss: 0.9674 - val_accuracy: 0.6963
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8273 - accuracy: 0.6452 - val_loss: 0.9672 - val_accuracy: 0.6916
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8264 - accuracy: 0.6735 - val_loss: 0.9653 - val_accuracy: 0.6822
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8126 - accuracy: 0.6350 - val_loss: 0.9610 - val_accuracy: 0.6822
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8379 - accuracy: 0.6684 - val_loss: 0.9663 - val_accuracy: 0.6822
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9026 - accuracy: 0.6555 - val_loss: 1.0111 - val_accuracy: 0.6636
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8266 - accuracy: 0.6607 - val_loss: 0.9796 - val_accuracy: 0.6916
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8173 - accuracy: 0.6478 - val_loss: 0.9268 - val_accuracy: 0.6822
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7663 - accuracy: 0.6812 - val_loss: 0.9219 - val_accuracy: 0.6776
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7876 - accuracy: 0.6401 - val_loss: 0.9218 - val_accuracy: 0.6729
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7853 - accuracy: 0.6375 - val_loss: 0.9042 - val_accuracy: 0.6776
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7867 - accuracy: 0.6118 - val_loss: 0.8920 - val_accuracy: 0.6963
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7885 - accuracy: 0.6555 - val_loss: 0.8866 - val_accuracy: 0.6822
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7416 - accuracy: 0.6581 - val_loss: 0.8865 - val_accuracy: 0.6682
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7389 - accuracy: 0.6735 - val_loss: 0.9088 - val_accuracy: 0.6869
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8217 - accuracy: 0.6658 - val_loss: 0.9070 - val_accuracy: 0.6589
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8392 - accuracy: 0.6607 - val_loss: 0.8805 - val_accuracy: 0.6729
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8057 - accuracy: 0.6632 - val_loss: 0.8797 - val_accuracy: 0.6776
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7909 - accuracy: 0.6838 - val_loss: 0.8884 - val_accuracy: 0.7056
Epoch 152/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7328 - accuracy: 0.6992 - val_loss: 0.9246 - val_accuracy: 0.7103
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7427 - accuracy: 0.6812 - val_loss: 0.9647 - val_accuracy: 0.6869
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7247 - accuracy: 0.6427 - val_loss: 0.8938 - val_accuracy: 0.6682
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6869 - accuracy: 0.6452 - val_loss: 0.9219 - val_accuracy: 0.6452

```
accuracy: 0.6542
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7324 - accuracy: 0.6401 - val_loss: 0.9393 - val_accuracy: 0.6682
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7245 - accuracy: 0.6607 - val_loss: 0.9160 - val_accuracy: 0.6636
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7460 - accuracy: 0.6530 - val_loss: 0.9359 - val_accuracy: 0.6636
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6476 - accuracy: 0.6478 - val_loss: 0.9318 - val_accuracy: 0.6636
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6412 - accuracy: 0.6170 - val_loss: 0.9551 - val_accuracy: 0.6682
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6705 - accuracy: 0.6298 - val_loss: 0.9485 - val_accuracy: 0.6636
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8107 - accuracy: 0.6555 - val_loss: 0.9493 - val_accuracy: 0.6636
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6824 - accuracy: 0.6195 - val_loss: 0.9438 - val_accuracy: 0.6636
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6385 - accuracy: 0.6350 - val_loss: 0.9404 - val_accuracy: 0.6776
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6881 - accuracy: 0.6221 - val_loss: 0.9439 - val_accuracy: 0.6636
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6080 - accuracy: 0.6195 - val_loss: 0.9434 - val_accuracy: 0.6542
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5824 - accuracy: 0.6247 - val_loss: 0.9131 - val_accuracy: 0.6636
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6183 - accuracy: 0.6272 - val_loss: 0.9101 - val_accuracy: 0.6542
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7051 - accuracy: 0.6221 - val_loss: 0.8856 - val_accuracy: 0.6589
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5924 - accuracy: 0.6504 - val_loss: 0.9079 - val_accuracy: 0.6542
Epoch 171/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6139 - accuracy: 0.6195 - val_loss: 0.8881 - val_accuracy: 0.6636
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6291 - accuracy: 0.6324 - val_loss: 0.9095 - val_accuracy: 0.6636
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6461 - accuracy: 0.5990 - val_loss: 0.8850 - val_accuracy: 0.6589
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6178 - accuracy: 0.5964 - val_loss: 0.8851 - val_accuracy: 0.6542
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5845 - accuracy: 0.5835 - val_loss: 0.8880 - val_accuracy: 0.6402
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5501 - accuracy: 0.6144 - val_loss: 0.8781 - val_accuracy: 0.6495
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5104 - accuracy: 0.5938 - val_loss: 0.8727 - val_accuracy: 0.6495
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5897 - accuracy: 0.6350 - val_loss: 0.8174 - val_accuracy: 0.6402
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5617 - accuracy: 0.5938 - val_loss: 0.8149 - val_accuracy: 0.6449
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6104 - accuracy: 0.6170 - val_loss: 0.7821 - val_accuracy: 0.6636
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5402 - accuracy: 0.6247 - val_loss: 0.7880 - val_accuracy: 0.6308
Epoch 182/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5080 - accuracy: 0.6195 - val_loss: 0.7683 - val_accuracy: 0.6262
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5243 - accuracy: 0.6221 - val_loss: 0.7447 - val_accuracy: 0.6262
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5266 - accuracy: 0.5835 - val_loss: 0.7634 - val_accuracy: 0.6262
Epoch 185/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.5529 - accuracy: 0.6118 - val_loss: 0.7636 - val_accuracy: 0.6308
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5539 - accuracy: 0.5887 - val_loss: 0.7039 - val_accuracy: 0.6168
Epoch 187/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5467 - accuracy: 0.5810 - val_loss: 0.7253 - val_accuracy: 0.6262
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5078 - accuracy: 0.5784 - val_loss: 0.7833 - val_accuracy: 0.6308
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4961 - accuracy: 0.5913 - val_loss: 0.7581 - val_accuracy: 0.6308
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5374 - accuracy: 0.5887 - val_loss: 0.7505 - val_accuracy: 0.6308
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5152 - accuracy: 0.5938 - val_loss: 0.7215 - val_accuracy: 0.6449
Epoch 192/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4841 - accuracy: 0.6041 - val_loss: 0.7403 - val_accuracy: 0.6449
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4725 - accuracy: 0.6272 - val_loss: 0.7490 - val_accuracy: 0.6495
Epoch 194/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4900 - accuracy: 0.6195 - val_loss: 0.7487 - val_accuracy: 0.6495
Epoch 195/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5601 - accuracy: 0.6195 - val_loss: 0.7474 - val_accuracy: 0.6495
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4332 - accuracy: 0.6170 - val_loss: 0.7459 - val_accuracy: 0.6542
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5013 - accuracy: 0.6195 - val_loss: 0.7055 - val_accuracy: 0.6495
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5266 - accuracy: 0.6247 - val_loss: 0.7373 - val_accuracy: 0.6449
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4641 - accuracy: 0.6015 - val_loss: 0.7477 - val_accuracy: 0.6542
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4901 - accuracy: 0.6144 - val_loss: 0.7151 - val_accuracy: 0.6495
Epoch 201/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4863 - accuracy: 0.6195 - val_loss: 0.6897 - val_accuracy: 0.6402
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5156 - accuracy: 0.5913 - val_loss: 0.6868 - val_accuracy: 0.6355
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4967 - accuracy: 0.5964 - val_loss: 0.6512 - val_accuracy: 0.6542
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4330 - accuracy: 0.6015 - val_loss: 0.6530 - val_accuracy: 0.6355
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4378 - accuracy: 0.5990 - val_loss: 0.6538 - val_accuracy: 0.6402
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4740 - accuracy: 0.5810 - val_loss: 0.6501 - val_accuracy: 0.6355
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4758 - accuracy: 0.5990 - val_loss: 0.6506 - val_accuracy: 0.6449
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4813 - accuracy: 0.6093 - val_loss: 0.6533 - val_accuracy: 0.6495
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5151 - accuracy: 0.6195 - val_loss: 0.6501 - val_accuracy: 0.6449
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4360 - accuracy: 0.6067 - val_loss: 0.6532 - val_accuracy: 0.6355
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4433 - accuracy: 0.5990 - val_loss: 0.6533 - val_accuracy: 0.6028
Epoch 212/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4589 - accuracy: 0.6041 - val_loss: 0.6306 - val_accuracy: 0.6168
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4475 - accuracy: 0.5938 - val_loss: 0.6572 - val_accuracy: 0.6168
Epoch 214/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4796 - accuracy: 0.5810 - val_loss: 0.6632 - val_accuracy: 0.6121
```

Epoch 215/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5277 - accuracy: 0.5913 - val_loss: 0.6632 - val_accuracy: 0.6168
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4516 - accuracy: 0.6041 - val_loss: 0.6945 - val_accuracy: 0.6308
Epoch 217/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4922 - accuracy: 0.6170 - val_loss: 0.6922 - val_accuracy: 0.6262
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4929 - accuracy: 0.6067 - val_loss: 0.6847 - val_accuracy: 0.6308
Epoch 219/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4536 - accuracy: 0.6195 - val_loss: 0.6859 - val_accuracy: 0.6308
Epoch 220/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4394 - accuracy: 0.6144 - val_loss: 0.6880 - val_accuracy: 0.6308
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5163 - accuracy: 0.6015 - val_loss: 0.6893 - val_accuracy: 0.6308
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4641 - accuracy: 0.6067 - val_loss: 0.6876 - val_accuracy: 0.6355
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4802 - accuracy: 0.6221 - val_loss: 0.6861 - val_accuracy: 0.6449
Epoch 224/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4291 - accuracy: 0.6401 - val_loss: 0.7139 - val_accuracy: 0.6682
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5045 - accuracy: 0.6452 - val_loss: 0.7152 - val_accuracy: 0.6822
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4922 - accuracy: 0.6247 - val_loss: 0.6922 - val_accuracy: 0.6776
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4678 - accuracy: 0.6607 - val_loss: 0.7112 - val_accuracy: 0.6822
Epoch 228/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4246 - accuracy: 0.6350 - val_loss: 0.6230 - val_accuracy: 0.6916
Epoch 229/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4811 - accuracy: 0.6272 - val_loss: 0.6184 - val_accuracy: 0.6963
Epoch 230/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4439 - accuracy: 0.6581 - val_loss: 0.6165 - val_accuracy: 0.6916
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4423 - accuracy: 0.6658 - val_loss: 0.6113 - val_accuracy: 0.7009
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4159 - accuracy: 0.6504 - val_loss: 0.6129 - val_accuracy: 0.7009
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4266 - accuracy: 0.6581 - val_loss: 0.6131 - val_accuracy: 0.6869
Epoch 234/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4089 - accuracy: 0.6504 - val_loss: 0.6128 - val_accuracy: 0.6822
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4180 - accuracy: 0.6478 - val_loss: 0.6162 - val_accuracy: 0.6682
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5319 - accuracy: 0.6247 - val_loss: 0.6170 - val_accuracy: 0.6729
Epoch 237/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4980 - accuracy: 0.6170 - val_loss: 0.6234 - val_accuracy: 0.6729
Epoch 238/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4711 - accuracy: 0.6272 - val_loss: 0.6466 - val_accuracy: 0.6729
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5132 - accuracy: 0.6401 - val_loss: 0.6989 - val_accuracy: 0.6776
Epoch 240/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4935 - accuracy: 0.6401 - val_loss: 0.7003 - val_accuracy: 0.6822
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4204 - accuracy: 0.6350 - val_loss: 0.7312 - val_accuracy: 0.6636
Epoch 242/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4658 - accuracy: 0.6067 - val_loss: 0.7334 - val_accuracy: 0.6589
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4080 - accuracy: 0.6272 - val_loss: 0.7024 - val_accuracy: 0.6916
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4227 - accuracy: 0.6247 - val_loss: 0.7136 - val_accuracy: 0.6916

```
accuracy: 0.6729
Epoch 245/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4545 - accuracy: 0.6170 - val_loss: 0.6433 - val_accuracy: 0.6916
Epoch 246/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4621 - accuracy: 0.6170 - val_loss: 0.6228 - val_accuracy: 0.7103
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4580 - accuracy: 0.6350 - val_loss: 0.6386 - val_accuracy: 0.7056
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4233 - accuracy: 0.6375 - val_loss: 0.6366 - val_accuracy: 0.6776
Epoch 249/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3980 - accuracy: 0.6530 - val_loss: 0.6376 - val_accuracy: 0.6776
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4107 - accuracy: 0.6195 - val_loss: 0.6372 - val_accuracy: 0.6682
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4167 - accuracy: 0.6324 - val_loss: 0.6372 - val_accuracy: 0.6449
Epoch 252/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4555 - accuracy: 0.6452 - val_loss: 0.6399 - val_accuracy: 0.6729
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4922 - accuracy: 0.6221 - val_loss: 0.6460 - val_accuracy: 0.6636
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4562 - accuracy: 0.6375 - val_loss: 0.7317 - val_accuracy: 0.6636
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4037 - accuracy: 0.6272 - val_loss: 0.7324 - val_accuracy: 0.6495
Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4166 - accuracy: 0.6272 - val_loss: 0.7363 - val_accuracy: 0.6542
Epoch 257/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5104 - accuracy: 0.6221 - val_loss: 0.6567 - val_accuracy: 0.6262
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4250 - accuracy: 0.6067 - val_loss: 0.6219 - val_accuracy: 0.6262
Epoch 259/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4190 - accuracy: 0.6478 - val_loss: 0.6197 - val_accuracy: 0.6542
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4065 - accuracy: 0.6221 - val_loss: 0.6486 - val_accuracy: 0.6402
Epoch 261/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4396 - accuracy: 0.6272 - val_loss: 0.6700 - val_accuracy: 0.6495
Epoch 262/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5393 - accuracy: 0.6478 - val_loss: 0.6984 - val_accuracy: 0.6542
Epoch 263/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4326 - accuracy: 0.6427 - val_loss: 0.6238 - val_accuracy: 0.6682
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4808 - accuracy: 0.6607 - val_loss: 0.6825 - val_accuracy: 0.6729
Epoch 265/1000
4/4 [=====] - 0s 18ms/step - loss: 0.4271 - accuracy: 0.6504 - val_loss: 0.7234 - val_accuracy: 0.6822
Epoch 266/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4521 - accuracy: 0.6581 - val_loss: 0.6813 - val_accuracy: 0.6822
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4261 - accuracy: 0.6350 - val_loss: 0.6722 - val_accuracy: 0.6916
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4156 - accuracy: 0.6375 - val_loss: 0.6737 - val_accuracy: 0.6869
Epoch 269/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4990 - accuracy: 0.6504 - val_loss: 0.6838 - val_accuracy: 0.6869
Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4516 - accuracy: 0.6684 - val_loss: 0.6434 - val_accuracy: 0.6776
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4708 - accuracy: 0.6581 - val_loss: 0.6230 - val_accuracy: 0.6822
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4243 - accuracy: 0.6452 - val_loss: 0.6510 - val_accuracy: 0.6963
Epoch 273/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4021 - accuracy: 0.6452 - val_loss: 0.6973 - val_accuracy: 0.6682
Epoch 274/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.5192 - accuracy: 0.6530 - val_loss: 0.6744 - val_accuracy: 0.6589
Epoch 275/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3947 - accuracy: 0.6324 - val_loss: 0.7013 - val_accuracy: 0.6589
Epoch 276/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4433 - accuracy: 0.6452 - val_loss: 0.6783 - val_accuracy: 0.6589
Epoch 277/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3917 - accuracy: 0.6247 - val_loss: 0.6742 - val_accuracy: 0.6495
Epoch 278/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4901 - accuracy: 0.6195 - val_loss: 0.6097 - val_accuracy: 0.6776
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4267 - accuracy: 0.6452 - val_loss: 0.6432 - val_accuracy: 0.6822
Epoch 280/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3842 - accuracy: 0.6375 - val_loss: 0.6682 - val_accuracy: 0.6822
Epoch 281/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4065 - accuracy: 0.6478 - val_loss: 0.6679 - val_accuracy: 0.6916
Epoch 282/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4496 - accuracy: 0.6401 - val_loss: 0.7049 - val_accuracy: 0.6869
Epoch 283/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4598 - accuracy: 0.6632 - val_loss: 0.7050 - val_accuracy: 0.6822
Epoch 284/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4792 - accuracy: 0.6452 - val_loss: 0.7094 - val_accuracy: 0.6822
Epoch 285/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4506 - accuracy: 0.6632 - val_loss: 0.7109 - val_accuracy: 0.6822
Epoch 286/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4013 - accuracy: 0.6581 - val_loss: 0.7081 - val_accuracy: 0.6729
Epoch 287/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4016 - accuracy: 0.6607 - val_loss: 0.7414 - val_accuracy: 0.6682
Epoch 288/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4681 - accuracy: 0.6658 - val_loss: 0.7042 - val_accuracy: 0.6682
Epoch 289/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4237 - accuracy: 0.6504 - val_loss: 0.6173 - val_accuracy: 0.6636
Epoch 290/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4154 - accuracy: 0.6401 - val_loss: 0.6196 - val_accuracy: 0.6776
Epoch 291/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4446 - accuracy: 0.6684 - val_loss: 0.6253 - val_accuracy: 0.6869
Epoch 292/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3959 - accuracy: 0.6555 - val_loss: 0.6278 - val_accuracy: 0.7009
Epoch 293/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4326 - accuracy: 0.6272 - val_loss: 0.6160 - val_accuracy: 0.6729
Epoch 294/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3975 - accuracy: 0.6504 - val_loss: 0.6137 - val_accuracy: 0.6729
Epoch 295/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3981 - accuracy: 0.6581 - val_loss: 0.6721 - val_accuracy: 0.6729
Epoch 296/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3948 - accuracy: 0.6401 - val_loss: 0.6692 - val_accuracy: 0.6729
Epoch 297/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4159 - accuracy: 0.6504 - val_loss: 0.6725 - val_accuracy: 0.6636
Epoch 298/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3853 - accuracy: 0.6581 - val_loss: 0.6714 - val_accuracy: 0.6589
Epoch 299/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4557 - accuracy: 0.6401 - val_loss: 0.6762 - val_accuracy: 0.6589
Epoch 300/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4602 - accuracy: 0.6658 - val_loss: 0.6760 - val_accuracy: 0.6495
Epoch 301/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4675 - accuracy: 0.6504 - val_loss: 0.6889 - val_accuracy: 0.6682
Epoch 302/1000
1/4 [====>.....] - ETA: 0s - loss: 0.4425 - accuracy: 0.6406Restoring model weights from the end of the best epoch: 152.
4/4 [=====] - 0s 15ms/step - loss: 0.4288 - accuracy: 0.6530 - val_loss: 0.6321 - val_accuracy: 0.6682
Epoch 302: early stopping
```

2/2 [=====] - 0s 4ms/step - loss: 0.9254 - accuracy: 0.7674
[CV] ENDDense1=25, Dense2=10; total time= 15.8s
Model: "sequential_15"

Layer (type)	Output Shape	Param #
dense_60 (Dense)	(None, 25)	175
batch_normalization_45 (BatchNormalization)	(None, 25)	100
activation_45 (Activation)	(None, 25)	0
dense_61 (Dense)	(None, 10)	260
batch_normalization_46 (BatchNormalization)	(None, 10)	40
activation_46 (Activation)	(None, 10)	0
dense_62 (Dense)	(None, 10)	110
batch_normalization_47 (BatchNormalization)	(None, 10)	40
activation_47 (Activation)	(None, 10)	0
dense_63 (Dense)	(None, 2)	22

Total params: 747
Trainable params: 657
Non-trainable params: 90

Epoch 1/1000
4/4 [=====] - 1s 57ms/step - loss: 4.8559 - accuracy: 0.5681 - val_loss: 7.3603 - val_accuracy: 0.4907
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3462 - accuracy: 0.5424 - val_loss: 5.6996 - val_accuracy: 0.5374
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 3.2557 - accuracy: 0.7069 - val_loss: 4.5961 - val_accuracy: 0.5748
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1208 - accuracy: 0.7172 - val_loss: 3.7714 - val_accuracy: 0.6168
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7057 - accuracy: 0.7147 - val_loss: 3.4700 - val_accuracy: 0.6262
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6590 - accuracy: 0.6401 - val_loss: 3.2099 - val_accuracy: 0.6682
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5435 - accuracy: 0.5810 - val_loss: 2.9893 - val_accuracy: 0.6682
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5730 - accuracy: 0.7147 - val_loss: 2.7230 - val_accuracy: 0.6729
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4153 - accuracy: 0.5913 - val_loss: 2.6103 - val_accuracy: 0.6682
Epoch 10/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3319 - accuracy: 0.6015 - val_loss: 2.5335 - val_accuracy: 0.6542
Epoch 11/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2670 - accuracy: 0.6478 - val_loss: 2.4744 - val_accuracy: 0.6542
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2693 - accuracy: 0.7301 - val_loss: 2.3201 - val_accuracy: 0.6495
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2246 - accuracy: 0.7224 - val_loss: 2.2349 - val_accuracy: 0.6542
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2413 - accuracy: 0.7198 - val_loss: 2.1992 - val_accuracy: 0.6495
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0839 - accuracy: 0.7404 - val_loss: 2.1488 - val_accuracy: 0.6542
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0609 - accuracy: 0.6221 - val_loss: 2.1190 - val_accuracy: 0.6542
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9303 - accuracy: 0.6581 - val_loss: 2.0887 - val_accuracy: 0.6495
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0265 - accuracy: 0.7326 - val_loss: 2.0631 - val_accuracy: 0.6449
Epoch 19/1000

```
4/4 [=====] - 0s 12ms/step - loss: 1.9232 - accuracy: 0.7301 - val_loss: 2.0482 - val_accuracy: 0.6355
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8746 - accuracy: 0.6118 - val_loss: 1.9963 - val_accuracy: 0.6449
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9106 - accuracy: 0.6504 - val_loss: 1.9511 - val_accuracy: 0.6869
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7908 - accuracy: 0.6452 - val_loss: 1.8834 - val_accuracy: 0.6963
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8931 - accuracy: 0.6375 - val_loss: 1.8539 - val_accuracy: 0.7103
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9497 - accuracy: 0.6298 - val_loss: 1.8354 - val_accuracy: 0.7196
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8098 - accuracy: 0.6607 - val_loss: 1.7871 - val_accuracy: 0.7103
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7605 - accuracy: 0.6324 - val_loss: 1.7606 - val_accuracy: 0.7056
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7091 - accuracy: 0.6530 - val_loss: 1.7391 - val_accuracy: 0.7056
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8075 - accuracy: 0.6452 - val_loss: 1.7160 - val_accuracy: 0.7009
Epoch 29/1000
4/4 [=====] - 0s 11ms/step - loss: 1.7449 - accuracy: 0.6478 - val_loss: 1.6796 - val_accuracy: 0.6963
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7239 - accuracy: 0.6581 - val_loss: 1.6253 - val_accuracy: 0.7009
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8144 - accuracy: 0.6684 - val_loss: 1.5867 - val_accuracy: 0.6963
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7574 - accuracy: 0.6555 - val_loss: 1.5546 - val_accuracy: 0.6869
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5715 - accuracy: 0.6658 - val_loss: 1.5189 - val_accuracy: 0.6822
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5940 - accuracy: 0.6710 - val_loss: 1.4790 - val_accuracy: 0.6822
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7267 - accuracy: 0.6838 - val_loss: 1.4857 - val_accuracy: 0.6869
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5329 - accuracy: 0.6684 - val_loss: 1.4551 - val_accuracy: 0.7009
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5148 - accuracy: 0.6787 - val_loss: 1.4323 - val_accuracy: 0.7056
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4692 - accuracy: 0.6864 - val_loss: 1.4133 - val_accuracy: 0.7103
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4253 - accuracy: 0.6710 - val_loss: 1.4032 - val_accuracy: 0.7056
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5200 - accuracy: 0.6787 - val_loss: 1.4036 - val_accuracy: 0.7103
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4742 - accuracy: 0.6838 - val_loss: 1.3908 - val_accuracy: 0.7056
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5100 - accuracy: 0.7069 - val_loss: 1.3697 - val_accuracy: 0.7103
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4429 - accuracy: 0.6838 - val_loss: 1.3693 - val_accuracy: 0.7103
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3901 - accuracy: 0.6915 - val_loss: 1.3546 - val_accuracy: 0.7009
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3598 - accuracy: 0.6915 - val_loss: 1.3558 - val_accuracy: 0.7009
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4599 - accuracy: 0.6710 - val_loss: 1.3375 - val_accuracy: 0.7009
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4319 - accuracy: 0.7069 - val_loss: 1.3306 - val_accuracy: 0.6963
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4106 - accuracy: 0.6967 - val_loss: 1.2905 - val_accuracy: 0.7056
```

Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3921 - accuracy: 0.6915 - val_loss: 1.2707 - val_accuracy: 0.7150
Epoch 50/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3767 - accuracy: 0.6787 - val_loss: 1.2664 - val_accuracy: 0.7243
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3775 - accuracy: 0.7018 - val_loss: 1.2540 - val_accuracy: 0.7150
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2718 - accuracy: 0.7095 - val_loss: 1.2646 - val_accuracy: 0.7103
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3524 - accuracy: 0.7172 - val_loss: 1.2525 - val_accuracy: 0.7103
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3447 - accuracy: 0.6838 - val_loss: 1.2411 - val_accuracy: 0.7196
Epoch 55/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2371 - accuracy: 0.6941 - val_loss: 1.2354 - val_accuracy: 0.7290
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2393 - accuracy: 0.6992 - val_loss: 1.1965 - val_accuracy: 0.7196
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2182 - accuracy: 0.6889 - val_loss: 1.2062 - val_accuracy: 0.7290
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2495 - accuracy: 0.6812 - val_loss: 1.2325 - val_accuracy: 0.7290
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1680 - accuracy: 0.7147 - val_loss: 1.2108 - val_accuracy: 0.7196
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1925 - accuracy: 0.7044 - val_loss: 1.2019 - val_accuracy: 0.7290
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1314 - accuracy: 0.7121 - val_loss: 1.1935 - val_accuracy: 0.7336
Epoch 62/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2030 - accuracy: 0.7044 - val_loss: 1.2036 - val_accuracy: 0.7430
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1625 - accuracy: 0.7044 - val_loss: 1.1639 - val_accuracy: 0.7336
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0713 - accuracy: 0.7018 - val_loss: 1.1795 - val_accuracy: 0.7290
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0747 - accuracy: 0.7249 - val_loss: 1.1685 - val_accuracy: 0.7196
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0600 - accuracy: 0.7121 - val_loss: 1.1633 - val_accuracy: 0.7150
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0555 - accuracy: 0.7069 - val_loss: 1.1625 - val_accuracy: 0.7336
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0209 - accuracy: 0.7018 - val_loss: 1.1534 - val_accuracy: 0.7290
Epoch 69/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1005 - accuracy: 0.7069 - val_loss: 1.1469 - val_accuracy: 0.7336
Epoch 70/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0199 - accuracy: 0.7018 - val_loss: 1.1386 - val_accuracy: 0.7290
Epoch 71/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0293 - accuracy: 0.7147 - val_loss: 1.1330 - val_accuracy: 0.7243
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0795 - accuracy: 0.6992 - val_loss: 1.1194 - val_accuracy: 0.7196
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9913 - accuracy: 0.7069 - val_loss: 1.1143 - val_accuracy: 0.7290
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0744 - accuracy: 0.6838 - val_loss: 1.1117 - val_accuracy: 0.7103
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9301 - accuracy: 0.7018 - val_loss: 1.1011 - val_accuracy: 0.6963
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0404 - accuracy: 0.7069 - val_loss: 1.0823 - val_accuracy: 0.6963
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0493 - accuracy: 0.6967 - val_loss: 1.0812 - val_accuracy: 0.7009
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0015 - accuracy: 0.7069 - val_loss: 1.0394 - val_accuracy: 0.7069

```
accuracy: 0.6682
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0883 - accuracy: 0.6735 - val_loss: 1.0672 - val_accuracy: 0.6682
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9494 - accuracy: 0.6864 - val_loss: 1.0357 - val_accuracy: 0.6869
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8768 - accuracy: 0.6864 - val_loss: 1.0053 - val_accuracy: 0.6916
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9535 - accuracy: 0.7095 - val_loss: 0.9467 - val_accuracy: 0.6963
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9866 - accuracy: 0.7018 - val_loss: 0.9661 - val_accuracy: 0.7009
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9528 - accuracy: 0.6941 - val_loss: 0.9869 - val_accuracy: 0.7056
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0684 - accuracy: 0.6915 - val_loss: 0.9498 - val_accuracy: 0.7056
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8974 - accuracy: 0.7121 - val_loss: 0.9497 - val_accuracy: 0.7056
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9305 - accuracy: 0.7224 - val_loss: 0.9597 - val_accuracy: 0.7103
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0663 - accuracy: 0.6992 - val_loss: 0.9442 - val_accuracy: 0.7290
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9378 - accuracy: 0.6864 - val_loss: 0.9058 - val_accuracy: 0.7290
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9552 - accuracy: 0.6915 - val_loss: 0.9420 - val_accuracy: 0.7430
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8713 - accuracy: 0.7018 - val_loss: 0.9520 - val_accuracy: 0.7336
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9088 - accuracy: 0.7121 - val_loss: 0.9534 - val_accuracy: 0.7196
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0146 - accuracy: 0.6941 - val_loss: 0.9655 - val_accuracy: 0.7383
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9275 - accuracy: 0.7121 - val_loss: 0.9573 - val_accuracy: 0.7336
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8693 - accuracy: 0.7069 - val_loss: 0.9163 - val_accuracy: 0.7430
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9340 - accuracy: 0.6915 - val_loss: 0.9150 - val_accuracy: 0.7383
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9053 - accuracy: 0.7224 - val_loss: 0.9074 - val_accuracy: 0.7477
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8648 - accuracy: 0.7352 - val_loss: 0.8812 - val_accuracy: 0.7430
Epoch 99/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8598 - accuracy: 0.7018 - val_loss: 0.9014 - val_accuracy: 0.7243
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8077 - accuracy: 0.7224 - val_loss: 0.9357 - val_accuracy: 0.7290
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9149 - accuracy: 0.6992 - val_loss: 0.9013 - val_accuracy: 0.7336
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8184 - accuracy: 0.7121 - val_loss: 0.9021 - val_accuracy: 0.7383
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8507 - accuracy: 0.7018 - val_loss: 0.8960 - val_accuracy: 0.7336
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8901 - accuracy: 0.7095 - val_loss: 0.8999 - val_accuracy: 0.7430
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8504 - accuracy: 0.6889 - val_loss: 0.8922 - val_accuracy: 0.7383
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7622 - accuracy: 0.7147 - val_loss: 0.9189 - val_accuracy: 0.7523
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8064 - accuracy: 0.7275 - val_loss: 0.9626 - val_accuracy: 0.7523
Epoch 108/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.7860 - accuracy: 0.7069 - val_loss: 0.9637 - val_accuracy: 0.7430
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7260 - accuracy: 0.7018 - val_loss: 0.9082 - val_accuracy: 0.7523
Epoch 110/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8237 - accuracy: 0.7044 - val_loss: 0.9093 - val_accuracy: 0.7477
Epoch 111/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8149 - accuracy: 0.6941 - val_loss: 0.9546 - val_accuracy: 0.7570
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7551 - accuracy: 0.7198 - val_loss: 0.9031 - val_accuracy: 0.7523
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8055 - accuracy: 0.7044 - val_loss: 0.9084 - val_accuracy: 0.7523
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8035 - accuracy: 0.7326 - val_loss: 0.9920 - val_accuracy: 0.7430
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7479 - accuracy: 0.7172 - val_loss: 1.0159 - val_accuracy: 0.7523
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8428 - accuracy: 0.7455 - val_loss: 0.9910 - val_accuracy: 0.7477
Epoch 117/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7988 - accuracy: 0.7018 - val_loss: 0.9594 - val_accuracy: 0.7617
Epoch 118/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7917 - accuracy: 0.7172 - val_loss: 0.9604 - val_accuracy: 0.7477
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7110 - accuracy: 0.7018 - val_loss: 0.9629 - val_accuracy: 0.7570
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6978 - accuracy: 0.7121 - val_loss: 0.9605 - val_accuracy: 0.7383
Epoch 121/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7125 - accuracy: 0.7198 - val_loss: 0.9595 - val_accuracy: 0.7383
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7627 - accuracy: 0.6967 - val_loss: 0.9598 - val_accuracy: 0.7243
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7956 - accuracy: 0.6735 - val_loss: 0.9403 - val_accuracy: 0.7056
Epoch 124/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6754 - accuracy: 0.6710 - val_loss: 1.0345 - val_accuracy: 0.7336
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6843 - accuracy: 0.6941 - val_loss: 1.0157 - val_accuracy: 0.7477
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7437 - accuracy: 0.7044 - val_loss: 0.9561 - val_accuracy: 0.7523
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7390 - accuracy: 0.7147 - val_loss: 0.9859 - val_accuracy: 0.7617
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7280 - accuracy: 0.7121 - val_loss: 0.9482 - val_accuracy: 0.7570
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6685 - accuracy: 0.7121 - val_loss: 0.9474 - val_accuracy: 0.7383
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6946 - accuracy: 0.7172 - val_loss: 0.9115 - val_accuracy: 0.7523
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6971 - accuracy: 0.7429 - val_loss: 0.9979 - val_accuracy: 0.7617
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6789 - accuracy: 0.7172 - val_loss: 0.9409 - val_accuracy: 0.7523
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6241 - accuracy: 0.7018 - val_loss: 0.9347 - val_accuracy: 0.7009
Epoch 134/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6510 - accuracy: 0.6941 - val_loss: 0.9157 - val_accuracy: 0.7056
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6394 - accuracy: 0.6710 - val_loss: 0.9398 - val_accuracy: 0.7150
Epoch 136/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6979 - accuracy: 0.6632 - val_loss: 0.9603 - val_accuracy: 0.7150
Epoch 137/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5687 - accuracy: 0.7069 - val_loss: 0.9679 - val_accuracy: 0.7196
```

Epoch 138/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6731 - accuracy: 0.6504 - val_loss: 0.9941 - val_accuracy: 0.6916
Epoch 139/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5776 - accuracy: 0.6504 - val_loss: 0.9493 - val_accuracy: 0.7103
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6270 - accuracy: 0.6607 - val_loss: 0.9652 - val_accuracy: 0.7009
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6112 - accuracy: 0.6632 - val_loss: 0.9578 - val_accuracy: 0.7103
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7241 - accuracy: 0.6504 - val_loss: 0.9660 - val_accuracy: 0.6589
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7192 - accuracy: 0.6607 - val_loss: 0.9661 - val_accuracy: 0.6589
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6200 - accuracy: 0.6530 - val_loss: 0.9815 - val_accuracy: 0.6449
Epoch 145/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6565 - accuracy: 0.6221 - val_loss: 0.9794 - val_accuracy: 0.6355
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6250 - accuracy: 0.6401 - val_loss: 0.9810 - val_accuracy: 0.6075
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6558 - accuracy: 0.6401 - val_loss: 0.9829 - val_accuracy: 0.6028
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6183 - accuracy: 0.6478 - val_loss: 0.9634 - val_accuracy: 0.6075
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6700 - accuracy: 0.6530 - val_loss: 1.0119 - val_accuracy: 0.6168
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5962 - accuracy: 0.6401 - val_loss: 1.0110 - val_accuracy: 0.6075
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6159 - accuracy: 0.6555 - val_loss: 0.9681 - val_accuracy: 0.5981
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6036 - accuracy: 0.6504 - val_loss: 0.9737 - val_accuracy: 0.6355
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5762 - accuracy: 0.6632 - val_loss: 1.0485 - val_accuracy: 0.6355
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5391 - accuracy: 0.6298 - val_loss: 1.1024 - val_accuracy: 0.6355
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5528 - accuracy: 0.6478 - val_loss: 1.1014 - val_accuracy: 0.6355
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5808 - accuracy: 0.6504 - val_loss: 1.1241 - val_accuracy: 0.6636
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5951 - accuracy: 0.6632 - val_loss: 1.1231 - val_accuracy: 0.6963
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5644 - accuracy: 0.6838 - val_loss: 1.1226 - val_accuracy: 0.7009
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6185 - accuracy: 0.6812 - val_loss: 1.1237 - val_accuracy: 0.7477
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6074 - accuracy: 0.7044 - val_loss: 1.0960 - val_accuracy: 0.7523
Epoch 161/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5264 - accuracy: 0.7018 - val_loss: 1.1290 - val_accuracy: 0.7523
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5574 - accuracy: 0.6889 - val_loss: 1.1027 - val_accuracy: 0.7523
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5321 - accuracy: 0.7404 - val_loss: 1.0429 - val_accuracy: 0.7523
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5415 - accuracy: 0.7301 - val_loss: 1.0444 - val_accuracy: 0.7523
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5267 - accuracy: 0.7455 - val_loss: 1.0734 - val_accuracy: 0.7383
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5337 - accuracy: 0.7326 - val_loss: 1.0411 - val_accuracy: 0.7383
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5389 - accuracy: 0.7481 - val_loss: 1.0362 - val_accuracy: 0.7383

```
accuracy: 0.7383
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5254 - accuracy: 0.7301 - val_loss: 1.0062 - val_
accuracy: 0.7477
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5730 - accuracy: 0.7506 - val_loss: 1.0057 - val_
accuracy: 0.7430
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4397 - accuracy: 0.7326 - val_loss: 1.0045 - val_
accuracy: 0.7477
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5557 - accuracy: 0.7661 - val_loss: 1.0328 - val_
accuracy: 0.7430
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5899 - accuracy: 0.7532 - val_loss: 1.0623 - val_
accuracy: 0.7430
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5338 - accuracy: 0.7738 - val_loss: 0.9882 - val_
accuracy: 0.7523
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5201 - accuracy: 0.7609 - val_loss: 0.9614 - val_
accuracy: 0.7430
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5145 - accuracy: 0.7584 - val_loss: 0.9553 - val_
accuracy: 0.7430
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5241 - accuracy: 0.7532 - val_loss: 0.9534 - val_
accuracy: 0.7383
Epoch 177/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5479 - accuracy: 0.7558 - val_loss: 0.9531 - val_
accuracy: 0.7383
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4865 - accuracy: 0.7301 - val_loss: 0.9537 - val_
accuracy: 0.7383
Epoch 179/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5072 - accuracy: 0.7352 - val_loss: 0.9284 - val_
accuracy: 0.7430
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5195 - accuracy: 0.7326 - val_loss: 0.9551 - val_
accuracy: 0.7290
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5328 - accuracy: 0.7558 - val_loss: 0.9287 - val_
accuracy: 0.7290
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4824 - accuracy: 0.7378 - val_loss: 0.9549 - val_
accuracy: 0.7430
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5217 - accuracy: 0.7661 - val_loss: 0.9474 - val_
accuracy: 0.7336
Epoch 184/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4866 - accuracy: 0.7404 - val_loss: 0.9486 - val_
accuracy: 0.7383
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5461 - accuracy: 0.7584 - val_loss: 0.9747 - val_
accuracy: 0.7430
Epoch 186/1000
4/4 [=====] - 0s 21ms/step - loss: 0.5469 - accuracy: 0.7738 - val_loss: 0.9755 - val_
accuracy: 0.7523
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6149 - accuracy: 0.7661 - val_loss: 0.9784 - val_
accuracy: 0.7290
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5468 - accuracy: 0.7301 - val_loss: 0.9480 - val_
accuracy: 0.7196
Epoch 189/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5054 - accuracy: 0.7249 - val_loss: 0.8865 - val_
accuracy: 0.7243
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5344 - accuracy: 0.7018 - val_loss: 0.8962 - val_
accuracy: 0.7243
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5238 - accuracy: 0.7018 - val_loss: 0.9106 - val_
accuracy: 0.7196
Epoch 192/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4972 - accuracy: 0.7069 - val_loss: 0.9124 - val_
accuracy: 0.7290
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5863 - accuracy: 0.7249 - val_loss: 0.9150 - val_
accuracy: 0.7383
Epoch 194/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4674 - accuracy: 0.7686 - val_loss: 0.9127 - val_
accuracy: 0.7336
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4599 - accuracy: 0.7455 - val_loss: 0.9082 - val_
accuracy: 0.7383
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5193 - accuracy: 0.7352 - val_loss: 0.9068 - val_
accuracy: 0.7383
Epoch 197/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.4513 - accuracy: 0.7455 - val_loss: 0.8878 - val_accuracy: 0.7290
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5090 - accuracy: 0.7558 - val_loss: 0.9094 - val_accuracy: 0.7336
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5624 - accuracy: 0.7686 - val_loss: 0.9118 - val_accuracy: 0.7383
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4689 - accuracy: 0.7763 - val_loss: 0.8987 - val_accuracy: 0.7477
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4550 - accuracy: 0.7584 - val_loss: 0.9215 - val_accuracy: 0.7570
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4820 - accuracy: 0.7635 - val_loss: 0.9408 - val_accuracy: 0.7523
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4730 - accuracy: 0.7481 - val_loss: 0.8132 - val_accuracy: 0.7196
Epoch 204/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5172 - accuracy: 0.7249 - val_loss: 0.8331 - val_accuracy: 0.7196
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5099 - accuracy: 0.7301 - val_loss: 0.8702 - val_accuracy: 0.7056
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5089 - accuracy: 0.7532 - val_loss: 0.8948 - val_accuracy: 0.7150
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5900 - accuracy: 0.7326 - val_loss: 0.8931 - val_accuracy: 0.7196
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4678 - accuracy: 0.7429 - val_loss: 0.8882 - val_accuracy: 0.7290
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5897 - accuracy: 0.7301 - val_loss: 0.8842 - val_accuracy: 0.7243
Epoch 210/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5147 - accuracy: 0.7404 - val_loss: 0.8856 - val_accuracy: 0.7196
Epoch 211/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4990 - accuracy: 0.7326 - val_loss: 0.8858 - val_accuracy: 0.7243
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4477 - accuracy: 0.7558 - val_loss: 0.8913 - val_accuracy: 0.7243
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4754 - accuracy: 0.7532 - val_loss: 0.8864 - val_accuracy: 0.7336
Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4634 - accuracy: 0.7378 - val_loss: 0.8843 - val_accuracy: 0.7243
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4288 - accuracy: 0.7584 - val_loss: 0.8802 - val_accuracy: 0.7150
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4697 - accuracy: 0.7429 - val_loss: 0.7813 - val_accuracy: 0.7103
Epoch 217/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4690 - accuracy: 0.7506 - val_loss: 0.7978 - val_accuracy: 0.7150
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5315 - accuracy: 0.7429 - val_loss: 0.8259 - val_accuracy: 0.7150
Epoch 219/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5714 - accuracy: 0.7224 - val_loss: 0.8553 - val_accuracy: 0.7150
Epoch 220/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5391 - accuracy: 0.7661 - val_loss: 0.8316 - val_accuracy: 0.7243
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5282 - accuracy: 0.7686 - val_loss: 0.8911 - val_accuracy: 0.7243
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4749 - accuracy: 0.7712 - val_loss: 0.9639 - val_accuracy: 0.7430
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5369 - accuracy: 0.7661 - val_loss: 0.9384 - val_accuracy: 0.7290
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5257 - accuracy: 0.7455 - val_loss: 0.9879 - val_accuracy: 0.7477
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4479 - accuracy: 0.7224 - val_loss: 0.9878 - val_accuracy: 0.7430
Epoch 226/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4910 - accuracy: 0.7198 - val_loss: 0.9899 - val_accuracy: 0.7430
```

Epoch 227/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4979 - accuracy: 0.7224 - val_loss: 1.0145 - val_accuracy: 0.7336
Epoch 228/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5259 - accuracy: 0.7275 - val_loss: 0.9588 - val_accuracy: 0.7290
Epoch 229/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4296 - accuracy: 0.7172 - val_loss: 0.9330 - val_accuracy: 0.7290
Epoch 230/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4953 - accuracy: 0.7224 - val_loss: 0.9084 - val_accuracy: 0.7290
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4714 - accuracy: 0.7224 - val_loss: 0.8511 - val_accuracy: 0.7477
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5000 - accuracy: 0.7789 - val_loss: 0.8202 - val_accuracy: 0.7477
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5097 - accuracy: 0.7558 - val_loss: 0.8368 - val_accuracy: 0.7430
Epoch 234/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4867 - accuracy: 0.7712 - val_loss: 0.8064 - val_accuracy: 0.7336
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5566 - accuracy: 0.7404 - val_loss: 0.8043 - val_accuracy: 0.7290
Epoch 236/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4431 - accuracy: 0.7892 - val_loss: 0.8282 - val_accuracy: 0.7383
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5662 - accuracy: 0.7584 - val_loss: 0.8566 - val_accuracy: 0.7383
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4514 - accuracy: 0.7815 - val_loss: 0.8544 - val_accuracy: 0.7383
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4808 - accuracy: 0.7918 - val_loss: 0.8543 - val_accuracy: 0.7383
Epoch 240/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4656 - accuracy: 0.7866 - val_loss: 0.8336 - val_accuracy: 0.7383
Epoch 241/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5380 - accuracy: 0.7661 - val_loss: 0.8144 - val_accuracy: 0.7336
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4901 - accuracy: 0.7969 - val_loss: 0.8658 - val_accuracy: 0.7383
Epoch 243/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4988 - accuracy: 0.7841 - val_loss: 0.8911 - val_accuracy: 0.7430
Epoch 244/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4498 - accuracy: 0.7815 - val_loss: 0.9192 - val_accuracy: 0.7430
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5161 - accuracy: 0.7789 - val_loss: 0.8974 - val_accuracy: 0.7383
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5033 - accuracy: 0.7943 - val_loss: 0.8682 - val_accuracy: 0.7383
Epoch 247/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4440 - accuracy: 0.7866 - val_loss: 0.8942 - val_accuracy: 0.7383
Epoch 248/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4976 - accuracy: 0.7789 - val_loss: 0.8925 - val_accuracy: 0.7383
Epoch 249/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5184 - accuracy: 0.8098 - val_loss: 0.8917 - val_accuracy: 0.7523
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4608 - accuracy: 0.7789 - val_loss: 0.8895 - val_accuracy: 0.7523
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4665 - accuracy: 0.7789 - val_loss: 0.8618 - val_accuracy: 0.7430
Epoch 252/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5065 - accuracy: 0.8021 - val_loss: 0.8811 - val_accuracy: 0.7523
Epoch 253/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4955 - accuracy: 0.7815 - val_loss: 0.8781 - val_accuracy: 0.7523
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4418 - accuracy: 0.7738 - val_loss: 0.8789 - val_accuracy: 0.7477
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5126 - accuracy: 0.7661 - val_loss: 0.8785 - val_accuracy: 0.7477
Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4490 - accuracy: 0.7841 - val_loss: 0.8529 - val_accuracy: 0.7477

```

accuracy: 0.7523
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4836 - accuracy: 0.7866 - val_loss: 0.8338 - val_
accuracy: 0.7570
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4168 - accuracy: 0.7969 - val_loss: 0.8298 - val_
accuracy: 0.7523
Epoch 259/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5402 - accuracy: 0.7532 - val_loss: 0.8558 - val_
accuracy: 0.7523
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4329 - accuracy: 0.7866 - val_loss: 0.8822 - val_
accuracy: 0.7477
Epoch 261/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5265 - accuracy: 0.7763 - val_loss: 0.8761 - val_
accuracy: 0.7383
Epoch 262/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5008 - accuracy: 0.7969 - val_loss: 0.8321 - val_
accuracy: 0.7336
Epoch 263/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4387 - accuracy: 0.8021 - val_loss: 0.8542 - val_
accuracy: 0.7336
Epoch 264/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4686 - accuracy: 0.7841 - val_loss: 0.8545 - val_
accuracy: 0.7290
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4661 - accuracy: 0.8046 - val_loss: 0.8771 - val_
accuracy: 0.7290
Epoch 266/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4860 - accuracy: 0.7841 - val_loss: 0.8519 - val_
accuracy: 0.7290
Epoch 267/1000
1/4 [====>.....] - ETA: 0s - loss: 0.4461 - accuracy: 0.7578Restoring model weights from th
e end of the best epoch: 117.
4/4 [=====] - 0s 15ms/step - loss: 0.4425 - accuracy: 0.7841 - val_loss: 0.8256 - val_
accuracy: 0.7243
Epoch 267: early stopping
2/2 [=====] - 0s 3ms/step - loss: 1.2634 - accuracy: 0.7674
[CV] END .....Dense1=25, Dense2=10; total time= 13.7s
Model: "sequential_16"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_64 (Dense)	(None, 25)	175
<hr/>		
batch_normalization_48 (BatchNormalization)	(None, 25)	100
activation_48 (Activation)	(None, 25)	0
dense_65 (Dense)	(None, 10)	260
batch_normalization_49 (BatchNormalization)	(None, 10)	40
activation_49 (Activation)	(None, 10)	0
dense_66 (Dense)	(None, 10)	110
batch_normalization_50 (BatchNormalization)	(None, 10)	40
activation_50 (Activation)	(None, 10)	0
dense_67 (Dense)	(None, 2)	22
<hr/>		
Total params: 747		
Trainable params: 657		
Non-trainable params: 90		

```

Epoch 1/1000
4/4 [=====] - 1s 55ms/step - loss: 4.1384 - accuracy: 0.4987 - val_loss: 3.9795 - val_
accuracy: 0.5187
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5509 - accuracy: 0.4936 - val_loss: 3.8595 - val_
accuracy: 0.5421
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 3.3232 - accuracy: 0.4653 - val_loss: 3.7255 - val_
accuracy: 0.5514
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4139 - accuracy: 0.4653 - val_loss: 3.5477 - val_
accuracy: 0.5514
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1172 - accuracy: 0.4807 - val_loss: 3.4354 - val_
accuracy: 0.5561
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1248 - accuracy: 0.4833 - val_loss: 3.3744 - val_
accuracy: 0.5421

```

Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8229 - accuracy: 0.5090 - val_loss: 3.3090 - val_accuracy: 0.5327
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0491 - accuracy: 0.5013 - val_loss: 3.2950 - val_accuracy: 0.5327
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9942 - accuracy: 0.5039 - val_loss: 3.0352 - val_accuracy: 0.5047
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9631 - accuracy: 0.4756 - val_loss: 2.9804 - val_accuracy: 0.5093
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9231 - accuracy: 0.4730 - val_loss: 2.7790 - val_accuracy: 0.5047
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7899 - accuracy: 0.4936 - val_loss: 2.6908 - val_accuracy: 0.4953
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5850 - accuracy: 0.5090 - val_loss: 2.6813 - val_accuracy: 0.4953
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6209 - accuracy: 0.4833 - val_loss: 2.5823 - val_accuracy: 0.5140
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6258 - accuracy: 0.4987 - val_loss: 2.4987 - val_accuracy: 0.5093
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6225 - accuracy: 0.4936 - val_loss: 2.3746 - val_accuracy: 0.5187
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6181 - accuracy: 0.4859 - val_loss: 2.3453 - val_accuracy: 0.5140
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5190 - accuracy: 0.5116 - val_loss: 2.2545 - val_accuracy: 0.5187
Epoch 19/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4572 - accuracy: 0.5270 - val_loss: 2.2215 - val_accuracy: 0.5140
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4115 - accuracy: 0.5116 - val_loss: 2.1076 - val_accuracy: 0.5140
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3804 - accuracy: 0.5167 - val_loss: 2.0774 - val_accuracy: 0.5047
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3355 - accuracy: 0.4987 - val_loss: 1.9943 - val_accuracy: 0.5047
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3239 - accuracy: 0.5193 - val_loss: 1.9467 - val_accuracy: 0.5093
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3566 - accuracy: 0.5193 - val_loss: 1.8281 - val_accuracy: 0.5093
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3011 - accuracy: 0.5116 - val_loss: 1.8262 - val_accuracy: 0.5093
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2453 - accuracy: 0.5167 - val_loss: 1.8004 - val_accuracy: 0.5093
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2455 - accuracy: 0.5193 - val_loss: 1.7775 - val_accuracy: 0.5047
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2061 - accuracy: 0.4936 - val_loss: 1.6959 - val_accuracy: 0.5047
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2076 - accuracy: 0.5373 - val_loss: 1.6810 - val_accuracy: 0.5047
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0459 - accuracy: 0.5193 - val_loss: 1.6647 - val_accuracy: 0.5047
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0484 - accuracy: 0.5167 - val_loss: 1.6421 - val_accuracy: 0.5140
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0047 - accuracy: 0.5141 - val_loss: 1.6283 - val_accuracy: 0.5140
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1006 - accuracy: 0.5398 - val_loss: 1.6074 - val_accuracy: 0.5047
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0102 - accuracy: 0.5321 - val_loss: 1.5583 - val_accuracy: 0.5047
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9412 - accuracy: 0.5373 - val_loss: 1.6012 - val_accuracy: 0.4953
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9491 - accuracy: 0.5347 - val_loss: 1.6275 - val_accuracy: 0.5047

```
accuracy: 0.5047
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0167 - accuracy: 0.5270 - val_loss: 1.6208 - val_
accuracy: 0.5187
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8918 - accuracy: 0.5501 - val_loss: 1.5532 - val_
accuracy: 0.5374
Epoch 39/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8593 - accuracy: 0.5424 - val_loss: 1.4987 - val_
accuracy: 0.5327
Epoch 40/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8737 - accuracy: 0.5630 - val_loss: 1.4813 - val_
accuracy: 0.5607
Epoch 41/1000
4/4 [=====] - 0s 15ms/step - loss: 1.8730 - accuracy: 0.5398 - val_loss: 1.4648 - val_
accuracy: 0.5654
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8393 - accuracy: 0.5553 - val_loss: 1.4423 - val_
accuracy: 0.5841
Epoch 43/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8606 - accuracy: 0.5810 - val_loss: 1.3996 - val_
accuracy: 0.6121
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8875 - accuracy: 0.5578 - val_loss: 1.3883 - val_
accuracy: 0.6028
Epoch 45/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8007 - accuracy: 0.5810 - val_loss: 1.3872 - val_
accuracy: 0.5981
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8392 - accuracy: 0.5656 - val_loss: 1.4023 - val_
accuracy: 0.5888
Epoch 47/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7533 - accuracy: 0.5450 - val_loss: 1.4134 - val_
accuracy: 0.5888
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7302 - accuracy: 0.5758 - val_loss: 1.4215 - val_
accuracy: 0.5888
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8181 - accuracy: 0.5835 - val_loss: 1.4053 - val_
accuracy: 0.6075
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7848 - accuracy: 0.5758 - val_loss: 1.3202 - val_
accuracy: 0.6028
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6815 - accuracy: 0.5887 - val_loss: 1.3798 - val_
accuracy: 0.6121
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6424 - accuracy: 0.6015 - val_loss: 1.3375 - val_
accuracy: 0.6262
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6094 - accuracy: 0.6041 - val_loss: 1.2993 - val_
accuracy: 0.6262
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7041 - accuracy: 0.6015 - val_loss: 1.2924 - val_
accuracy: 0.6168
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7102 - accuracy: 0.5810 - val_loss: 1.2495 - val_
accuracy: 0.5888
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6051 - accuracy: 0.5938 - val_loss: 1.2495 - val_
accuracy: 0.5981
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6240 - accuracy: 0.5938 - val_loss: 1.2309 - val_
accuracy: 0.6121
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6345 - accuracy: 0.6015 - val_loss: 1.1910 - val_
accuracy: 0.5935
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5381 - accuracy: 0.6015 - val_loss: 1.1812 - val_
accuracy: 0.5888
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5635 - accuracy: 0.6221 - val_loss: 1.1734 - val_
accuracy: 0.6028
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5213 - accuracy: 0.6067 - val_loss: 1.1607 - val_
accuracy: 0.6075
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5744 - accuracy: 0.6144 - val_loss: 1.1409 - val_
accuracy: 0.6168
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5028 - accuracy: 0.6195 - val_loss: 1.1579 - val_
accuracy: 0.6215
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5200 - accuracy: 0.6221 - val_loss: 1.1449 - val_
accuracy: 0.6168
Epoch 65/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5287 - accuracy: 0.6041 - val_loss: 1.1444 - val_
accuracy: 0.6308
Epoch 66/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 1.4394 - accuracy: 0.6272 - val_loss: 1.1341 - val_accuracy: 0.6168
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5096 - accuracy: 0.5810 - val_loss: 1.1176 - val_accuracy: 0.6308
Epoch 68/1000
4/4 [=====] - 0s 16ms/step - loss: 1.3981 - accuracy: 0.6401 - val_loss: 1.0423 - val_accuracy: 0.6355
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2660 - accuracy: 0.6324 - val_loss: 1.0186 - val_accuracy: 0.6262
Epoch 70/1000
4/4 [=====] - 0s 15ms/step - loss: 1.3160 - accuracy: 0.6375 - val_loss: 0.9959 - val_accuracy: 0.6449
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2749 - accuracy: 0.6144 - val_loss: 0.9838 - val_accuracy: 0.6262
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3069 - accuracy: 0.6504 - val_loss: 0.9585 - val_accuracy: 0.6402
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2128 - accuracy: 0.6607 - val_loss: 0.9549 - val_accuracy: 0.6075
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2053 - accuracy: 0.6478 - val_loss: 0.9436 - val_accuracy: 0.6121
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3384 - accuracy: 0.6401 - val_loss: 0.9289 - val_accuracy: 0.6262
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2375 - accuracy: 0.6427 - val_loss: 0.8962 - val_accuracy: 0.6262
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2056 - accuracy: 0.6555 - val_loss: 0.8892 - val_accuracy: 0.6308
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1108 - accuracy: 0.6607 - val_loss: 0.8918 - val_accuracy: 0.6262
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1327 - accuracy: 0.6684 - val_loss: 0.8599 - val_accuracy: 0.6121
Epoch 80/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0948 - accuracy: 0.6504 - val_loss: 0.8611 - val_accuracy: 0.6308
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1932 - accuracy: 0.6607 - val_loss: 0.8613 - val_accuracy: 0.6262
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0472 - accuracy: 0.6710 - val_loss: 0.8111 - val_accuracy: 0.6355
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0129 - accuracy: 0.6735 - val_loss: 0.8072 - val_accuracy: 0.6262
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0443 - accuracy: 0.6632 - val_loss: 0.8002 - val_accuracy: 0.6308
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0264 - accuracy: 0.6478 - val_loss: 0.7615 - val_accuracy: 0.6168
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0531 - accuracy: 0.6607 - val_loss: 0.7465 - val_accuracy: 0.6355
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9380 - accuracy: 0.7147 - val_loss: 0.7350 - val_accuracy: 0.6308
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0056 - accuracy: 0.6889 - val_loss: 0.7188 - val_accuracy: 0.6308
Epoch 89/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9694 - accuracy: 0.6967 - val_loss: 0.7206 - val_accuracy: 0.6495
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8913 - accuracy: 0.6889 - val_loss: 0.7100 - val_accuracy: 0.6449
Epoch 91/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9342 - accuracy: 0.6992 - val_loss: 0.6940 - val_accuracy: 0.6402
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9833 - accuracy: 0.6787 - val_loss: 0.7465 - val_accuracy: 0.6636
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0229 - accuracy: 0.7198 - val_loss: 0.7483 - val_accuracy: 0.6589
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0580 - accuracy: 0.6915 - val_loss: 0.7421 - val_accuracy: 0.6449
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0137 - accuracy: 0.6992 - val_loss: 0.7394 - val_accuracy: 0.6495
```

Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0101 - accuracy: 0.6915 - val_loss: 0.6913 - val_accuracy: 0.6636
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9462 - accuracy: 0.7147 - val_loss: 0.6824 - val_accuracy: 0.6542
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8728 - accuracy: 0.7172 - val_loss: 0.6802 - val_accuracy: 0.6495
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7921 - accuracy: 0.7172 - val_loss: 0.6871 - val_accuracy: 0.6542
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8989 - accuracy: 0.7275 - val_loss: 0.6799 - val_accuracy: 0.6495
Epoch 101/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7985 - accuracy: 0.7249 - val_loss: 0.6736 - val_accuracy: 0.6589
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8018 - accuracy: 0.7249 - val_loss: 0.6698 - val_accuracy: 0.6636
Epoch 103/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8548 - accuracy: 0.7069 - val_loss: 0.6173 - val_accuracy: 0.6682
Epoch 104/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8092 - accuracy: 0.7172 - val_loss: 0.6084 - val_accuracy: 0.6729
Epoch 105/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7989 - accuracy: 0.7198 - val_loss: 0.6078 - val_accuracy: 0.6636
Epoch 106/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7533 - accuracy: 0.7352 - val_loss: 0.6033 - val_accuracy: 0.6636
Epoch 107/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7587 - accuracy: 0.7326 - val_loss: 0.5939 - val_accuracy: 0.6682
Epoch 108/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7236 - accuracy: 0.7481 - val_loss: 0.5946 - val_accuracy: 0.6729
Epoch 109/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6867 - accuracy: 0.7301 - val_loss: 0.6757 - val_accuracy: 0.6869
Epoch 110/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6905 - accuracy: 0.7249 - val_loss: 0.6081 - val_accuracy: 0.6776
Epoch 111/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7508 - accuracy: 0.7404 - val_loss: 0.5722 - val_accuracy: 0.6729
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7835 - accuracy: 0.7275 - val_loss: 0.5699 - val_accuracy: 0.6682
Epoch 113/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7318 - accuracy: 0.7301 - val_loss: 0.6247 - val_accuracy: 0.6822
Epoch 114/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6851 - accuracy: 0.7429 - val_loss: 0.5614 - val_accuracy: 0.6729
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7040 - accuracy: 0.7198 - val_loss: 0.5609 - val_accuracy: 0.6776
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6797 - accuracy: 0.7301 - val_loss: 0.5579 - val_accuracy: 0.6869
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7153 - accuracy: 0.7275 - val_loss: 0.5817 - val_accuracy: 0.6776
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7231 - accuracy: 0.7455 - val_loss: 0.5716 - val_accuracy: 0.6916
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6990 - accuracy: 0.7455 - val_loss: 0.5683 - val_accuracy: 0.6963
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6258 - accuracy: 0.7686 - val_loss: 0.5580 - val_accuracy: 0.6963
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7124 - accuracy: 0.7584 - val_loss: 0.5789 - val_accuracy: 0.7009
Epoch 122/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6899 - accuracy: 0.7326 - val_loss: 0.5400 - val_accuracy: 0.7056
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6776 - accuracy: 0.7404 - val_loss: 0.5337 - val_accuracy: 0.7056
Epoch 124/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5997 - accuracy: 0.7609 - val_loss: 0.5392 - val_accuracy: 0.7243
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5839 - accuracy: 0.7378 - val_loss: 0.5681 - val_accuracy: 0.7243

```
accuracy: 0.7243
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6916 - accuracy: 0.7429 - val_loss: 0.6133 - val_accuracy: 0.7243
Epoch 127/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5763 - accuracy: 0.7686 - val_loss: 0.5550 - val_accuracy: 0.7290
Epoch 128/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6571 - accuracy: 0.7609 - val_loss: 0.6239 - val_accuracy: 0.7383
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5456 - accuracy: 0.7918 - val_loss: 0.6002 - val_accuracy: 0.7290
Epoch 130/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5423 - accuracy: 0.7815 - val_loss: 0.6156 - val_accuracy: 0.7523
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5739 - accuracy: 0.7763 - val_loss: 0.6741 - val_accuracy: 0.7523
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6034 - accuracy: 0.8046 - val_loss: 0.6755 - val_accuracy: 0.7430
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6178 - accuracy: 0.7815 - val_loss: 0.6762 - val_accuracy: 0.7477
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5273 - accuracy: 0.7866 - val_loss: 0.7071 - val_accuracy: 0.7477
Epoch 135/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5520 - accuracy: 0.7892 - val_loss: 0.6536 - val_accuracy: 0.7383
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5645 - accuracy: 0.8046 - val_loss: 0.6761 - val_accuracy: 0.7523
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5710 - accuracy: 0.7635 - val_loss: 0.6774 - val_accuracy: 0.7477
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5275 - accuracy: 0.7892 - val_loss: 0.5746 - val_accuracy: 0.7523
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5842 - accuracy: 0.7789 - val_loss: 0.5730 - val_accuracy: 0.7523
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5490 - accuracy: 0.7635 - val_loss: 0.5755 - val_accuracy: 0.7477
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5474 - accuracy: 0.7943 - val_loss: 0.5494 - val_accuracy: 0.7570
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4994 - accuracy: 0.7789 - val_loss: 0.5786 - val_accuracy: 0.7477
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5296 - accuracy: 0.8072 - val_loss: 0.5980 - val_accuracy: 0.7477
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5367 - accuracy: 0.8021 - val_loss: 0.5749 - val_accuracy: 0.7430
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5422 - accuracy: 0.8021 - val_loss: 0.5547 - val_accuracy: 0.7383
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5565 - accuracy: 0.8072 - val_loss: 0.6389 - val_accuracy: 0.7383
Epoch 147/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6260 - accuracy: 0.7943 - val_loss: 0.6137 - val_accuracy: 0.7430
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5071 - accuracy: 0.8226 - val_loss: 0.6410 - val_accuracy: 0.7477
Epoch 149/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4767 - accuracy: 0.8046 - val_loss: 0.6364 - val_accuracy: 0.7710
Epoch 150/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4800 - accuracy: 0.8021 - val_loss: 0.6712 - val_accuracy: 0.7897
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6193 - accuracy: 0.7841 - val_loss: 0.7202 - val_accuracy: 0.7664
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4784 - accuracy: 0.8098 - val_loss: 0.7103 - val_accuracy: 0.7570
Epoch 153/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5385 - accuracy: 0.7969 - val_loss: 0.7094 - val_accuracy: 0.7664
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5712 - accuracy: 0.8098 - val_loss: 0.7640 - val_accuracy: 0.7757
Epoch 155/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.5073 - accuracy: 0.8098 - val_loss: 0.7408 - val_accuracy: 0.7757
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5591 - accuracy: 0.7841 - val_loss: 0.7390 - val_accuracy: 0.7757
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5471 - accuracy: 0.8072 - val_loss: 0.7116 - val_accuracy: 0.7804
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4325 - accuracy: 0.8021 - val_loss: 0.7165 - val_accuracy: 0.7944
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4452 - accuracy: 0.7943 - val_loss: 0.8106 - val_accuracy: 0.7850
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4710 - accuracy: 0.8201 - val_loss: 0.7138 - val_accuracy: 0.7804
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4893 - accuracy: 0.7943 - val_loss: 0.7235 - val_accuracy: 0.7757
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4880 - accuracy: 0.8072 - val_loss: 0.7151 - val_accuracy: 0.7664
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5025 - accuracy: 0.7686 - val_loss: 0.7758 - val_accuracy: 0.7664
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5467 - accuracy: 0.7763 - val_loss: 0.7818 - val_accuracy: 0.7664
Epoch 165/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4712 - accuracy: 0.7866 - val_loss: 0.7515 - val_accuracy: 0.7617
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4456 - accuracy: 0.7918 - val_loss: 0.7616 - val_accuracy: 0.7617
Epoch 167/1000
4/4 [=====] - 0s 19ms/step - loss: 0.5031 - accuracy: 0.8098 - val_loss: 0.7975 - val_accuracy: 0.7664
Epoch 168/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5013 - accuracy: 0.7866 - val_loss: 0.9458 - val_accuracy: 0.7664
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4692 - accuracy: 0.8123 - val_loss: 0.8674 - val_accuracy: 0.7664
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4551 - accuracy: 0.8149 - val_loss: 0.8644 - val_accuracy: 0.7664
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4341 - accuracy: 0.8201 - val_loss: 0.8771 - val_accuracy: 0.7617
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5034 - accuracy: 0.8123 - val_loss: 0.9177 - val_accuracy: 0.7570
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4310 - accuracy: 0.8201 - val_loss: 0.8258 - val_accuracy: 0.7523
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4154 - accuracy: 0.7969 - val_loss: 0.8169 - val_accuracy: 0.7477
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5067 - accuracy: 0.8201 - val_loss: 0.6300 - val_accuracy: 0.7523
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4588 - accuracy: 0.8098 - val_loss: 0.6593 - val_accuracy: 0.7477
Epoch 177/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4376 - accuracy: 0.8560 - val_loss: 0.6249 - val_accuracy: 0.7477
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4485 - accuracy: 0.8303 - val_loss: 0.5178 - val_accuracy: 0.7336
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4909 - accuracy: 0.8509 - val_loss: 0.5660 - val_accuracy: 0.7336
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4432 - accuracy: 0.8201 - val_loss: 0.5261 - val_accuracy: 0.7290
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4358 - accuracy: 0.8252 - val_loss: 0.5180 - val_accuracy: 0.7243
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3952 - accuracy: 0.8406 - val_loss: 0.5458 - val_accuracy: 0.7290
Epoch 183/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4674 - accuracy: 0.8432 - val_loss: 0.5768 - val_accuracy: 0.7150
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3880 - accuracy: 0.8278 - val_loss: 0.5521 - val_accuracy: 0.7150
```

Epoch 185/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4202 - accuracy: 0.8226 - val_loss: 0.5489 - val_accuracy: 0.7290
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4184 - accuracy: 0.8380 - val_loss: 0.5478 - val_accuracy: 0.7290
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4134 - accuracy: 0.8149 - val_loss: 0.5461 - val_accuracy: 0.7336
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4677 - accuracy: 0.8149 - val_loss: 0.5714 - val_accuracy: 0.7477
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5041 - accuracy: 0.8278 - val_loss: 0.5451 - val_accuracy: 0.7430
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4591 - accuracy: 0.8406 - val_loss: 0.5742 - val_accuracy: 0.7477
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4024 - accuracy: 0.8201 - val_loss: 0.5496 - val_accuracy: 0.7430
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3897 - accuracy: 0.8329 - val_loss: 0.5456 - val_accuracy: 0.7477
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4424 - accuracy: 0.8278 - val_loss: 0.5130 - val_accuracy: 0.7383
Epoch 194/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4142 - accuracy: 0.8355 - val_loss: 0.5386 - val_accuracy: 0.7570
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3740 - accuracy: 0.8329 - val_loss: 0.5417 - val_accuracy: 0.7430
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3942 - accuracy: 0.8278 - val_loss: 0.5459 - val_accuracy: 0.7336
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4104 - accuracy: 0.8329 - val_loss: 0.6882 - val_accuracy: 0.7150
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4155 - accuracy: 0.8175 - val_loss: 0.6845 - val_accuracy: 0.7243
Epoch 199/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4347 - accuracy: 0.8201 - val_loss: 0.6865 - val_accuracy: 0.7196
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4694 - accuracy: 0.8252 - val_loss: 0.6266 - val_accuracy: 0.7290
Epoch 201/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4599 - accuracy: 0.8226 - val_loss: 0.6334 - val_accuracy: 0.7196
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4126 - accuracy: 0.8072 - val_loss: 0.6600 - val_accuracy: 0.7243
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3928 - accuracy: 0.8303 - val_loss: 0.6333 - val_accuracy: 0.7196
Epoch 204/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3749 - accuracy: 0.8483 - val_loss: 0.6306 - val_accuracy: 0.7196
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4124 - accuracy: 0.8226 - val_loss: 0.5856 - val_accuracy: 0.7056
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3974 - accuracy: 0.8098 - val_loss: 0.5824 - val_accuracy: 0.7103
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3732 - accuracy: 0.8226 - val_loss: 0.6107 - val_accuracy: 0.7009
Epoch 208/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3982 - accuracy: 0.8406 - val_loss: 0.6103 - val_accuracy: 0.6963
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4407 - accuracy: 0.8201 - val_loss: 0.6078 - val_accuracy: 0.6963
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4470 - accuracy: 0.8046 - val_loss: 0.6072 - val_accuracy: 0.7009
Epoch 211/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4135 - accuracy: 0.7995 - val_loss: 0.6048 - val_accuracy: 0.7056
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3839 - accuracy: 0.8201 - val_loss: 0.6029 - val_accuracy: 0.7056
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3702 - accuracy: 0.8406 - val_loss: 0.5797 - val_accuracy: 0.7009
Epoch 214/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3826 - accuracy: 0.8072 - val_loss: 0.5528 - val_accuracy: 0.7009

```
accuracy: 0.6963
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3958 - accuracy: 0.8021 - val_loss: 0.5786 - val_
accuracy: 0.7056
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3953 - accuracy: 0.8252 - val_loss: 0.5851 - val_
accuracy: 0.6916
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3789 - accuracy: 0.8329 - val_loss: 0.5694 - val_
accuracy: 0.7103
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3687 - accuracy: 0.7943 - val_loss: 0.5686 - val_
accuracy: 0.7103
Epoch 219/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3990 - accuracy: 0.8175 - val_loss: 0.5967 - val_
accuracy: 0.7056
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3753 - accuracy: 0.8201 - val_loss: 0.5973 - val_
accuracy: 0.7009
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4055 - accuracy: 0.8123 - val_loss: 0.5741 - val_
accuracy: 0.6822
Epoch 222/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3788 - accuracy: 0.7969 - val_loss: 0.5469 - val_
accuracy: 0.6963
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3926 - accuracy: 0.8149 - val_loss: 0.5425 - val_
accuracy: 0.6963
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3676 - accuracy: 0.8226 - val_loss: 0.5425 - val_
accuracy: 0.6916
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3901 - accuracy: 0.8355 - val_loss: 0.5430 - val_
accuracy: 0.6963
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3863 - accuracy: 0.8149 - val_loss: 0.5347 - val_
accuracy: 0.6963
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4093 - accuracy: 0.8278 - val_loss: 0.5326 - val_
accuracy: 0.6916
Epoch 228/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3656 - accuracy: 0.8303 - val_loss: 0.5314 - val_
accuracy: 0.6916
Epoch 229/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3799 - accuracy: 0.8149 - val_loss: 0.5153 - val_
accuracy: 0.6916
Epoch 230/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4088 - accuracy: 0.8226 - val_loss: 0.5060 - val_
accuracy: 0.7103
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4097 - accuracy: 0.8123 - val_loss: 0.5066 - val_
accuracy: 0.7103
Epoch 232/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3785 - accuracy: 0.8252 - val_loss: 0.5383 - val_
accuracy: 0.7150
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3557 - accuracy: 0.8509 - val_loss: 0.5365 - val_
accuracy: 0.7150
Epoch 234/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4222 - accuracy: 0.8278 - val_loss: 0.5630 - val_
accuracy: 0.7103
Epoch 235/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3668 - accuracy: 0.8149 - val_loss: 0.5511 - val_
accuracy: 0.7056
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3815 - accuracy: 0.8149 - val_loss: 0.5354 - val_
accuracy: 0.6822
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4282 - accuracy: 0.8201 - val_loss: 0.5981 - val_
accuracy: 0.6916
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4022 - accuracy: 0.8252 - val_loss: 0.5839 - val_
accuracy: 0.6869
Epoch 239/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3542 - accuracy: 0.8278 - val_loss: 0.5800 - val_
accuracy: 0.7056
Epoch 240/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4176 - accuracy: 0.8278 - val_loss: 0.6093 - val_
accuracy: 0.7056
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4344 - accuracy: 0.8226 - val_loss: 0.6309 - val_
accuracy: 0.7150
Epoch 242/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4434 - accuracy: 0.8175 - val_loss: 0.6359 - val_
accuracy: 0.7150
Epoch 243/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3677 - accuracy: 0.8175 - val_loss: 0.6578 - val_
accuracy: 0.7196
Epoch 244/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3818 - accuracy: 0.8252 - val_loss: 0.6015 - val_accuracy: 0.7243
Epoch 245/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3929 - accuracy: 0.8175 - val_loss: 0.6007 - val_accuracy: 0.7243
Epoch 246/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3800 - accuracy: 0.8201 - val_loss: 0.6296 - val_accuracy: 0.7336
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4003 - accuracy: 0.8252 - val_loss: 0.6273 - val_accuracy: 0.7243
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3512 - accuracy: 0.8252 - val_loss: 0.5991 - val_accuracy: 0.7243
Epoch 249/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3609 - accuracy: 0.8252 - val_loss: 0.5974 - val_accuracy: 0.7336
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3969 - accuracy: 0.8278 - val_loss: 0.6025 - val_accuracy: 0.7383
Epoch 251/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4037 - accuracy: 0.8406 - val_loss: 0.6051 - val_accuracy: 0.7336
Epoch 252/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3671 - accuracy: 0.8098 - val_loss: 0.6333 - val_accuracy: 0.7290
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3878 - accuracy: 0.8278 - val_loss: 0.6784 - val_accuracy: 0.7150
Epoch 254/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3747 - accuracy: 0.8046 - val_loss: 0.6750 - val_accuracy: 0.7196
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3575 - accuracy: 0.8226 - val_loss: 0.6989 - val_accuracy: 0.7243
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4165 - accuracy: 0.8201 - val_loss: 0.6686 - val_accuracy: 0.7196
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3709 - accuracy: 0.8278 - val_loss: 0.6696 - val_accuracy: 0.7056
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4085 - accuracy: 0.8252 - val_loss: 0.6663 - val_accuracy: 0.7009
Epoch 259/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3726 - accuracy: 0.8252 - val_loss: 0.6640 - val_accuracy: 0.7103
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3782 - accuracy: 0.8303 - val_loss: 0.6586 - val_accuracy: 0.7056
Epoch 261/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3575 - accuracy: 0.8046 - val_loss: 0.6322 - val_accuracy: 0.7103
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4002 - accuracy: 0.8329 - val_loss: 0.6582 - val_accuracy: 0.7103
Epoch 263/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3614 - accuracy: 0.8175 - val_loss: 0.6572 - val_accuracy: 0.7150
Epoch 264/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3568 - accuracy: 0.7995 - val_loss: 0.6855 - val_accuracy: 0.7290
Epoch 265/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4134 - accuracy: 0.8201 - val_loss: 0.6606 - val_accuracy: 0.7243
Epoch 266/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3809 - accuracy: 0.7841 - val_loss: 0.6300 - val_accuracy: 0.7336
Epoch 267/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3658 - accuracy: 0.8072 - val_loss: 0.6864 - val_accuracy: 0.7290
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3520 - accuracy: 0.8329 - val_loss: 0.6901 - val_accuracy: 0.7336
Epoch 269/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3885 - accuracy: 0.8098 - val_loss: 0.6902 - val_accuracy: 0.7430
Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3988 - accuracy: 0.8149 - val_loss: 0.6942 - val_accuracy: 0.7383
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3921 - accuracy: 0.8303 - val_loss: 0.6915 - val_accuracy: 0.7243
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3445 - accuracy: 0.8226 - val_loss: 0.6915 - val_accuracy: 0.7103
Epoch 273/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3502 - accuracy: 0.8046 - val_loss: 0.6900 - val_accuracy: 0.7150
```

Epoch 274/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3612 - accuracy: 0.8046 - val_loss: 0.6903 - val_accuracy: 0.7196
Epoch 275/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3953 - accuracy: 0.7995 - val_loss: 0.6507 - val_accuracy: 0.7196
Epoch 276/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4222 - accuracy: 0.8226 - val_loss: 0.6418 - val_accuracy: 0.7243
Epoch 277/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3692 - accuracy: 0.8303 - val_loss: 0.6456 - val_accuracy: 0.7243
Epoch 278/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3681 - accuracy: 0.8226 - val_loss: 0.6525 - val_accuracy: 0.7336
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3547 - accuracy: 0.8355 - val_loss: 0.6301 - val_accuracy: 0.7336
Epoch 280/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3539 - accuracy: 0.8252 - val_loss: 0.6093 - val_accuracy: 0.7336
Epoch 281/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4187 - accuracy: 0.8226 - val_loss: 0.5904 - val_accuracy: 0.7243
Epoch 282/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4822 - accuracy: 0.7866 - val_loss: 0.6325 - val_accuracy: 0.7196
Epoch 283/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4054 - accuracy: 0.8380 - val_loss: 0.5890 - val_accuracy: 0.7336
Epoch 284/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3967 - accuracy: 0.8175 - val_loss: 0.6184 - val_accuracy: 0.7243
Epoch 285/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3560 - accuracy: 0.8201 - val_loss: 0.6565 - val_accuracy: 0.7336
Epoch 286/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3751 - accuracy: 0.8380 - val_loss: 0.6433 - val_accuracy: 0.7243
Epoch 287/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3773 - accuracy: 0.8278 - val_loss: 0.6413 - val_accuracy: 0.7196
Epoch 288/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4498 - accuracy: 0.8175 - val_loss: 0.6639 - val_accuracy: 0.7009
Epoch 289/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4447 - accuracy: 0.8046 - val_loss: 0.6900 - val_accuracy: 0.7009
Epoch 290/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3291 - accuracy: 0.8278 - val_loss: 0.6570 - val_accuracy: 0.6869
Epoch 291/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3837 - accuracy: 0.8483 - val_loss: 0.6792 - val_accuracy: 0.7009
Epoch 292/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3813 - accuracy: 0.8149 - val_loss: 0.7629 - val_accuracy: 0.6822
Epoch 293/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4559 - accuracy: 0.8226 - val_loss: 0.7108 - val_accuracy: 0.6963
Epoch 294/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4264 - accuracy: 0.8175 - val_loss: 0.6567 - val_accuracy: 0.6963
Epoch 295/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3375 - accuracy: 0.8226 - val_loss: 0.6522 - val_accuracy: 0.6963
Epoch 296/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3343 - accuracy: 0.8175 - val_loss: 0.7006 - val_accuracy: 0.6963
Epoch 297/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3543 - accuracy: 0.8252 - val_loss: 0.7164 - val_accuracy: 0.6963
Epoch 298/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3822 - accuracy: 0.8380 - val_loss: 0.5987 - val_accuracy: 0.7103
Epoch 299/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3368 - accuracy: 0.8278 - val_loss: 0.5943 - val_accuracy: 0.7100
Epoch 300/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3758 - accuracy: 0.8175 - val_loss: 0.8042 - val_accuracy: 0.7103
Epoch 301/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4108 - accuracy: 0.8149 - val_loss: 0.7499 - val_accuracy: 0.6963
Epoch 302/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4833 - accuracy: 0.8149 - val_loss: 0.8002 - val_accuracy: 0.7009
Epoch 303/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4310 - accuracy: 0.8355 - val_loss: 0.7800 - val_accuracy: 0.7009

```

accuracy: 0.7056
Epoch 304/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3808 - accuracy: 0.8355 - val_loss: 0.7571 - val_
accuracy: 0.7196
Epoch 305/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4129 - accuracy: 0.7943 - val_loss: 0.7205 - val_
accuracy: 0.6822
Epoch 306/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3772 - accuracy: 0.7789 - val_loss: 0.7191 - val_
accuracy: 0.6869
Epoch 307/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3652 - accuracy: 0.7943 - val_loss: 0.7494 - val_
accuracy: 0.6682
Epoch 308/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3896 - accuracy: 0.7969Restoring model weights from th
e end of the best epoch: 158.
4/4 [=====] - 0s 14ms/step - loss: 0.3712 - accuracy: 0.7866 - val_loss: 0.7861 - val_
accuracy: 0.6636
Epoch 308: early stopping
2/2 [=====] - 0s 3ms/step - loss: 0.9104 - accuracy: 0.6977
[CV] END .....Dense1=25, Dense2=10; total time= 15.7s
Model: "sequential_17"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_68 (Dense)	(None, 25)	175
batch_normalization_51 (BatchNormalization)	(None, 25)	100
activation_51 (Activation)	(None, 25)	0
dense_69 (Dense)	(None, 10)	260
batch_normalization_52 (BatchNormalization)	(None, 10)	40
activation_52 (Activation)	(None, 10)	0
dense_70 (Dense)	(None, 10)	110
batch_normalization_53 (BatchNormalization)	(None, 10)	40
activation_53 (Activation)	(None, 10)	0
dense_71 (Dense)	(None, 2)	22
<hr/>		
Total params: 747		
Trainable params: 657		
Non-trainable params: 90		

```

Epoch 1/1000
4/4 [=====] - 1s 58ms/step - loss: 5.3821 - accuracy: 0.6735 - val_loss: 4.9320 - val_
accuracy: 0.4579
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 4.8488 - accuracy: 0.7224 - val_loss: 4.4096 - val_
accuracy: 0.4673
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 4.7468 - accuracy: 0.7326 - val_loss: 4.0823 - val_
accuracy: 0.5187
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 4.4374 - accuracy: 0.7172 - val_loss: 3.6828 - val_
accuracy: 0.5888
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 4.1003 - accuracy: 0.7121 - val_loss: 3.7129 - val_
accuracy: 0.6682
Epoch 6/1000
4/4 [=====] - 0s 15ms/step - loss: 4.0739 - accuracy: 0.7378 - val_loss: 3.9207 - val_
accuracy: 0.6963
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9397 - accuracy: 0.7249 - val_loss: 3.8184 - val_
accuracy: 0.7103
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7110 - accuracy: 0.7172 - val_loss: 3.6760 - val_
accuracy: 0.7103
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9328 - accuracy: 0.6967 - val_loss: 3.4854 - val_
accuracy: 0.7196
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8297 - accuracy: 0.7224 - val_loss: 3.1890 - val_
accuracy: 0.7243
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5009 - accuracy: 0.7121 - val_loss: 2.9524 - val_
accuracy: 0.6869
Epoch 12/1000
4/4 [=====] - 0s 15ms/step - loss: 3.4440 - accuracy: 0.7198 - val_loss: 2.7190 - val_
accuracy: 0.6963

```

Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5071 - accuracy: 0.7069 - val_loss: 2.3650 - val_accuracy: 0.6869
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 3.2785 - accuracy: 0.7018 - val_loss: 2.2130 - val_accuracy: 0.6822
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2695 - accuracy: 0.7378 - val_loss: 2.1588 - val_accuracy: 0.6776
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1851 - accuracy: 0.7121 - val_loss: 2.0461 - val_accuracy: 0.6729
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2325 - accuracy: 0.7018 - val_loss: 2.0124 - val_accuracy: 0.6682
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0692 - accuracy: 0.7121 - val_loss: 1.9419 - val_accuracy: 0.6636
Epoch 19/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0640 - accuracy: 0.7069 - val_loss: 1.8702 - val_accuracy: 0.6636
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8908 - accuracy: 0.7044 - val_loss: 1.8497 - val_accuracy: 0.6729
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8866 - accuracy: 0.6864 - val_loss: 1.8104 - val_accuracy: 0.6776
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7900 - accuracy: 0.7095 - val_loss: 1.7706 - val_accuracy: 0.6729
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7677 - accuracy: 0.6967 - val_loss: 1.7568 - val_accuracy: 0.6729
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7790 - accuracy: 0.6838 - val_loss: 1.7359 - val_accuracy: 0.6636
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6779 - accuracy: 0.7069 - val_loss: 1.7503 - val_accuracy: 0.6589
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6142 - accuracy: 0.7044 - val_loss: 1.7351 - val_accuracy: 0.6589
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8680 - accuracy: 0.6967 - val_loss: 1.7230 - val_accuracy: 0.6589
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5334 - accuracy: 0.6992 - val_loss: 1.7134 - val_accuracy: 0.6495
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6310 - accuracy: 0.6915 - val_loss: 1.6687 - val_accuracy: 0.6542
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6242 - accuracy: 0.6889 - val_loss: 1.6488 - val_accuracy: 0.6495
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4693 - accuracy: 0.6787 - val_loss: 1.6277 - val_accuracy: 0.6449
Epoch 32/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5566 - accuracy: 0.6864 - val_loss: 1.6155 - val_accuracy: 0.6449
Epoch 33/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3966 - accuracy: 0.6864 - val_loss: 1.6114 - val_accuracy: 0.6355
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2364 - accuracy: 0.6889 - val_loss: 1.6096 - val_accuracy: 0.6355
Epoch 35/1000
4/4 [=====] - 0s 16ms/step - loss: 2.2555 - accuracy: 0.6787 - val_loss: 1.6057 - val_accuracy: 0.6308
Epoch 36/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2142 - accuracy: 0.6838 - val_loss: 1.6030 - val_accuracy: 0.6355
Epoch 37/1000
4/4 [=====] - 0s 18ms/step - loss: 2.2284 - accuracy: 0.6710 - val_loss: 1.6010 - val_accuracy: 0.6308
Epoch 38/1000
4/4 [=====] - 0s 17ms/step - loss: 2.2753 - accuracy: 0.6607 - val_loss: 1.5981 - val_accuracy: 0.6308
Epoch 39/1000
4/4 [=====] - 0s 15ms/step - loss: 2.1440 - accuracy: 0.6632 - val_loss: 1.5942 - val_accuracy: 0.6308
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2213 - accuracy: 0.6838 - val_loss: 1.5829 - val_accuracy: 0.6355
Epoch 41/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9668 - accuracy: 0.6581 - val_loss: 1.5754 - val_accuracy: 0.6262
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9847 - accuracy: 0.6864 - val_loss: 1.5735 - val_accuracy: 0.6262

```
accuracy: 0.6215
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9601 - accuracy: 0.6658 - val_loss: 1.5681 - val_accuracy: 0.6215
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9264 - accuracy: 0.6735 - val_loss: 1.5617 - val_accuracy: 0.6355
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8221 - accuracy: 0.6838 - val_loss: 1.5491 - val_accuracy: 0.6308
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8676 - accuracy: 0.6761 - val_loss: 1.5703 - val_accuracy: 0.6355
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8356 - accuracy: 0.6632 - val_loss: 1.5602 - val_accuracy: 0.6402
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8212 - accuracy: 0.6787 - val_loss: 1.5435 - val_accuracy: 0.6402
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7607 - accuracy: 0.6761 - val_loss: 1.5307 - val_accuracy: 0.6402
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8662 - accuracy: 0.6581 - val_loss: 1.5194 - val_accuracy: 0.6402
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7732 - accuracy: 0.6864 - val_loss: 1.5098 - val_accuracy: 0.6402
Epoch 52/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7891 - accuracy: 0.6684 - val_loss: 1.4959 - val_accuracy: 0.6355
Epoch 53/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6352 - accuracy: 0.6607 - val_loss: 1.4854 - val_accuracy: 0.6355
Epoch 54/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7322 - accuracy: 0.6967 - val_loss: 1.4642 - val_accuracy: 0.6262
Epoch 55/1000
4/4 [=====] - 0s 15ms/step - loss: 1.6279 - accuracy: 0.6632 - val_loss: 1.4446 - val_accuracy: 0.6262
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6319 - accuracy: 0.6787 - val_loss: 1.4345 - val_accuracy: 0.6215
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6396 - accuracy: 0.5733 - val_loss: 1.4262 - val_accuracy: 0.5467
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6423 - accuracy: 0.5476 - val_loss: 1.4182 - val_accuracy: 0.5514
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7238 - accuracy: 0.5630 - val_loss: 1.4137 - val_accuracy: 0.5514
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5610 - accuracy: 0.5424 - val_loss: 1.4292 - val_accuracy: 0.5280
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5476 - accuracy: 0.5398 - val_loss: 1.3886 - val_accuracy: 0.5280
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5001 - accuracy: 0.5476 - val_loss: 1.4364 - val_accuracy: 0.5514
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4365 - accuracy: 0.5501 - val_loss: 1.4044 - val_accuracy: 0.5467
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4198 - accuracy: 0.5347 - val_loss: 1.4119 - val_accuracy: 0.5561
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3831 - accuracy: 0.5398 - val_loss: 1.4011 - val_accuracy: 0.5467
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3375 - accuracy: 0.5604 - val_loss: 1.3904 - val_accuracy: 0.5607
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2916 - accuracy: 0.5578 - val_loss: 1.3699 - val_accuracy: 0.5514
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3151 - accuracy: 0.5501 - val_loss: 1.3532 - val_accuracy: 0.5748
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3146 - accuracy: 0.5244 - val_loss: 1.3432 - val_accuracy: 0.5654
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2480 - accuracy: 0.5707 - val_loss: 1.3186 - val_accuracy: 0.5748
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2685 - accuracy: 0.5784 - val_loss: 1.2983 - val_accuracy: 0.5748
Epoch 72/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 1.2478 - accuracy: 0.5810 - val_loss: 1.2776 - val_accuracy: 0.5748
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2624 - accuracy: 0.5784 - val_loss: 1.2529 - val_accuracy: 0.5701
Epoch 74/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1888 - accuracy: 0.6093 - val_loss: 1.2328 - val_accuracy: 0.5748
Epoch 75/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1910 - accuracy: 0.6041 - val_loss: 1.2051 - val_accuracy: 0.5888
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1171 - accuracy: 0.6093 - val_loss: 1.1763 - val_accuracy: 0.5794
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2417 - accuracy: 0.5990 - val_loss: 1.1584 - val_accuracy: 0.5748
Epoch 78/1000
4/4 [=====] - 0s 18ms/step - loss: 1.1079 - accuracy: 0.6093 - val_loss: 1.1370 - val_accuracy: 0.5701
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1431 - accuracy: 0.5861 - val_loss: 1.1142 - val_accuracy: 0.5794
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1196 - accuracy: 0.6144 - val_loss: 1.0955 - val_accuracy: 0.5794
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1180 - accuracy: 0.5861 - val_loss: 1.0754 - val_accuracy: 0.5794
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1670 - accuracy: 0.5630 - val_loss: 1.0511 - val_accuracy: 0.5748
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1170 - accuracy: 0.5964 - val_loss: 1.0363 - val_accuracy: 0.5794
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0187 - accuracy: 0.6015 - val_loss: 1.0233 - val_accuracy: 0.5748
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1033 - accuracy: 0.5887 - val_loss: 1.0092 - val_accuracy: 0.5888
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0404 - accuracy: 0.6093 - val_loss: 1.0032 - val_accuracy: 0.5888
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9280 - accuracy: 0.5810 - val_loss: 0.8710 - val_accuracy: 0.5794
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0056 - accuracy: 0.6041 - val_loss: 0.8776 - val_accuracy: 0.6121
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0128 - accuracy: 0.5784 - val_loss: 0.8761 - val_accuracy: 0.6121
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9701 - accuracy: 0.5733 - val_loss: 0.8680 - val_accuracy: 0.6168
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0377 - accuracy: 0.5810 - val_loss: 0.8657 - val_accuracy: 0.6028
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0315 - accuracy: 0.5578 - val_loss: 0.8626 - val_accuracy: 0.6075
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9241 - accuracy: 0.5913 - val_loss: 0.8589 - val_accuracy: 0.5701
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9303 - accuracy: 0.5990 - val_loss: 0.8531 - val_accuracy: 0.5701
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9882 - accuracy: 0.5810 - val_loss: 0.8515 - val_accuracy: 0.5888
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9860 - accuracy: 0.5681 - val_loss: 0.8486 - val_accuracy: 0.5841
Epoch 97/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9465 - accuracy: 0.5990 - val_loss: 0.8468 - val_accuracy: 0.5841
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9594 - accuracy: 0.6015 - val_loss: 0.8402 - val_accuracy: 0.5981
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9360 - accuracy: 0.5810 - val_loss: 0.8383 - val_accuracy: 0.6028
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9164 - accuracy: 0.6067 - val_loss: 0.8365 - val_accuracy: 0.6028
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9727 - accuracy: 0.5887 - val_loss: 0.8370 - val_accuracy: 0.6028
```

Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8922 - accuracy: 0.5938 - val_loss: 0.8593 - val_accuracy: 0.6028
Epoch 103/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9082 - accuracy: 0.6067 - val_loss: 0.8601 - val_accuracy: 0.6028
Epoch 104/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9376 - accuracy: 0.5990 - val_loss: 0.8637 - val_accuracy: 0.6028
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9032 - accuracy: 0.6298 - val_loss: 0.8665 - val_accuracy: 0.6075
Epoch 106/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8196 - accuracy: 0.5964 - val_loss: 0.8917 - val_accuracy: 0.6075
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7584 - accuracy: 0.5990 - val_loss: 0.8937 - val_accuracy: 0.6121
Epoch 108/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8536 - accuracy: 0.6195 - val_loss: 0.9122 - val_accuracy: 0.6075
Epoch 109/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9686 - accuracy: 0.6221 - val_loss: 0.9348 - val_accuracy: 0.6075
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8836 - accuracy: 0.6170 - val_loss: 0.9830 - val_accuracy: 0.6075
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9022 - accuracy: 0.5938 - val_loss: 1.0051 - val_accuracy: 0.6028
Epoch 112/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8487 - accuracy: 0.6015 - val_loss: 1.0031 - val_accuracy: 0.6075
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8032 - accuracy: 0.5913 - val_loss: 0.9772 - val_accuracy: 0.6075
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8179 - accuracy: 0.6170 - val_loss: 0.9677 - val_accuracy: 0.6075
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9343 - accuracy: 0.6144 - val_loss: 0.9668 - val_accuracy: 0.5981
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8059 - accuracy: 0.5964 - val_loss: 0.8569 - val_accuracy: 0.5935
Epoch 117/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7098 - accuracy: 0.5784 - val_loss: 0.9591 - val_accuracy: 0.5701
Epoch 118/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8182 - accuracy: 0.6093 - val_loss: 0.9816 - val_accuracy: 0.6028
Epoch 119/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7121 - accuracy: 0.5810 - val_loss: 0.9587 - val_accuracy: 0.6028
Epoch 120/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7249 - accuracy: 0.6118 - val_loss: 0.9467 - val_accuracy: 0.6028
Epoch 121/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6773 - accuracy: 0.6144 - val_loss: 0.9403 - val_accuracy: 0.5794
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7303 - accuracy: 0.6144 - val_loss: 0.9377 - val_accuracy: 0.5748
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7878 - accuracy: 0.6170 - val_loss: 0.9395 - val_accuracy: 0.5654
Epoch 124/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6935 - accuracy: 0.6118 - val_loss: 0.9384 - val_accuracy: 0.5654
Epoch 125/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6616 - accuracy: 0.5990 - val_loss: 0.9069 - val_accuracy: 0.5654
Epoch 126/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6654 - accuracy: 0.6221 - val_loss: 0.9947 - val_accuracy: 0.5607
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7244 - accuracy: 0.6093 - val_loss: 1.0391 - val_accuracy: 0.5607
Epoch 128/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6827 - accuracy: 0.5707 - val_loss: 1.0058 - val_accuracy: 0.5607
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6211 - accuracy: 0.5758 - val_loss: 1.0044 - val_accuracy: 0.5607
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7430 - accuracy: 0.5758 - val_loss: 0.9421 - val_accuracy: 0.5607
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5992 - accuracy: 0.5656 - val_loss: 0.9422 - val_accuracy: 0.5656

```
accuracy: 0.5607
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5493 - accuracy: 0.5501 - val_loss: 0.9647 - val_accuracy: 0.5607
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6022 - accuracy: 0.5707 - val_loss: 0.9671 - val_accuracy: 0.5561
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6125 - accuracy: 0.5733 - val_loss: 1.0457 - val_accuracy: 0.5561
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6477 - accuracy: 0.5476 - val_loss: 0.9982 - val_accuracy: 0.5607
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6312 - accuracy: 0.5758 - val_loss: 1.0489 - val_accuracy: 0.5561
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5855 - accuracy: 0.5707 - val_loss: 1.1266 - val_accuracy: 0.5421
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5916 - accuracy: 0.5630 - val_loss: 1.1088 - val_accuracy: 0.5421
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6618 - accuracy: 0.5630 - val_loss: 1.1228 - val_accuracy: 0.5514
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5621 - accuracy: 0.5578 - val_loss: 1.1468 - val_accuracy: 0.5514
Epoch 141/1000
4/4 [=====] - 0s 18ms/step - loss: 0.5994 - accuracy: 0.5784 - val_loss: 1.1240 - val_accuracy: 0.5514
Epoch 142/1000
4/4 [=====] - 0s 17ms/step - loss: 0.5916 - accuracy: 0.5784 - val_loss: 1.1579 - val_accuracy: 0.5841
Epoch 143/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6000 - accuracy: 0.5938 - val_loss: 1.1527 - val_accuracy: 0.5888
Epoch 144/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6888 - accuracy: 0.5964 - val_loss: 1.1538 - val_accuracy: 0.5981
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5969 - accuracy: 0.6118 - val_loss: 1.1813 - val_accuracy: 0.5935
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6087 - accuracy: 0.6041 - val_loss: 1.1767 - val_accuracy: 0.6028
Epoch 147/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5554 - accuracy: 0.6067 - val_loss: 1.1804 - val_accuracy: 0.6075
Epoch 148/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5764 - accuracy: 0.6298 - val_loss: 1.1741 - val_accuracy: 0.6075
Epoch 149/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5704 - accuracy: 0.6272 - val_loss: 1.0614 - val_accuracy: 0.5981
Epoch 150/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6156 - accuracy: 0.6170 - val_loss: 1.0611 - val_accuracy: 0.5841
Epoch 151/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5940 - accuracy: 0.6093 - val_loss: 1.3194 - val_accuracy: 0.5841
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5984 - accuracy: 0.6375 - val_loss: 1.2634 - val_accuracy: 0.5701
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6160 - accuracy: 0.6221 - val_loss: 1.3162 - val_accuracy: 0.5888
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6714 - accuracy: 0.6401 - val_loss: 1.2638 - val_accuracy: 0.5888
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5506 - accuracy: 0.6350 - val_loss: 1.2326 - val_accuracy: 0.5935
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5762 - accuracy: 0.6067 - val_loss: 1.2273 - val_accuracy: 0.5794
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5590 - accuracy: 0.6247 - val_loss: 1.1190 - val_accuracy: 0.5748
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5486 - accuracy: 0.6221 - val_loss: 1.1436 - val_accuracy: 0.5701
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5680 - accuracy: 0.5784 - val_loss: 1.1416 - val_accuracy: 0.5561
Epoch 160/1000
1/4 [====>.....] - ETA: 0s - loss: 0.4583 - accuracy: 0.5703Restoring model weights from the end of the best epoch: 10.
4/4 [=====] - 0s 15ms/step - loss: 0.5738 - accuracy: 0.6067 - val_loss: 1.0273 - val_accuracy: 0.5738
```

```
accuracy: 0.5888
Epoch 160: early stopping
2/2 [=====] - 0s 4ms/step - loss: 2.6501 - accuracy: 0.7907
[CV] END .....Dense1=25, Dense2=10; total time= 9.1s
Model: "sequential_18"
```

Layer (type)	Output Shape	Param #
<hr/>		
dense_72 (Dense)	(None, 25)	175
batch_normalization_54 (Batch Normalization)	(None, 25)	100
activation_54 (Activation)	(None, 25)	0
dense_73 (Dense)	(None, 10)	260
batch_normalization_55 (Batch Normalization)	(None, 10)	40
activation_55 (Activation)	(None, 10)	0
dense_74 (Dense)	(None, 10)	110
batch_normalization_56 (Batch Normalization)	(None, 10)	40
activation_56 (Activation)	(None, 10)	0
dense_75 (Dense)	(None, 2)	22
<hr/>		

```
Total params: 747
Trainable params: 657
Non-trainable params: 90
```

```
Epoch 1/1000
4/4 [=====] - 1s 55ms/step - loss: 5.6903 - accuracy: 0.5604 - val_loss: 8.1250 - val_accuracy: 0.4439
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 4.3484 - accuracy: 0.5810 - val_loss: 7.5080 - val_accuracy: 0.4439
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 3.9291 - accuracy: 0.6041 - val_loss: 6.7294 - val_accuracy: 0.4299
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 3.6618 - accuracy: 0.6015 - val_loss: 5.8088 - val_accuracy: 0.4486
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 3.3226 - accuracy: 0.6581 - val_loss: 4.0715 - val_accuracy: 0.4579
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1234 - accuracy: 0.6427 - val_loss: 3.2726 - val_accuracy: 0.4486
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7842 - accuracy: 0.6350 - val_loss: 2.9342 - val_accuracy: 0.4486
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6101 - accuracy: 0.5887 - val_loss: 2.5451 - val_accuracy: 0.4299
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3163 - accuracy: 0.6195 - val_loss: 2.2033 - val_accuracy: 0.4486
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0441 - accuracy: 0.6530 - val_loss: 1.9254 - val_accuracy: 0.4579
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0687 - accuracy: 0.6735 - val_loss: 1.7522 - val_accuracy: 0.4439
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9975 - accuracy: 0.6401 - val_loss: 1.7326 - val_accuracy: 0.4486
Epoch 13/1000
4/4 [=====] - 0s 15ms/step - loss: 1.7907 - accuracy: 0.6247 - val_loss: 1.7173 - val_accuracy: 0.4439
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7419 - accuracy: 0.6530 - val_loss: 1.7199 - val_accuracy: 0.4346
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5921 - accuracy: 0.6761 - val_loss: 1.7153 - val_accuracy: 0.4346
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6501 - accuracy: 0.6735 - val_loss: 1.6744 - val_accuracy: 0.4159
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6253 - accuracy: 0.6452 - val_loss: 1.6305 - val_accuracy: 0.4065
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5122 - accuracy: 0.6684 - val_loss: 1.6226 - val_accuracy: 0.4065
```

```
accuracy: 0.4019
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5924 - accuracy: 0.5990 - val_loss: 1.5817 - val_accuracy: 0.3879
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4864 - accuracy: 0.6401 - val_loss: 1.5600 - val_accuracy: 0.3832
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2091 - accuracy: 0.6530 - val_loss: 1.5475 - val_accuracy: 0.3879
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2660 - accuracy: 0.6735 - val_loss: 1.5026 - val_accuracy: 0.3879
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3135 - accuracy: 0.6452 - val_loss: 1.4776 - val_accuracy: 0.3925
Epoch 24/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3427 - accuracy: 0.6350 - val_loss: 1.4628 - val_accuracy: 0.3785
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0512 - accuracy: 0.6555 - val_loss: 1.4284 - val_accuracy: 0.3925
Epoch 26/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1579 - accuracy: 0.6427 - val_loss: 1.4209 - val_accuracy: 0.3832
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3248 - accuracy: 0.6015 - val_loss: 1.4135 - val_accuracy: 0.4579
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0781 - accuracy: 0.6015 - val_loss: 1.3851 - val_accuracy: 0.4533
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1566 - accuracy: 0.6452 - val_loss: 1.3673 - val_accuracy: 0.4393
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1354 - accuracy: 0.6247 - val_loss: 1.3556 - val_accuracy: 0.4439
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0349 - accuracy: 0.5835 - val_loss: 1.3421 - val_accuracy: 0.4439
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9562 - accuracy: 0.5887 - val_loss: 1.3302 - val_accuracy: 0.4439
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8859 - accuracy: 0.6093 - val_loss: 1.3159 - val_accuracy: 0.4439
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0209 - accuracy: 0.6067 - val_loss: 1.2766 - val_accuracy: 0.4439
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0140 - accuracy: 0.5810 - val_loss: 1.2836 - val_accuracy: 0.4486
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8373 - accuracy: 0.5758 - val_loss: 1.2651 - val_accuracy: 0.4486
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8594 - accuracy: 0.5733 - val_loss: 1.2284 - val_accuracy: 0.4486
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9206 - accuracy: 0.5733 - val_loss: 1.2013 - val_accuracy: 0.4486
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8927 - accuracy: 0.5784 - val_loss: 1.1900 - val_accuracy: 0.4486
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8600 - accuracy: 0.5861 - val_loss: 1.1919 - val_accuracy: 0.4486
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8106 - accuracy: 0.5707 - val_loss: 1.1268 - val_accuracy: 0.4486
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8279 - accuracy: 0.5887 - val_loss: 1.1065 - val_accuracy: 0.4486
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8793 - accuracy: 0.5527 - val_loss: 1.0917 - val_accuracy: 0.4393
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8968 - accuracy: 0.5835 - val_loss: 1.0888 - val_accuracy: 0.4393
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6778 - accuracy: 0.5604 - val_loss: 1.1039 - val_accuracy: 0.4393
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8005 - accuracy: 0.5578 - val_loss: 1.0643 - val_accuracy: 0.4393
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7585 - accuracy: 0.5398 - val_loss: 1.0413 - val_accuracy: 0.4346
Epoch 48/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.6612 - accuracy: 0.5810 - val_loss: 0.9794 - val_accuracy: 0.4299
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7070 - accuracy: 0.5835 - val_loss: 0.9619 - val_accuracy: 0.4299
Epoch 50/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6945 - accuracy: 0.5733 - val_loss: 0.9516 - val_accuracy: 0.4299
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6926 - accuracy: 0.5630 - val_loss: 0.9636 - val_accuracy: 0.4299
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6315 - accuracy: 0.5938 - val_loss: 0.9388 - val_accuracy: 0.4299
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6005 - accuracy: 0.5887 - val_loss: 0.9337 - val_accuracy: 0.4299
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7511 - accuracy: 0.5707 - val_loss: 0.9206 - val_accuracy: 0.4299
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6794 - accuracy: 0.5810 - val_loss: 0.9011 - val_accuracy: 0.4299
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7062 - accuracy: 0.5758 - val_loss: 0.8640 - val_accuracy: 0.4346
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6054 - accuracy: 0.5604 - val_loss: 0.8481 - val_accuracy: 0.4299
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6563 - accuracy: 0.5476 - val_loss: 0.8390 - val_accuracy: 0.4252
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5917 - accuracy: 0.5707 - val_loss: 0.8271 - val_accuracy: 0.4252
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6072 - accuracy: 0.5681 - val_loss: 0.7927 - val_accuracy: 0.4299
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5898 - accuracy: 0.5810 - val_loss: 0.7862 - val_accuracy: 0.4252
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7430 - accuracy: 0.5630 - val_loss: 0.7739 - val_accuracy: 0.4252
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5563 - accuracy: 0.5758 - val_loss: 0.7595 - val_accuracy: 0.4252
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6245 - accuracy: 0.6067 - val_loss: 0.7359 - val_accuracy: 0.4299
Epoch 65/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5570 - accuracy: 0.6015 - val_loss: 0.7203 - val_accuracy: 0.4299
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5522 - accuracy: 0.5527 - val_loss: 0.7183 - val_accuracy: 0.4299
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5987 - accuracy: 0.5604 - val_loss: 0.7178 - val_accuracy: 0.4346
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5863 - accuracy: 0.5707 - val_loss: 0.7091 - val_accuracy: 0.4346
Epoch 69/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5152 - accuracy: 0.5681 - val_loss: 0.6987 - val_accuracy: 0.4346
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5515 - accuracy: 0.5887 - val_loss: 0.7081 - val_accuracy: 0.4299
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6158 - accuracy: 0.5733 - val_loss: 0.7071 - val_accuracy: 0.4299
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6050 - accuracy: 0.5681 - val_loss: 0.6957 - val_accuracy: 0.4299
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6316 - accuracy: 0.5887 - val_loss: 0.6881 - val_accuracy: 0.4299
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5477 - accuracy: 0.5861 - val_loss: 0.6742 - val_accuracy: 0.4393
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6185 - accuracy: 0.5553 - val_loss: 0.6708 - val_accuracy: 0.4439
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5201 - accuracy: 0.5758 - val_loss: 0.6596 - val_accuracy: 0.4486
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5545 - accuracy: 0.5630 - val_loss: 0.6554 - val_accuracy: 0.4533
```

Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5087 - accuracy: 0.5810 - val_loss: 0.6520 - val_accuracy: 0.4626
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5391 - accuracy: 0.5656 - val_loss: 0.6498 - val_accuracy: 0.4626
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5849 - accuracy: 0.6144 - val_loss: 0.6288 - val_accuracy: 0.4626
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5325 - accuracy: 0.6144 - val_loss: 0.6128 - val_accuracy: 0.4720
Epoch 82/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5644 - accuracy: 0.6015 - val_loss: 0.6072 - val_accuracy: 0.4860
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5627 - accuracy: 0.6067 - val_loss: 0.6066 - val_accuracy: 0.4813
Epoch 84/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4688 - accuracy: 0.6247 - val_loss: 0.6021 - val_accuracy: 0.4860
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5011 - accuracy: 0.5810 - val_loss: 0.6229 - val_accuracy: 0.4252
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5003 - accuracy: 0.5913 - val_loss: 0.6136 - val_accuracy: 0.4346
Epoch 87/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5437 - accuracy: 0.5604 - val_loss: 0.5953 - val_accuracy: 0.4486
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6077 - accuracy: 0.5758 - val_loss: 0.5765 - val_accuracy: 0.4720
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5228 - accuracy: 0.5835 - val_loss: 0.5870 - val_accuracy: 0.5000
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5816 - accuracy: 0.5913 - val_loss: 0.5877 - val_accuracy: 0.4953
Epoch 91/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4645 - accuracy: 0.5835 - val_loss: 0.5861 - val_accuracy: 0.5187
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4454 - accuracy: 0.5964 - val_loss: 0.5852 - val_accuracy: 0.5140
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5693 - accuracy: 0.5835 - val_loss: 0.5840 - val_accuracy: 0.5327
Epoch 94/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4458 - accuracy: 0.5424 - val_loss: 0.5792 - val_accuracy: 0.5467
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5337 - accuracy: 0.5707 - val_loss: 0.5828 - val_accuracy: 0.5467
Epoch 96/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4770 - accuracy: 0.6118 - val_loss: 0.5774 - val_accuracy: 0.5794
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5854 - accuracy: 0.5810 - val_loss: 0.5840 - val_accuracy: 0.5514
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4464 - accuracy: 0.5990 - val_loss: 0.5861 - val_accuracy: 0.5187
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4721 - accuracy: 0.5707 - val_loss: 0.5837 - val_accuracy: 0.5421
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6047 - accuracy: 0.5707 - val_loss: 0.5928 - val_accuracy: 0.5421
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5721 - accuracy: 0.5964 - val_loss: 0.5931 - val_accuracy: 0.5327
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4920 - accuracy: 0.5707 - val_loss: 0.5849 - val_accuracy: 0.6028
Epoch 103/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4260 - accuracy: 0.5964 - val_loss: 0.5890 - val_accuracy: 0.6075
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4862 - accuracy: 0.6504 - val_loss: 0.5913 - val_accuracy: 0.6168
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5298 - accuracy: 0.6272 - val_loss: 0.6177 - val_accuracy: 0.6028
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5330 - accuracy: 0.6118 - val_loss: 0.5998 - val_accuracy: 0.5981
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5436 - accuracy: 0.5990 - val_loss: 0.6262 - val_accuracy: 0.6028

```
accuracy: 0.6028
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4743 - accuracy: 0.6375 - val_loss: 0.6318 - val_accuracy: 0.5981
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5027 - accuracy: 0.6118 - val_loss: 0.7103 - val_accuracy: 0.6308
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4821 - accuracy: 0.5913 - val_loss: 0.7157 - val_accuracy: 0.6121
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4743 - accuracy: 0.6247 - val_loss: 0.7277 - val_accuracy: 0.6121
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5338 - accuracy: 0.5913 - val_loss: 0.7473 - val_accuracy: 0.6308
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4408 - accuracy: 0.6324 - val_loss: 0.7280 - val_accuracy: 0.6262
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4076 - accuracy: 0.6221 - val_loss: 0.7269 - val_accuracy: 0.6215
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4608 - accuracy: 0.6015 - val_loss: 0.7221 - val_accuracy: 0.6168
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5014 - accuracy: 0.6375 - val_loss: 0.7152 - val_accuracy: 0.6262
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4912 - accuracy: 0.6324 - val_loss: 0.7139 - val_accuracy: 0.6168
Epoch 118/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4557 - accuracy: 0.6401 - val_loss: 0.7233 - val_accuracy: 0.6215
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4187 - accuracy: 0.6144 - val_loss: 0.7493 - val_accuracy: 0.6215
Epoch 120/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5092 - accuracy: 0.5835 - val_loss: 0.7068 - val_accuracy: 0.6121
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5555 - accuracy: 0.6401 - val_loss: 0.7351 - val_accuracy: 0.6168
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4815 - accuracy: 0.6350 - val_loss: 0.7114 - val_accuracy: 0.6075
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4754 - accuracy: 0.6632 - val_loss: 0.7283 - val_accuracy: 0.6215
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4489 - accuracy: 0.6504 - val_loss: 0.7307 - val_accuracy: 0.6168
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4701 - accuracy: 0.6530 - val_loss: 0.7235 - val_accuracy: 0.5935
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4148 - accuracy: 0.6632 - val_loss: 0.7304 - val_accuracy: 0.5841
Epoch 127/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4193 - accuracy: 0.6067 - val_loss: 0.8285 - val_accuracy: 0.5794
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4732 - accuracy: 0.6041 - val_loss: 0.8347 - val_accuracy: 0.5981
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4888 - accuracy: 0.5990 - val_loss: 0.8027 - val_accuracy: 0.6075
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4153 - accuracy: 0.6015 - val_loss: 0.8292 - val_accuracy: 0.6028
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4979 - accuracy: 0.6093 - val_loss: 0.8233 - val_accuracy: 0.5981
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4671 - accuracy: 0.5835 - val_loss: 0.7990 - val_accuracy: 0.6075
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4837 - accuracy: 0.5450 - val_loss: 0.8064 - val_accuracy: 0.6028
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4395 - accuracy: 0.5758 - val_loss: 0.8049 - val_accuracy: 0.6028
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4158 - accuracy: 0.5784 - val_loss: 0.7975 - val_accuracy: 0.5981
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4403 - accuracy: 0.5578 - val_loss: 0.8006 - val_accuracy: 0.5935
Epoch 137/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3936 - accuracy: 0.5656 - val_loss: 0.8009 - val_accuracy: 0.5748
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4390 - accuracy: 0.5398 - val_loss: 0.8022 - val_accuracy: 0.5654
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5006 - accuracy: 0.5219 - val_loss: 0.8178 - val_accuracy: 0.5981
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4200 - accuracy: 0.5578 - val_loss: 0.8708 - val_accuracy: 0.6028
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4983 - accuracy: 0.5604 - val_loss: 0.8364 - val_accuracy: 0.5888
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4742 - accuracy: 0.5450 - val_loss: 0.8355 - val_accuracy: 0.5794
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4094 - accuracy: 0.5707 - val_loss: 0.8291 - val_accuracy: 0.5701
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4345 - accuracy: 0.5604 - val_loss: 0.8516 - val_accuracy: 0.6075
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4296 - accuracy: 0.5476 - val_loss: 0.8740 - val_accuracy: 0.5794
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3660 - accuracy: 0.5527 - val_loss: 0.8333 - val_accuracy: 0.5841
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4543 - accuracy: 0.5141 - val_loss: 0.8286 - val_accuracy: 0.6075
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3773 - accuracy: 0.5810 - val_loss: 0.8070 - val_accuracy: 0.6075
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4063 - accuracy: 0.5707 - val_loss: 0.7942 - val_accuracy: 0.5794
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4263 - accuracy: 0.5398 - val_loss: 0.8043 - val_accuracy: 0.6028
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4259 - accuracy: 0.5707 - val_loss: 0.7990 - val_accuracy: 0.5888
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4249 - accuracy: 0.5835 - val_loss: 0.8670 - val_accuracy: 0.6075
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4159 - accuracy: 0.5681 - val_loss: 0.9048 - val_accuracy: 0.5841
Epoch 154/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3784 - accuracy: 0.5887 - val_loss: 0.8519 - val_accuracy: 0.5981
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4144 - accuracy: 0.5656 - val_loss: 0.9173 - val_accuracy: 0.5935
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4496 - accuracy: 0.5707 - val_loss: 0.8624 - val_accuracy: 0.5935
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5225 - accuracy: 0.5835 - val_loss: 0.7763 - val_accuracy: 0.5935
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4275 - accuracy: 0.5990 - val_loss: 0.7958 - val_accuracy: 0.5981
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4782 - accuracy: 0.5810 - val_loss: 0.8002 - val_accuracy: 0.6028
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4411 - accuracy: 0.5758 - val_loss: 0.8116 - val_accuracy: 0.5981
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3771 - accuracy: 0.5913 - val_loss: 0.8128 - val_accuracy: 0.5981
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4125 - accuracy: 0.5990 - val_loss: 0.8223 - val_accuracy: 0.5935
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4206 - accuracy: 0.5630 - val_loss: 0.9542 - val_accuracy: 0.5794
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3791 - accuracy: 0.5707 - val_loss: 1.0216 - val_accuracy: 0.5794
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4154 - accuracy: 0.5553 - val_loss: 1.0353 - val_accuracy: 0.5701
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5313 - accuracy: 0.5321 - val_loss: 1.0631 - val_accuracy: 0.5561
```

Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4066 - accuracy: 0.5630 - val_loss: 1.0652 - val_accuracy: 0.5561
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4179 - accuracy: 0.5476 - val_loss: 1.0953 - val_accuracy: 0.5514
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4200 - accuracy: 0.5373 - val_loss: 1.0656 - val_accuracy: 0.5467
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3936 - accuracy: 0.5424 - val_loss: 1.0320 - val_accuracy: 0.5654
Epoch 171/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4027 - accuracy: 0.5527 - val_loss: 0.9875 - val_accuracy: 0.5514
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4671 - accuracy: 0.5141 - val_loss: 0.9298 - val_accuracy: 0.5888
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3695 - accuracy: 0.5990 - val_loss: 1.0399 - val_accuracy: 0.5841
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4280 - accuracy: 0.6067 - val_loss: 1.0641 - val_accuracy: 0.5981
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3756 - accuracy: 0.5424 - val_loss: 1.0305 - val_accuracy: 0.6028
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4013 - accuracy: 0.5296 - val_loss: 1.0879 - val_accuracy: 0.5607
Epoch 177/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4034 - accuracy: 0.4936 - val_loss: 1.0895 - val_accuracy: 0.5561
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3571 - accuracy: 0.5347 - val_loss: 1.1167 - val_accuracy: 0.5514
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4018 - accuracy: 0.4961 - val_loss: 1.0561 - val_accuracy: 0.5561
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3589 - accuracy: 0.5167 - val_loss: 1.0900 - val_accuracy: 0.5748
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4024 - accuracy: 0.4987 - val_loss: 1.0948 - val_accuracy: 0.5748
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3615 - accuracy: 0.4884 - val_loss: 1.1112 - val_accuracy: 0.5748
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3668 - accuracy: 0.5373 - val_loss: 1.0284 - val_accuracy: 0.5935
Epoch 184/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3517 - accuracy: 0.5553 - val_loss: 1.0524 - val_accuracy: 0.5935
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3563 - accuracy: 0.5604 - val_loss: 1.0562 - val_accuracy: 0.6121
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4659 - accuracy: 0.5527 - val_loss: 0.9474 - val_accuracy: 0.5888
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3608 - accuracy: 0.5141 - val_loss: 0.9762 - val_accuracy: 0.5654
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4237 - accuracy: 0.5321 - val_loss: 1.0020 - val_accuracy: 0.5701
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4303 - accuracy: 0.5656 - val_loss: 1.0006 - val_accuracy: 0.5748
Epoch 190/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3913 - accuracy: 0.5758 - val_loss: 0.9965 - val_accuracy: 0.5654
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3679 - accuracy: 0.5424 - val_loss: 0.9891 - val_accuracy: 0.5607
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4210 - accuracy: 0.5450 - val_loss: 0.9683 - val_accuracy: 0.5561
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3981 - accuracy: 0.5681 - val_loss: 0.9678 - val_accuracy: 0.5561
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3640 - accuracy: 0.5476 - val_loss: 1.0044 - val_accuracy: 0.5467
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3826 - accuracy: 0.5373 - val_loss: 1.0308 - val_accuracy: 0.5467
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4323 - accuracy: 0.5398 - val_loss: 0.9877 - val_accuracy: 0.5467

```
accuracy: 0.5607
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4162 - accuracy: 0.5321 - val_loss: 0.9749 - val_accuracy: 0.5514
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4563 - accuracy: 0.5244 - val_loss: 0.9096 - val_accuracy: 0.5421
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3817 - accuracy: 0.4859 - val_loss: 1.0076 - val_accuracy: 0.5514
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4314 - accuracy: 0.5476 - val_loss: 1.0406 - val_accuracy: 0.5374
Epoch 201/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4584 - accuracy: 0.5373 - val_loss: 1.1950 - val_accuracy: 0.5514
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3810 - accuracy: 0.5630 - val_loss: 1.2151 - val_accuracy: 0.5467
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4293 - accuracy: 0.5244 - val_loss: 1.1089 - val_accuracy: 0.5514
Epoch 204/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3484 - accuracy: 0.5476 - val_loss: 1.2280 - val_accuracy: 0.5561
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3777 - accuracy: 0.5656 - val_loss: 1.1737 - val_accuracy: 0.5467
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4188 - accuracy: 0.5656 - val_loss: 1.2896 - val_accuracy: 0.6121
Epoch 207/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5591 - accuracy: 0.5193 - val_loss: 1.2184 - val_accuracy: 0.5841
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4407 - accuracy: 0.5784 - val_loss: 1.2077 - val_accuracy: 0.5701
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4246 - accuracy: 0.5398 - val_loss: 1.1003 - val_accuracy: 0.5794
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3846 - accuracy: 0.5913 - val_loss: 1.1018 - val_accuracy: 0.5841
Epoch 211/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3999 - accuracy: 0.5707 - val_loss: 1.1034 - val_accuracy: 0.5935
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3517 - accuracy: 0.5527 - val_loss: 0.9742 - val_accuracy: 0.5701
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3631 - accuracy: 0.5553 - val_loss: 0.9988 - val_accuracy: 0.5561
Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3675 - accuracy: 0.5630 - val_loss: 0.9303 - val_accuracy: 0.5327
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3846 - accuracy: 0.5733 - val_loss: 0.9413 - val_accuracy: 0.5187
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3529 - accuracy: 0.5810 - val_loss: 0.9796 - val_accuracy: 0.5421
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3651 - accuracy: 0.5270 - val_loss: 1.1004 - val_accuracy: 0.5561
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3345 - accuracy: 0.5578 - val_loss: 1.0328 - val_accuracy: 0.5467
Epoch 219/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4105 - accuracy: 0.5450 - val_loss: 0.9680 - val_accuracy: 0.5561
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3369 - accuracy: 0.5450 - val_loss: 1.0284 - val_accuracy: 0.5561
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3531 - accuracy: 0.5733 - val_loss: 0.9471 - val_accuracy: 0.5421
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3695 - accuracy: 0.5656 - val_loss: 0.8877 - val_accuracy: 0.5514
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3611 - accuracy: 0.5913 - val_loss: 0.9186 - val_accuracy: 0.5467
Epoch 224/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3616 - accuracy: 0.5373 - val_loss: 0.8875 - val_accuracy: 0.5514
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4220 - accuracy: 0.5835 - val_loss: 0.8863 - val_accuracy: 0.5607
Epoch 226/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3435 - accuracy: 0.5630 - val_loss: 0.8544 - val_accuracy: 0.5561
Epoch 227/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4177 - accuracy: 0.5938 - val_loss: 0.9015 - val_accuracy: 0.5514
Epoch 228/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3891 - accuracy: 0.5347 - val_loss: 0.8817 - val_accuracy: 0.5514
Epoch 229/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4329 - accuracy: 0.5938 - val_loss: 0.9402 - val_accuracy: 0.5607
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3542 - accuracy: 0.5964 - val_loss: 0.9937 - val_accuracy: 0.5701
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3891 - accuracy: 0.5810 - val_loss: 0.9901 - val_accuracy: 0.5654
Epoch 232/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4676 - accuracy: 0.5964 - val_loss: 0.9949 - val_accuracy: 0.5701
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4230 - accuracy: 0.6067 - val_loss: 0.9067 - val_accuracy: 0.5607
Epoch 234/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3382 - accuracy: 0.6144 - val_loss: 0.9063 - val_accuracy: 0.5701
Epoch 235/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3399 - accuracy: 0.6093 - val_loss: 0.9328 - val_accuracy: 0.5794
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3305 - accuracy: 0.6067 - val_loss: 0.9067 - val_accuracy: 0.5888
Epoch 237/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3773 - accuracy: 0.6015 - val_loss: 0.8397 - val_accuracy: 0.5654
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3690 - accuracy: 0.5733 - val_loss: 0.8419 - val_accuracy: 0.5748
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3785 - accuracy: 0.6067 - val_loss: 0.8605 - val_accuracy: 0.5841
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3512 - accuracy: 0.6041 - val_loss: 0.8625 - val_accuracy: 0.5888
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3776 - accuracy: 0.6118 - val_loss: 0.8448 - val_accuracy: 0.5841
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3405 - accuracy: 0.5604 - val_loss: 0.9131 - val_accuracy: 0.6075
Epoch 243/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3364 - accuracy: 0.6247 - val_loss: 0.7536 - val_accuracy: 0.5841
Epoch 244/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3533 - accuracy: 0.5861 - val_loss: 0.7454 - val_accuracy: 0.6028
Epoch 245/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4287 - accuracy: 0.5964 - val_loss: 0.7441 - val_accuracy: 0.5748
Epoch 246/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3713 - accuracy: 0.6093 - val_loss: 0.7435 - val_accuracy: 0.5748
Epoch 247/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3651 - accuracy: 0.5810 - val_loss: 0.7219 - val_accuracy: 0.5654
Epoch 248/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3289 - accuracy: 0.6093 - val_loss: 0.7197 - val_accuracy: 0.5794
Epoch 249/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3963 - accuracy: 0.5681 - val_loss: 0.7216 - val_accuracy: 0.5794
Epoch 250/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4555 - accuracy: 0.5887 - val_loss: 0.7182 - val_accuracy: 0.5841
Epoch 251/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3355 - accuracy: 0.5990 - val_loss: 0.7253 - val_accuracy: 0.5888
Epoch 252/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3847 - accuracy: 0.6015 - val_loss: 0.7177 - val_accuracy: 0.5935
Epoch 253/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4040 - accuracy: 0.5861 - val_loss: 0.7252 - val_accuracy: 0.5748
Epoch 254/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3356 - accuracy: 0.5758 - val_loss: 0.7130 - val_accuracy: 0.5794
Epoch 255/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3275 - accuracy: 0.6144 - val_loss: 0.7056 - val_accuracy: 0.5701
```

```

Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3211 - accuracy: 0.6015 - val_loss: 0.7044 - val_accuracy: 0.5701
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3891 - accuracy: 0.5938 - val_loss: 0.7039 - val_accuracy: 0.5607
Epoch 258/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3758 - accuracy: 0.6144 - val_loss: 0.7613 - val_accuracy: 0.5794
Epoch 259/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3814 - accuracy: 0.5781Restoring model weights from th
e end of the best epoch: 109.
4/4 [=====] - 0s 15ms/step - loss: 0.3670 - accuracy: 0.5990 - val_loss: 0.7668 - val_accuracy: 0.5888
Epoch 259: early stopping
2/2 [=====] - 0s 4ms/step - loss: 0.8564 - accuracy: 0.6977
[CV] END .....Dense1=25, Dense2=10; total time= 14.1s
Model: "sequential_19"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_76 (Dense)	(None, 25)	175
batch_normalization_57 (BatchNormalization)	(None, 25)	100
activation_57 (Activation)	(None, 25)	0
dense_77 (Dense)	(None, 25)	650
batch_normalization_58 (BatchNormalization)	(None, 25)	100
activation_58 (Activation)	(None, 25)	0
dense_78 (Dense)	(None, 10)	260
batch_normalization_59 (BatchNormalization)	(None, 10)	40
activation_59 (Activation)	(None, 10)	0
dense_79 (Dense)	(None, 2)	22
<hr/>		

Total params: 1,347
Trainable params: 1,227
Non-trainable params: 120

```

Epoch 1/1000
4/4 [=====] - 1s 55ms/step - loss: 5.0695 - accuracy: 0.5490 - val_loss: 4.2463 - val_accuracy: 0.5701
Epoch 2/1000
4/4 [=====] - 0s 15ms/step - loss: 4.2426 - accuracy: 0.5284 - val_loss: 4.3236 - val_accuracy: 0.5794
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 4.1402 - accuracy: 0.5490 - val_loss: 4.2058 - val_accuracy: 0.6121
Epoch 4/1000
4/4 [=====] - 0s 16ms/step - loss: 3.9815 - accuracy: 0.5541 - val_loss: 4.0101 - val_accuracy: 0.6168
Epoch 5/1000
4/4 [=====] - 0s 18ms/step - loss: 4.1092 - accuracy: 0.5129 - val_loss: 3.5184 - val_accuracy: 0.5421
Epoch 6/1000
4/4 [=====] - 0s 16ms/step - loss: 3.9032 - accuracy: 0.5180 - val_loss: 3.0899 - val_accuracy: 0.5421
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 3.8152 - accuracy: 0.5180 - val_loss: 2.8390 - val_accuracy: 0.4626
Epoch 8/1000
4/4 [=====] - 0s 15ms/step - loss: 3.6762 - accuracy: 0.5284 - val_loss: 2.5704 - val_accuracy: 0.5748
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5725 - accuracy: 0.6057 - val_loss: 2.4844 - val_accuracy: 0.5467
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5198 - accuracy: 0.5825 - val_loss: 2.3986 - val_accuracy: 0.5421
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5889 - accuracy: 0.5928 - val_loss: 2.2759 - val_accuracy: 0.5514
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4795 - accuracy: 0.5825 - val_loss: 2.0995 - val_accuracy: 0.5374
Epoch 13/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3595 - accuracy: 0.5876 - val_loss: 2.0445 - val_accuracy: 0.5421
Epoch 14/1000

```

```
4/4 [=====] - 0s 13ms/step - loss: 3.3800 - accuracy: 0.5644 - val_loss: 2.0188 - val_accuracy: 0.5327
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 3.2734 - accuracy: 0.5876 - val_loss: 2.0189 - val_accuracy: 0.5280
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3020 - accuracy: 0.5979 - val_loss: 1.9878 - val_accuracy: 0.5280
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 3.2480 - accuracy: 0.5747 - val_loss: 1.9116 - val_accuracy: 0.5374
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1064 - accuracy: 0.5928 - val_loss: 1.8884 - val_accuracy: 0.5561
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1245 - accuracy: 0.5851 - val_loss: 1.8680 - val_accuracy: 0.5561
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8519 - accuracy: 0.6031 - val_loss: 1.8401 - val_accuracy: 0.5561
Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 2.9840 - accuracy: 0.6057 - val_loss: 1.8207 - val_accuracy: 0.5514
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8794 - accuracy: 0.6031 - val_loss: 1.7973 - val_accuracy: 0.5467
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0885 - accuracy: 0.5851 - val_loss: 1.7747 - val_accuracy: 0.5514
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9280 - accuracy: 0.6082 - val_loss: 1.7045 - val_accuracy: 0.5467
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9877 - accuracy: 0.5670 - val_loss: 1.6759 - val_accuracy: 0.5467
Epoch 26/1000
4/4 [=====] - 0s 14ms/step - loss: 2.9645 - accuracy: 0.5928 - val_loss: 1.6120 - val_accuracy: 0.5374
Epoch 27/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7964 - accuracy: 0.5876 - val_loss: 1.5923 - val_accuracy: 0.5421
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9359 - accuracy: 0.5851 - val_loss: 1.5744 - val_accuracy: 0.5421
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7612 - accuracy: 0.6031 - val_loss: 1.5214 - val_accuracy: 0.5374
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6102 - accuracy: 0.6005 - val_loss: 1.4934 - val_accuracy: 0.5421
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6700 - accuracy: 0.5876 - val_loss: 1.4806 - val_accuracy: 0.5467
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5537 - accuracy: 0.6031 - val_loss: 1.4583 - val_accuracy: 0.5748
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3215 - accuracy: 0.6237 - val_loss: 1.4640 - val_accuracy: 0.5561
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4451 - accuracy: 0.6392 - val_loss: 1.4417 - val_accuracy: 0.5607
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0826 - accuracy: 0.6237 - val_loss: 1.4445 - val_accuracy: 0.5654
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1549 - accuracy: 0.6469 - val_loss: 1.4636 - val_accuracy: 0.5607
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0758 - accuracy: 0.6134 - val_loss: 1.5214 - val_accuracy: 0.5561
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0047 - accuracy: 0.6211 - val_loss: 1.4760 - val_accuracy: 0.5561
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8830 - accuracy: 0.6289 - val_loss: 1.5173 - val_accuracy: 0.5607
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9788 - accuracy: 0.6392 - val_loss: 1.4691 - val_accuracy: 0.5654
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9876 - accuracy: 0.6134 - val_loss: 1.3960 - val_accuracy: 0.5794
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8187 - accuracy: 0.6289 - val_loss: 1.3681 - val_accuracy: 0.5748
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8182 - accuracy: 0.6495 - val_loss: 1.3562 - val_accuracy: 0.5701
```

Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6617 - accuracy: 0.6289 - val_loss: 1.3412 - val_accuracy: 0.5701
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6645 - accuracy: 0.6701 - val_loss: 1.3370 - val_accuracy: 0.5794
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7716 - accuracy: 0.6263 - val_loss: 1.3477 - val_accuracy: 0.5794
Epoch 47/1000
4/4 [=====] - 0s 16ms/step - loss: 1.7550 - accuracy: 0.6443 - val_loss: 1.3371 - val_accuracy: 0.5888
Epoch 48/1000
4/4 [=====] - 0s 17ms/step - loss: 1.5846 - accuracy: 0.6314 - val_loss: 1.3991 - val_accuracy: 0.5888
Epoch 49/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5167 - accuracy: 0.6418 - val_loss: 1.3570 - val_accuracy: 0.5841
Epoch 50/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4273 - accuracy: 0.6495 - val_loss: 1.3471 - val_accuracy: 0.5888
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3743 - accuracy: 0.6366 - val_loss: 1.4124 - val_accuracy: 0.5888
Epoch 52/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5293 - accuracy: 0.6521 - val_loss: 1.4282 - val_accuracy: 0.5888
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3923 - accuracy: 0.6418 - val_loss: 1.4197 - val_accuracy: 0.5981
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3255 - accuracy: 0.6392 - val_loss: 1.4084 - val_accuracy: 0.5841
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4572 - accuracy: 0.6186 - val_loss: 1.4252 - val_accuracy: 0.5981
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2991 - accuracy: 0.6624 - val_loss: 1.4100 - val_accuracy: 0.5935
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3106 - accuracy: 0.6211 - val_loss: 1.3929 - val_accuracy: 0.5981
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3878 - accuracy: 0.5851 - val_loss: 1.3875 - val_accuracy: 0.5935
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2473 - accuracy: 0.6082 - val_loss: 1.3817 - val_accuracy: 0.6075
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1735 - accuracy: 0.6211 - val_loss: 1.3582 - val_accuracy: 0.6075
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1777 - accuracy: 0.6469 - val_loss: 1.2629 - val_accuracy: 0.6215
Epoch 62/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1650 - accuracy: 0.6418 - val_loss: 1.3035 - val_accuracy: 0.6168
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1087 - accuracy: 0.6289 - val_loss: 1.3036 - val_accuracy: 0.6168
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0697 - accuracy: 0.6649 - val_loss: 1.2704 - val_accuracy: 0.6168
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0595 - accuracy: 0.6340 - val_loss: 1.2857 - val_accuracy: 0.6121
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0666 - accuracy: 0.6546 - val_loss: 1.3017 - val_accuracy: 0.6168
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0316 - accuracy: 0.6598 - val_loss: 1.2934 - val_accuracy: 0.6168
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0523 - accuracy: 0.6778 - val_loss: 1.2921 - val_accuracy: 0.6215
Epoch 69/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1256 - accuracy: 0.6572 - val_loss: 1.2526 - val_accuracy: 0.6215
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1202 - accuracy: 0.6495 - val_loss: 1.2684 - val_accuracy: 0.6215
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0924 - accuracy: 0.6469 - val_loss: 1.2845 - val_accuracy: 0.6168
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1060 - accuracy: 0.6495 - val_loss: 1.3181 - val_accuracy: 0.6168
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0797 - accuracy: 0.6495 - val_loss: 1.2990 - val_accuracy: 0.6168

```
accuracy: 0.6168
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0217 - accuracy: 0.6314 - val_loss: 1.2913 - val_accuracy: 0.6215
Epoch 75/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0930 - accuracy: 0.6237 - val_loss: 1.2853 - val_accuracy: 0.5935
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9775 - accuracy: 0.6057 - val_loss: 1.2770 - val_accuracy: 0.5935
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0058 - accuracy: 0.6263 - val_loss: 1.2503 - val_accuracy: 0.5981
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0250 - accuracy: 0.6314 - val_loss: 1.2646 - val_accuracy: 0.5841
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9916 - accuracy: 0.6263 - val_loss: 1.2537 - val_accuracy: 0.5514
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9609 - accuracy: 0.6289 - val_loss: 1.2781 - val_accuracy: 0.5421
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9532 - accuracy: 0.6366 - val_loss: 1.2804 - val_accuracy: 0.5327
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8734 - accuracy: 0.6057 - val_loss: 1.2741 - val_accuracy: 0.5467
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8531 - accuracy: 0.5825 - val_loss: 1.2436 - val_accuracy: 0.5280
Epoch 84/1000
4/4 [=====] - 0s 16ms/step - loss: 0.9598 - accuracy: 0.6005 - val_loss: 1.2582 - val_accuracy: 0.4907
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8635 - accuracy: 0.5490 - val_loss: 1.2553 - val_accuracy: 0.4626
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8886 - accuracy: 0.5206 - val_loss: 1.2224 - val_accuracy: 0.4673
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8554 - accuracy: 0.5284 - val_loss: 1.2138 - val_accuracy: 0.4626
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8387 - accuracy: 0.5387 - val_loss: 1.2169 - val_accuracy: 0.4626
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8420 - accuracy: 0.5412 - val_loss: 1.2022 - val_accuracy: 0.4720
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9166 - accuracy: 0.5412 - val_loss: 1.1365 - val_accuracy: 0.4720
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8253 - accuracy: 0.5541 - val_loss: 1.1607 - val_accuracy: 0.4626
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8353 - accuracy: 0.5412 - val_loss: 1.1730 - val_accuracy: 0.4579
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8934 - accuracy: 0.5361 - val_loss: 1.1440 - val_accuracy: 0.4626
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7262 - accuracy: 0.5284 - val_loss: 1.1833 - val_accuracy: 0.4626
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8969 - accuracy: 0.5387 - val_loss: 1.1830 - val_accuracy: 0.4579
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8311 - accuracy: 0.5567 - val_loss: 1.1500 - val_accuracy: 0.4626
Epoch 97/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8052 - accuracy: 0.5387 - val_loss: 1.1659 - val_accuracy: 0.4673
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8515 - accuracy: 0.5387 - val_loss: 1.1605 - val_accuracy: 0.4626
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8185 - accuracy: 0.5309 - val_loss: 1.0827 - val_accuracy: 0.4626
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7964 - accuracy: 0.5284 - val_loss: 1.0743 - val_accuracy: 0.4860
Epoch 101/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7505 - accuracy: 0.5464 - val_loss: 1.0627 - val_accuracy: 0.4720
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8507 - accuracy: 0.5541 - val_loss: 1.0962 - val_accuracy: 0.4860
Epoch 103/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.7049 - accuracy: 0.5361 - val_loss: 1.1180 - val_accuracy: 0.4860
Epoch 104/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7458 - accuracy: 0.5464 - val_loss: 1.1119 - val_accuracy: 0.4860
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6780 - accuracy: 0.5490 - val_loss: 1.1074 - val_accuracy: 0.4907
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6963 - accuracy: 0.5412 - val_loss: 1.0580 - val_accuracy: 0.4813
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8103 - accuracy: 0.5464 - val_loss: 0.9734 - val_accuracy: 0.5093
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7719 - accuracy: 0.5593 - val_loss: 0.9661 - val_accuracy: 0.5140
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6873 - accuracy: 0.5619 - val_loss: 0.9007 - val_accuracy: 0.5093
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6840 - accuracy: 0.5825 - val_loss: 0.9277 - val_accuracy: 0.4860
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7224 - accuracy: 0.5438 - val_loss: 0.9458 - val_accuracy: 0.4860
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7213 - accuracy: 0.5799 - val_loss: 0.8730 - val_accuracy: 0.4907
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6106 - accuracy: 0.5825 - val_loss: 0.9275 - val_accuracy: 0.4907
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7078 - accuracy: 0.5696 - val_loss: 0.9170 - val_accuracy: 0.5000
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5935 - accuracy: 0.5696 - val_loss: 0.9087 - val_accuracy: 0.4953
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5985 - accuracy: 0.5928 - val_loss: 0.8762 - val_accuracy: 0.5047
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6381 - accuracy: 0.5438 - val_loss: 0.7725 - val_accuracy: 0.5047
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5794 - accuracy: 0.5902 - val_loss: 0.8603 - val_accuracy: 0.5093
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5516 - accuracy: 0.5851 - val_loss: 0.8385 - val_accuracy: 0.5000
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6205 - accuracy: 0.5722 - val_loss: 0.8302 - val_accuracy: 0.5093
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5996 - accuracy: 0.5979 - val_loss: 0.8268 - val_accuracy: 0.5140
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5180 - accuracy: 0.5825 - val_loss: 0.8226 - val_accuracy: 0.5187
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5667 - accuracy: 0.5619 - val_loss: 0.8162 - val_accuracy: 0.5140
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5592 - accuracy: 0.5851 - val_loss: 0.8528 - val_accuracy: 0.5234
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5918 - accuracy: 0.5979 - val_loss: 0.8773 - val_accuracy: 0.5234
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5050 - accuracy: 0.5954 - val_loss: 0.7196 - val_accuracy: 0.5234
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5877 - accuracy: 0.5799 - val_loss: 0.7670 - val_accuracy: 0.5140
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4941 - accuracy: 0.6005 - val_loss: 0.7653 - val_accuracy: 0.5140
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4857 - accuracy: 0.5954 - val_loss: 0.7422 - val_accuracy: 0.4860
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5011 - accuracy: 0.6521 - val_loss: 0.7414 - val_accuracy: 0.4813
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5147 - accuracy: 0.6314 - val_loss: 0.7359 - val_accuracy: 0.6168
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5971 - accuracy: 0.6856 - val_loss: 0.7412 - val_accuracy: 0.6308
```

Epoch 133/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4906 - accuracy: 0.7010 - val_loss: 0.7207 - val_accuracy: 0.6355
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5322 - accuracy: 0.6727 - val_loss: 0.7704 - val_accuracy: 0.6215
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4632 - accuracy: 0.6778 - val_loss: 0.7360 - val_accuracy: 0.6262
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4655 - accuracy: 0.6830 - val_loss: 0.7063 - val_accuracy: 0.6776
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4605 - accuracy: 0.6649 - val_loss: 0.7441 - val_accuracy: 0.5234
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5483 - accuracy: 0.6057 - val_loss: 0.7722 - val_accuracy: 0.6262
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4497 - accuracy: 0.6753 - val_loss: 0.7284 - val_accuracy: 0.6355
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4128 - accuracy: 0.6907 - val_loss: 0.7258 - val_accuracy: 0.5374
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4737 - accuracy: 0.6289 - val_loss: 0.7728 - val_accuracy: 0.5467
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4281 - accuracy: 0.5954 - val_loss: 0.7411 - val_accuracy: 0.5561
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4504 - accuracy: 0.6263 - val_loss: 0.7203 - val_accuracy: 0.6589
Epoch 144/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4278 - accuracy: 0.6572 - val_loss: 0.7619 - val_accuracy: 0.5467
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4742 - accuracy: 0.6108 - val_loss: 0.8127 - val_accuracy: 0.5514
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4831 - accuracy: 0.6314 - val_loss: 0.8074 - val_accuracy: 0.6776
Epoch 147/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5133 - accuracy: 0.6959 - val_loss: 0.7790 - val_accuracy: 0.6542
Epoch 148/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4679 - accuracy: 0.6804 - val_loss: 0.7788 - val_accuracy: 0.6355
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4843 - accuracy: 0.7062 - val_loss: 0.7567 - val_accuracy: 0.6449
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4880 - accuracy: 0.6830 - val_loss: 0.7510 - val_accuracy: 0.6355
Epoch 151/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4652 - accuracy: 0.7010 - val_loss: 0.6983 - val_accuracy: 0.6262
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4747 - accuracy: 0.6985 - val_loss: 0.6915 - val_accuracy: 0.6402
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4458 - accuracy: 0.6675 - val_loss: 0.6641 - val_accuracy: 0.6355
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4793 - accuracy: 0.6907 - val_loss: 0.6560 - val_accuracy: 0.6355
Epoch 155/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4301 - accuracy: 0.7010 - val_loss: 0.6513 - val_accuracy: 0.6262
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4862 - accuracy: 0.6701 - val_loss: 0.6835 - val_accuracy: 0.6355
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4317 - accuracy: 0.6933 - val_loss: 0.6804 - val_accuracy: 0.6449
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4583 - accuracy: 0.7191 - val_loss: 0.6826 - val_accuracy: 0.6402
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3983 - accuracy: 0.7036 - val_loss: 0.7330 - val_accuracy: 0.6121
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4493 - accuracy: 0.6907 - val_loss: 0.7313 - val_accuracy: 0.5748
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4122 - accuracy: 0.6804 - val_loss: 0.7495 - val_accuracy: 0.6308
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4073 - accuracy: 0.6959 - val_loss: 0.7491 - val_accuracy: 0.6308

```
accuracy: 0.6168
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4424 - accuracy: 0.6933 - val_loss: 0.7508 - val_
accuracy: 0.6121
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5214 - accuracy: 0.6881 - val_loss: 0.7502 - val_
accuracy: 0.6215
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4006 - accuracy: 0.6907 - val_loss: 0.7285 - val_
accuracy: 0.6215
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4287 - accuracy: 0.6778 - val_loss: 0.7482 - val_
accuracy: 0.6262
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4605 - accuracy: 0.6959 - val_loss: 0.6783 - val_
accuracy: 0.6449
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4355 - accuracy: 0.7216 - val_loss: 0.6789 - val_
accuracy: 0.6215
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3923 - accuracy: 0.6675 - val_loss: 0.6492 - val_
accuracy: 0.6121
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3742 - accuracy: 0.6881 - val_loss: 0.6752 - val_
accuracy: 0.6262
Epoch 171/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4201 - accuracy: 0.7010 - val_loss: 0.6922 - val_
accuracy: 0.6355
Epoch 172/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4576 - accuracy: 0.7010 - val_loss: 0.6638 - val_
accuracy: 0.6168
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4435 - accuracy: 0.6881 - val_loss: 0.6683 - val_
accuracy: 0.6215
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4430 - accuracy: 0.6675 - val_loss: 0.6848 - val_
accuracy: 0.6168
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4338 - accuracy: 0.6959 - val_loss: 0.6546 - val_
accuracy: 0.5981
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4005 - accuracy: 0.6959 - val_loss: 0.6504 - val_
accuracy: 0.5888
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4144 - accuracy: 0.6933 - val_loss: 0.6501 - val_
accuracy: 0.5841
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4394 - accuracy: 0.7036 - val_loss: 0.6786 - val_
accuracy: 0.6028
Epoch 179/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4313 - accuracy: 0.6985 - val_loss: 0.6505 - val_
accuracy: 0.6075
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3811 - accuracy: 0.7010 - val_loss: 0.6805 - val_
accuracy: 0.6121
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4902 - accuracy: 0.6830 - val_loss: 0.6805 - val_
accuracy: 0.6121
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4169 - accuracy: 0.6933 - val_loss: 0.6801 - val_
accuracy: 0.6168
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3987 - accuracy: 0.6907 - val_loss: 0.6776 - val_
accuracy: 0.6121
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3956 - accuracy: 0.6804 - val_loss: 0.6754 - val_
accuracy: 0.6215
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3879 - accuracy: 0.7191 - val_loss: 0.6748 - val_
accuracy: 0.6121
Epoch 186/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4541 - accuracy: 0.6933 - val_loss: 0.6796 - val_
accuracy: 0.6168
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4390 - accuracy: 0.7010 - val_loss: 0.6806 - val_
accuracy: 0.6215
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4132 - accuracy: 0.7139 - val_loss: 0.7032 - val_
accuracy: 0.6028
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4218 - accuracy: 0.7036 - val_loss: 0.7029 - val_
accuracy: 0.6075
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4486 - accuracy: 0.6778 - val_loss: 0.7275 - val_
accuracy: 0.5841
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4824 - accuracy: 0.6804 - val_loss: 0.6767 - val_
accuracy: 0.6028
Epoch 192/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.4363 - accuracy: 0.7088 - val_loss: 0.7054 - val_accuracy: 0.6121
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4830 - accuracy: 0.6572 - val_loss: 0.6280 - val_accuracy: 0.6121
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4592 - accuracy: 0.7113 - val_loss: 0.6255 - val_accuracy: 0.6075
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4454 - accuracy: 0.7010 - val_loss: 0.6269 - val_accuracy: 0.6075
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5339 - accuracy: 0.6856 - val_loss: 0.6286 - val_accuracy: 0.6075
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4601 - accuracy: 0.6727 - val_loss: 0.7020 - val_accuracy: 0.6075
Epoch 198/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4182 - accuracy: 0.7010 - val_loss: 0.7006 - val_accuracy: 0.5748
Epoch 199/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3921 - accuracy: 0.6778 - val_loss: 0.7039 - val_accuracy: 0.5935
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5317 - accuracy: 0.6804 - val_loss: 0.6332 - val_accuracy: 0.6028
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3443 - accuracy: 0.7010 - val_loss: 0.6273 - val_accuracy: 0.5888
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4105 - accuracy: 0.6856 - val_loss: 0.6273 - val_accuracy: 0.5981
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3754 - accuracy: 0.6959 - val_loss: 0.6253 - val_accuracy: 0.5888
Epoch 204/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3922 - accuracy: 0.7165 - val_loss: 0.6276 - val_accuracy: 0.5888
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3466 - accuracy: 0.6959 - val_loss: 0.6541 - val_accuracy: 0.5841
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4634 - accuracy: 0.6753 - val_loss: 0.7056 - val_accuracy: 0.5841
Epoch 207/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3892 - accuracy: 0.6753 - val_loss: 0.7085 - val_accuracy: 0.5701
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4465 - accuracy: 0.6649 - val_loss: 0.6462 - val_accuracy: 0.5748
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4195 - accuracy: 0.6649 - val_loss: 0.6824 - val_accuracy: 0.5748
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4418 - accuracy: 0.6856 - val_loss: 0.7343 - val_accuracy: 0.5701
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3437 - accuracy: 0.6881 - val_loss: 0.7675 - val_accuracy: 0.5654
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4092 - accuracy: 0.6856 - val_loss: 0.7118 - val_accuracy: 0.5794
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3723 - accuracy: 0.6753 - val_loss: 0.7463 - val_accuracy: 0.5607
Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4005 - accuracy: 0.6804 - val_loss: 0.7208 - val_accuracy: 0.5607
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3569 - accuracy: 0.6649 - val_loss: 0.7684 - val_accuracy: 0.5701
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4194 - accuracy: 0.6701 - val_loss: 0.7586 - val_accuracy: 0.5467
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4238 - accuracy: 0.6727 - val_loss: 0.7990 - val_accuracy: 0.5654
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4323 - accuracy: 0.6443 - val_loss: 0.7246 - val_accuracy: 0.5607
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4106 - accuracy: 0.6624 - val_loss: 0.7222 - val_accuracy: 0.5561
Epoch 220/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3603 - accuracy: 0.6624 - val_loss: 0.7474 - val_accuracy: 0.5607
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3740 - accuracy: 0.6546 - val_loss: 0.7219 - val_accuracy: 0.5654
```

Epoch 222/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3743 - accuracy: 0.6624 - val_loss: 0.6908 - val_accuracy: 0.5561
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3721 - accuracy: 0.6572 - val_loss: 0.6929 - val_accuracy: 0.5561
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3703 - accuracy: 0.6804 - val_loss: 0.7204 - val_accuracy: 0.5327
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3630 - accuracy: 0.6366 - val_loss: 0.7222 - val_accuracy: 0.5327
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3850 - accuracy: 0.6418 - val_loss: 0.7240 - val_accuracy: 0.5187
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3348 - accuracy: 0.6495 - val_loss: 0.7561 - val_accuracy: 0.5093
Epoch 228/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3814 - accuracy: 0.6108 - val_loss: 0.7436 - val_accuracy: 0.4813
Epoch 229/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3860 - accuracy: 0.6211 - val_loss: 0.7449 - val_accuracy: 0.4907
Epoch 230/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3218 - accuracy: 0.5979 - val_loss: 0.7717 - val_accuracy: 0.4813
Epoch 231/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3300 - accuracy: 0.6134 - val_loss: 0.7287 - val_accuracy: 0.5000
Epoch 232/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3974 - accuracy: 0.5747 - val_loss: 0.8030 - val_accuracy: 0.4907
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3951 - accuracy: 0.5979 - val_loss: 0.7827 - val_accuracy: 0.4953
Epoch 234/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3547 - accuracy: 0.6160 - val_loss: 0.8283 - val_accuracy: 0.5000
Epoch 235/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3762 - accuracy: 0.5979 - val_loss: 0.8348 - val_accuracy: 0.4953
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3284 - accuracy: 0.5825 - val_loss: 0.8383 - val_accuracy: 0.4953
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3343 - accuracy: 0.5515 - val_loss: 0.8147 - val_accuracy: 0.4813
Epoch 238/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4196 - accuracy: 0.5619 - val_loss: 0.7483 - val_accuracy: 0.4860
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3089 - accuracy: 0.6005 - val_loss: 0.7179 - val_accuracy: 0.5047
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3337 - accuracy: 0.5799 - val_loss: 0.7205 - val_accuracy: 0.5000
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3562 - accuracy: 0.5928 - val_loss: 0.7165 - val_accuracy: 0.4953
Epoch 242/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3714 - accuracy: 0.5773 - val_loss: 0.7393 - val_accuracy: 0.5047
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3569 - accuracy: 0.6082 - val_loss: 0.7098 - val_accuracy: 0.5000
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3867 - accuracy: 0.5799 - val_loss: 0.7104 - val_accuracy: 0.4953
Epoch 245/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4085 - accuracy: 0.5722 - val_loss: 0.7162 - val_accuracy: 0.5047
Epoch 246/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3384 - accuracy: 0.6211 - val_loss: 0.7117 - val_accuracy: 0.4953
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3749 - accuracy: 0.5722 - val_loss: 0.7503 - val_accuracy: 0.4860
Epoch 248/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3357 - accuracy: 0.6005 - val_loss: 0.7465 - val_accuracy: 0.4860
Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3770 - accuracy: 0.6108 - val_loss: 0.7503 - val_accuracy: 0.4860
Epoch 250/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3456 - accuracy: 0.5979 - val_loss: 0.7431 - val_accuracy: 0.4626
Epoch 251/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3073 - accuracy: 0.5799 - val_loss: 0.7657 - val_accuracy: 0.4626

```
accuracy: 0.4673
Epoch 252/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4208 - accuracy: 0.5567 - val_loss: 0.7395 - val_accuracy: 0.4673
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3142 - accuracy: 0.5954 - val_loss: 0.7383 - val_accuracy: 0.4626
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3945 - accuracy: 0.5722 - val_loss: 0.7362 - val_accuracy: 0.4626
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3547 - accuracy: 0.6031 - val_loss: 0.7340 - val_accuracy: 0.4813
Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3749 - accuracy: 0.5799 - val_loss: 0.7902 - val_accuracy: 0.4953
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3321 - accuracy: 0.5464 - val_loss: 0.7900 - val_accuracy: 0.5047
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2996 - accuracy: 0.5696 - val_loss: 0.7885 - val_accuracy: 0.5047
Epoch 259/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3392 - accuracy: 0.5515 - val_loss: 0.7079 - val_accuracy: 0.5140
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4810 - accuracy: 0.6057 - val_loss: 0.7077 - val_accuracy: 0.5140
Epoch 261/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3146 - accuracy: 0.5928 - val_loss: 0.7279 - val_accuracy: 0.5187
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3662 - accuracy: 0.5954 - val_loss: 0.7267 - val_accuracy: 0.4953
Epoch 263/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3673 - accuracy: 0.6005 - val_loss: 0.7266 - val_accuracy: 0.5000
Epoch 264/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3703 - accuracy: 0.5722 - val_loss: 0.7008 - val_accuracy: 0.5000
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3307 - accuracy: 0.5928 - val_loss: 0.7017 - val_accuracy: 0.5047
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3210 - accuracy: 0.5928 - val_loss: 0.7222 - val_accuracy: 0.4907
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3589 - accuracy: 0.5851 - val_loss: 0.6649 - val_accuracy: 0.4860
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3832 - accuracy: 0.5387 - val_loss: 0.6640 - val_accuracy: 0.4953
Epoch 269/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2997 - accuracy: 0.5799 - val_loss: 0.6627 - val_accuracy: 0.4860
Epoch 270/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3195 - accuracy: 0.5619 - val_loss: 0.6628 - val_accuracy: 0.4720
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3279 - accuracy: 0.5825 - val_loss: 0.6649 - val_accuracy: 0.4813
Epoch 272/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3388 - accuracy: 0.5644 - val_loss: 0.6143 - val_accuracy: 0.4860
Epoch 273/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3314 - accuracy: 0.6031 - val_loss: 0.6141 - val_accuracy: 0.4673
Epoch 274/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2939 - accuracy: 0.6263 - val_loss: 0.6135 - val_accuracy: 0.4720
Epoch 275/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3045 - accuracy: 0.5619 - val_loss: 0.6182 - val_accuracy: 0.4860
Epoch 276/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3061 - accuracy: 0.5928 - val_loss: 0.6479 - val_accuracy: 0.4907
Epoch 277/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2990 - accuracy: 0.5773 - val_loss: 0.6142 - val_accuracy: 0.5000
Epoch 278/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3312 - accuracy: 0.5979 - val_loss: 0.7024 - val_accuracy: 0.5187
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3542 - accuracy: 0.6031 - val_loss: 0.6707 - val_accuracy: 0.5187
Epoch 280/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4938 - accuracy: 0.6082 - val_loss: 0.6707 - val_accuracy: 0.5234
Epoch 281/1000
```

```

4/4 [=====] - 0s 11ms/step - loss: 0.3132 - accuracy: 0.6160 - val_loss: 0.6220 - val_accuracy: 0.5140
Epoch 282/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3186 - accuracy: 0.6186 - val_loss: 0.6232 - val_accuracy: 0.4907
Epoch 283/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3211 - accuracy: 0.6031 - val_loss: 0.5770 - val_accuracy: 0.4907
Epoch 284/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3522 - accuracy: 0.5928 - val_loss: 0.5929 - val_accuracy: 0.4813
Epoch 285/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4362 - accuracy: 0.5954 - val_loss: 0.6236 - val_accuracy: 0.4720
Epoch 286/1000
1/4 [====>.....] - ETA: 0s - loss: 0.2852 - accuracy: 0.5625Restoring model weights from the end of the best epoch: 136.
4/4 [=====] - 0s 15ms/step - loss: 0.3511 - accuracy: 0.6031 - val_loss: 0.6320 - val_accuracy: 0.4813
Epoch 286: early stopping
2/2 [=====] - 0s 4ms/step - loss: 1.1546 - accuracy: 0.5227
[CV] END .....Dense1=25, Dense2=25; total time= 14.7s
Model: "sequential_20"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_80 (Dense)	(None, 25)	175
<hr/>		
batch_normalization_60 (BatchNormalization)	(None, 25)	100
activation_60 (Activation)	(None, 25)	0
dense_81 (Dense)	(None, 25)	650
batch_normalization_61 (BatchNormalization)	(None, 25)	100
activation_61 (Activation)	(None, 25)	0
dense_82 (Dense)	(None, 10)	260
batch_normalization_62 (BatchNormalization)	(None, 10)	40
activation_62 (Activation)	(None, 10)	0
dense_83 (Dense)	(None, 2)	22
<hr/>		
Total params: 1,347		
Trainable params: 1,227		
Non-trainable params: 120		

```

Epoch 1/1000
4/4 [=====] - 1s 61ms/step - loss: 5.7211 - accuracy: 0.5438 - val_loss: 7.2056 - val_accuracy: 0.4393
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 4.3063 - accuracy: 0.5979 - val_loss: 6.9359 - val_accuracy: 0.4579
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 3.9171 - accuracy: 0.6263 - val_loss: 6.2939 - val_accuracy: 0.5280
Epoch 4/1000
4/4 [=====] - 0s 15ms/step - loss: 3.7663 - accuracy: 0.6289 - val_loss: 5.5382 - val_accuracy: 0.5701
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 3.6584 - accuracy: 0.6211 - val_loss: 5.0839 - val_accuracy: 0.5888
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 3.3164 - accuracy: 0.6263 - val_loss: 4.6488 - val_accuracy: 0.5748
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 3.3619 - accuracy: 0.6160 - val_loss: 4.2556 - val_accuracy: 0.5981
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2758 - accuracy: 0.6289 - val_loss: 3.9810 - val_accuracy: 0.5888
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1226 - accuracy: 0.6057 - val_loss: 3.6093 - val_accuracy: 0.5701
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8808 - accuracy: 0.6624 - val_loss: 2.9220 - val_accuracy: 0.5794
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9693 - accuracy: 0.6031 - val_loss: 2.6027 - val_accuracy: 0.5701
Epoch 12/1000
4/4 [=====] - 0s 15ms/step - loss: 2.8146 - accuracy: 0.6443 - val_loss: 2.4785 - val_

```

accuracy: 0.5561
Epoch 13/1000
4/4 [=====] - 0s 16ms/step - loss: 2.7178 - accuracy: 0.6263 - val_loss: 2.2900 - val_accuracy: 0.5654
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8095 - accuracy: 0.6263 - val_loss: 2.1678 - val_accuracy: 0.5701
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7930 - accuracy: 0.6237 - val_loss: 2.0902 - val_accuracy: 0.5748
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7500 - accuracy: 0.6469 - val_loss: 2.0700 - val_accuracy: 0.5654
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6089 - accuracy: 0.6469 - val_loss: 2.0412 - val_accuracy: 0.5654
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5944 - accuracy: 0.6392 - val_loss: 2.0122 - val_accuracy: 0.5607
Epoch 19/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5952 - accuracy: 0.6031 - val_loss: 1.9826 - val_accuracy: 0.5654
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4307 - accuracy: 0.6340 - val_loss: 1.9542 - val_accuracy: 0.5654
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4032 - accuracy: 0.6495 - val_loss: 1.8828 - val_accuracy: 0.5701
Epoch 22/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3569 - accuracy: 0.6778 - val_loss: 1.8311 - val_accuracy: 0.5701
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3401 - accuracy: 0.6521 - val_loss: 1.7924 - val_accuracy: 0.5607
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2010 - accuracy: 0.6443 - val_loss: 1.7587 - val_accuracy: 0.5654
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1892 - accuracy: 0.6521 - val_loss: 1.7251 - val_accuracy: 0.5654
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1918 - accuracy: 0.6572 - val_loss: 1.6859 - val_accuracy: 0.5748
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0835 - accuracy: 0.6340 - val_loss: 1.6724 - val_accuracy: 0.5701
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1977 - accuracy: 0.6469 - val_loss: 1.6467 - val_accuracy: 0.5607
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0738 - accuracy: 0.6546 - val_loss: 1.6393 - val_accuracy: 0.5561
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1440 - accuracy: 0.6134 - val_loss: 1.6210 - val_accuracy: 0.5654
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1005 - accuracy: 0.6366 - val_loss: 1.6150 - val_accuracy: 0.5654
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1289 - accuracy: 0.6572 - val_loss: 1.6106 - val_accuracy: 0.5701
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0734 - accuracy: 0.6366 - val_loss: 1.6050 - val_accuracy: 0.5748
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0664 - accuracy: 0.6314 - val_loss: 1.5938 - val_accuracy: 0.5794
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1079 - accuracy: 0.6289 - val_loss: 1.5817 - val_accuracy: 0.5841
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1042 - accuracy: 0.6366 - val_loss: 1.5738 - val_accuracy: 0.5935
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1165 - accuracy: 0.6211 - val_loss: 1.5536 - val_accuracy: 0.5935
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8917 - accuracy: 0.6392 - val_loss: 1.5478 - val_accuracy: 0.6075
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8922 - accuracy: 0.6314 - val_loss: 1.5375 - val_accuracy: 0.6028
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9520 - accuracy: 0.6546 - val_loss: 1.5236 - val_accuracy: 0.6636
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8455 - accuracy: 0.6598 - val_loss: 1.5241 - val_accuracy: 0.6262
Epoch 42/1000

```
4/4 [=====] - 0s 13ms/step - loss: 1.8540 - accuracy: 0.6469 - val_loss: 1.5057 - val_accuracy: 0.6729
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8705 - accuracy: 0.6727 - val_loss: 1.5011 - val_accuracy: 0.6215
Epoch 44/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7546 - accuracy: 0.6495 - val_loss: 1.4918 - val_accuracy: 0.6215
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9244 - accuracy: 0.6598 - val_loss: 1.4850 - val_accuracy: 0.6168
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8310 - accuracy: 0.6418 - val_loss: 1.4753 - val_accuracy: 0.6168
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7221 - accuracy: 0.6289 - val_loss: 1.4613 - val_accuracy: 0.6168
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9044 - accuracy: 0.6263 - val_loss: 1.4545 - val_accuracy: 0.6262
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8103 - accuracy: 0.6521 - val_loss: 1.4382 - val_accuracy: 0.6215
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7574 - accuracy: 0.6495 - val_loss: 1.4238 - val_accuracy: 0.6121
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6798 - accuracy: 0.6443 - val_loss: 1.4002 - val_accuracy: 0.6075
Epoch 52/1000
4/4 [=====] - 0s 11ms/step - loss: 1.6725 - accuracy: 0.6314 - val_loss: 1.3877 - val_accuracy: 0.6168
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7439 - accuracy: 0.6289 - val_loss: 1.3793 - val_accuracy: 0.6262
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6139 - accuracy: 0.6624 - val_loss: 1.4092 - val_accuracy: 0.6075
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6480 - accuracy: 0.6418 - val_loss: 1.3945 - val_accuracy: 0.6075
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5414 - accuracy: 0.6392 - val_loss: 1.4271 - val_accuracy: 0.6028
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6274 - accuracy: 0.6598 - val_loss: 1.4097 - val_accuracy: 0.6028
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4311 - accuracy: 0.6572 - val_loss: 1.3956 - val_accuracy: 0.5794
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4637 - accuracy: 0.6521 - val_loss: 1.3885 - val_accuracy: 0.5935
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3945 - accuracy: 0.6392 - val_loss: 1.3775 - val_accuracy: 0.6075
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3034 - accuracy: 0.6469 - val_loss: 1.3657 - val_accuracy: 0.6402
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2509 - accuracy: 0.6804 - val_loss: 1.3692 - val_accuracy: 0.6121
Epoch 63/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2699 - accuracy: 0.6418 - val_loss: 1.3909 - val_accuracy: 0.6075
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2462 - accuracy: 0.6186 - val_loss: 1.3775 - val_accuracy: 0.6028
Epoch 65/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1715 - accuracy: 0.6418 - val_loss: 1.3607 - val_accuracy: 0.5981
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1640 - accuracy: 0.6675 - val_loss: 1.3526 - val_accuracy: 0.6168
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1749 - accuracy: 0.6469 - val_loss: 1.3390 - val_accuracy: 0.6215
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1482 - accuracy: 0.6521 - val_loss: 1.3282 - val_accuracy: 0.6215
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2340 - accuracy: 0.6469 - val_loss: 1.3197 - val_accuracy: 0.6215
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1313 - accuracy: 0.6314 - val_loss: 1.3125 - val_accuracy: 0.6215
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0376 - accuracy: 0.6598 - val_loss: 1.3279 - val_accuracy: 0.6215
```

Epoch 72/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1359 - accuracy: 0.6366 - val_loss: 1.2901 - val_accuracy: 0.6168
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0074 - accuracy: 0.6314 - val_loss: 1.2802 - val_accuracy: 0.6215
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9921 - accuracy: 0.6598 - val_loss: 1.2759 - val_accuracy: 0.6168
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0329 - accuracy: 0.6495 - val_loss: 1.2707 - val_accuracy: 0.6262
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0498 - accuracy: 0.6598 - val_loss: 1.2488 - val_accuracy: 0.6402
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0715 - accuracy: 0.6495 - val_loss: 1.2661 - val_accuracy: 0.6355
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0261 - accuracy: 0.6572 - val_loss: 1.2615 - val_accuracy: 0.6355
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0392 - accuracy: 0.6237 - val_loss: 1.2548 - val_accuracy: 0.6355
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0000 - accuracy: 0.6418 - val_loss: 1.2648 - val_accuracy: 0.6355
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0339 - accuracy: 0.6624 - val_loss: 1.2430 - val_accuracy: 0.6402
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9401 - accuracy: 0.6649 - val_loss: 1.2415 - val_accuracy: 0.6402
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0270 - accuracy: 0.6675 - val_loss: 1.2384 - val_accuracy: 0.6402
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9836 - accuracy: 0.6675 - val_loss: 1.2371 - val_accuracy: 0.6402
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9731 - accuracy: 0.6649 - val_loss: 1.2338 - val_accuracy: 0.6402
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8956 - accuracy: 0.6649 - val_loss: 1.2311 - val_accuracy: 0.6495
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9144 - accuracy: 0.6418 - val_loss: 1.2292 - val_accuracy: 0.6495
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9912 - accuracy: 0.6572 - val_loss: 1.2284 - val_accuracy: 0.6449
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9089 - accuracy: 0.6572 - val_loss: 1.2243 - val_accuracy: 0.6449
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9691 - accuracy: 0.6418 - val_loss: 1.2222 - val_accuracy: 0.6355
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8767 - accuracy: 0.6418 - val_loss: 1.2188 - val_accuracy: 0.6308
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9310 - accuracy: 0.6521 - val_loss: 1.2187 - val_accuracy: 0.6355
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9760 - accuracy: 0.6727 - val_loss: 1.2131 - val_accuracy: 0.6215
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8992 - accuracy: 0.6521 - val_loss: 1.2092 - val_accuracy: 0.6168
Epoch 95/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9866 - accuracy: 0.6649 - val_loss: 1.2113 - val_accuracy: 0.6215
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9279 - accuracy: 0.6469 - val_loss: 1.2004 - val_accuracy: 0.6262
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9346 - accuracy: 0.6521 - val_loss: 1.2047 - val_accuracy: 0.6262
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9116 - accuracy: 0.6469 - val_loss: 1.1649 - val_accuracy: 0.6215
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9873 - accuracy: 0.6624 - val_loss: 1.1936 - val_accuracy: 0.6168
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9522 - accuracy: 0.6263 - val_loss: 1.1919 - val_accuracy: 0.6168
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9241 - accuracy: 0.6598 - val_loss: 1.1891 - val_accuracy: 0.6168

```
accuracy: 0.6168
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9045 - accuracy: 0.6572 - val_loss: 1.1905 - val_
accuracy: 0.6168
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8997 - accuracy: 0.6572 - val_loss: 1.1858 - val_
accuracy: 0.6168
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8521 - accuracy: 0.6598 - val_loss: 1.1583 - val_
accuracy: 0.6262
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9041 - accuracy: 0.6418 - val_loss: 1.1531 - val_
accuracy: 0.6355
Epoch 106/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8553 - accuracy: 0.6624 - val_loss: 1.1849 - val_
accuracy: 0.6308
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8834 - accuracy: 0.6598 - val_loss: 1.2080 - val_
accuracy: 0.6308
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8583 - accuracy: 0.6598 - val_loss: 1.2095 - val_
accuracy: 0.6402
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7816 - accuracy: 0.6572 - val_loss: 1.2083 - val_
accuracy: 0.6308
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7990 - accuracy: 0.6598 - val_loss: 1.1948 - val_
accuracy: 0.6355
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8714 - accuracy: 0.6469 - val_loss: 1.1894 - val_
accuracy: 0.6308
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7947 - accuracy: 0.6701 - val_loss: 1.2188 - val_
accuracy: 0.6308
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8568 - accuracy: 0.6572 - val_loss: 1.2404 - val_
accuracy: 0.6308
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7855 - accuracy: 0.6598 - val_loss: 1.2650 - val_
accuracy: 0.6262
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8304 - accuracy: 0.6701 - val_loss: 1.2418 - val_
accuracy: 0.6308
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8787 - accuracy: 0.6727 - val_loss: 1.2158 - val_
accuracy: 0.6308
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8368 - accuracy: 0.6392 - val_loss: 1.2328 - val_
accuracy: 0.6449
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8683 - accuracy: 0.6572 - val_loss: 1.2531 - val_
accuracy: 0.6449
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8622 - accuracy: 0.6418 - val_loss: 1.1987 - val_
accuracy: 0.6449
Epoch 120/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8192 - accuracy: 0.6418 - val_loss: 1.3337 - val_
accuracy: 0.6449
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8971 - accuracy: 0.6263 - val_loss: 1.3421 - val_
accuracy: 0.6449
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8355 - accuracy: 0.6727 - val_loss: 1.3578 - val_
accuracy: 0.6355
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7905 - accuracy: 0.6572 - val_loss: 1.3611 - val_
accuracy: 0.6262
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8350 - accuracy: 0.6624 - val_loss: 1.4038 - val_
accuracy: 0.6402
Epoch 125/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8191 - accuracy: 0.6469 - val_loss: 1.4099 - val_
accuracy: 0.6355
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7387 - accuracy: 0.6469 - val_loss: 1.4353 - val_
accuracy: 0.6449
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8379 - accuracy: 0.6701 - val_loss: 1.4733 - val_
accuracy: 0.6449
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8675 - accuracy: 0.6598 - val_loss: 1.4450 - val_
accuracy: 0.6495
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8162 - accuracy: 0.6392 - val_loss: 1.4265 - val_
accuracy: 0.6495
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7987 - accuracy: 0.6469 - val_loss: 1.4528 - val_
accuracy: 0.6495
Epoch 131/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.8280 - accuracy: 0.6495 - val_loss: 1.4620 - val_accuracy: 0.6542
Epoch 132/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8560 - accuracy: 0.6366 - val_loss: 1.4398 - val_accuracy: 0.6495
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7586 - accuracy: 0.6701 - val_loss: 1.4617 - val_accuracy: 0.6542
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8071 - accuracy: 0.6521 - val_loss: 1.4750 - val_accuracy: 0.6495
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9050 - accuracy: 0.6675 - val_loss: 1.4316 - val_accuracy: 0.6495
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7277 - accuracy: 0.6443 - val_loss: 1.3466 - val_accuracy: 0.6402
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7950 - accuracy: 0.6546 - val_loss: 1.3764 - val_accuracy: 0.6355
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7850 - accuracy: 0.6572 - val_loss: 1.3744 - val_accuracy: 0.6355
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7935 - accuracy: 0.6753 - val_loss: 1.3485 - val_accuracy: 0.6308
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7869 - accuracy: 0.6649 - val_loss: 1.3529 - val_accuracy: 0.6262
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7932 - accuracy: 0.6392 - val_loss: 1.3706 - val_accuracy: 0.6308
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8227 - accuracy: 0.6598 - val_loss: 1.3374 - val_accuracy: 0.6308
Epoch 143/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8084 - accuracy: 0.6727 - val_loss: 1.3094 - val_accuracy: 0.6262
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7744 - accuracy: 0.6521 - val_loss: 1.3059 - val_accuracy: 0.6308
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6980 - accuracy: 0.6598 - val_loss: 1.3023 - val_accuracy: 0.6355
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8358 - accuracy: 0.6237 - val_loss: 1.3198 - val_accuracy: 0.6308
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7593 - accuracy: 0.6263 - val_loss: 1.3426 - val_accuracy: 0.6308
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7021 - accuracy: 0.6237 - val_loss: 1.3180 - val_accuracy: 0.6355
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7962 - accuracy: 0.6392 - val_loss: 1.3399 - val_accuracy: 0.6308
Epoch 150/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7086 - accuracy: 0.6237 - val_loss: 1.3374 - val_accuracy: 0.6355
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6846 - accuracy: 0.6289 - val_loss: 1.3095 - val_accuracy: 0.6355
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7182 - accuracy: 0.6314 - val_loss: 1.2974 - val_accuracy: 0.6449
Epoch 153/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6970 - accuracy: 0.6237 - val_loss: 1.2839 - val_accuracy: 0.6682
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7468 - accuracy: 0.6340 - val_loss: 1.2292 - val_accuracy: 0.6495
Epoch 155/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6897 - accuracy: 0.6186 - val_loss: 1.1759 - val_accuracy: 0.6589
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6787 - accuracy: 0.6289 - val_loss: 1.1757 - val_accuracy: 0.6636
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6896 - accuracy: 0.6495 - val_loss: 1.1705 - val_accuracy: 0.6589
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7601 - accuracy: 0.6314 - val_loss: 1.2113 - val_accuracy: 0.6636
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6722 - accuracy: 0.6237 - val_loss: 1.2147 - val_accuracy: 0.6542
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6969 - accuracy: 0.6237 - val_loss: 1.1660 - val_accuracy: 0.6589
```

Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6476 - accuracy: 0.6186 - val_loss: 1.1981 - val_accuracy: 0.6542
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6237 - accuracy: 0.6263 - val_loss: 1.2747 - val_accuracy: 0.6495
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6972 - accuracy: 0.6186 - val_loss: 1.2239 - val_accuracy: 0.6495
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6016 - accuracy: 0.6366 - val_loss: 1.2497 - val_accuracy: 0.6495
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6434 - accuracy: 0.6263 - val_loss: 1.2716 - val_accuracy: 0.6542
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6478 - accuracy: 0.6314 - val_loss: 1.2954 - val_accuracy: 0.6402
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6739 - accuracy: 0.6237 - val_loss: 1.2957 - val_accuracy: 0.6402
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6394 - accuracy: 0.6108 - val_loss: 1.3286 - val_accuracy: 0.6402
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5436 - accuracy: 0.6057 - val_loss: 1.3700 - val_accuracy: 0.6262
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6205 - accuracy: 0.6186 - val_loss: 1.3657 - val_accuracy: 0.6262
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6328 - accuracy: 0.6263 - val_loss: 1.3390 - val_accuracy: 0.6262
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7524 - accuracy: 0.6108 - val_loss: 1.3716 - val_accuracy: 0.6262
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6855 - accuracy: 0.6289 - val_loss: 1.3432 - val_accuracy: 0.6215
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6523 - accuracy: 0.6186 - val_loss: 1.3104 - val_accuracy: 0.6168
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6344 - accuracy: 0.6392 - val_loss: 1.3327 - val_accuracy: 0.6121
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6001 - accuracy: 0.6289 - val_loss: 1.3786 - val_accuracy: 0.6121
Epoch 177/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6438 - accuracy: 0.6160 - val_loss: 1.3959 - val_accuracy: 0.6075
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6378 - accuracy: 0.6237 - val_loss: 1.3753 - val_accuracy: 0.6121
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5894 - accuracy: 0.6186 - val_loss: 1.4289 - val_accuracy: 0.6168
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6165 - accuracy: 0.6340 - val_loss: 1.3971 - val_accuracy: 0.6215
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5756 - accuracy: 0.6108 - val_loss: 1.3659 - val_accuracy: 0.6168
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5961 - accuracy: 0.6237 - val_loss: 1.3730 - val_accuracy: 0.6355
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5913 - accuracy: 0.6263 - val_loss: 1.3409 - val_accuracy: 0.6355
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5780 - accuracy: 0.6263 - val_loss: 1.3442 - val_accuracy: 0.6308
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5746 - accuracy: 0.6211 - val_loss: 1.3316 - val_accuracy: 0.6262
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5811 - accuracy: 0.6160 - val_loss: 1.3608 - val_accuracy: 0.6308
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6200 - accuracy: 0.6340 - val_loss: 1.3510 - val_accuracy: 0.6402
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5340 - accuracy: 0.6469 - val_loss: 1.3521 - val_accuracy: 0.6402
Epoch 189/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5766 - accuracy: 0.6340 - val_loss: 1.3533 - val_accuracy: 0.6449
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5410 - accuracy: 0.6160 - val_loss: 1.3474 - val_accuracy: 0.6449

```

accuracy: 0.6262
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6263 - accuracy: 0.6546 - val_loss: 1.3535 - val_accuracy: 0.6168
Epoch 192/1000
1/4 [====>.....] - ETA: 0s - loss: 0.4940 - accuracy: 0.6328Restoring model weights from th
e end of the best epoch: 42.
4/4 [=====] - 0s 14ms/step - loss: 0.5805 - accuracy: 0.6418 - val_loss: 1.3307 - val_accuracy: 0.6121
Epoch 192: early stopping
2/2 [=====] - 0s 3ms/step - loss: 1.7385 - accuracy: 0.6136
[CV] END .....Dense1=25, Dense2=25; total time= 10.3s
Model: "sequential_21"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_84 (Dense)	(None, 25)	175
batch_normalization_63 (BatchNormalization)	(None, 25)	100
activation_63 (Activation)	(None, 25)	0
dense_85 (Dense)	(None, 25)	650
batch_normalization_64 (BatchNormalization)	(None, 25)	100
activation_64 (Activation)	(None, 25)	0
dense_86 (Dense)	(None, 10)	260
batch_normalization_65 (BatchNormalization)	(None, 10)	40
activation_65 (Activation)	(None, 10)	0
dense_87 (Dense)	(None, 2)	22
<hr/>		
Total params: 1,347		
Trainable params: 1,227		
Non-trainable params: 120		

```

Epoch 1/1000
4/4 [=====] - 2s 57ms/step - loss: 4.1160 - accuracy: 0.5835 - val_loss: 5.5177 - val_accuracy: 0.6449
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2172 - accuracy: 0.6067 - val_loss: 4.8118 - val_accuracy: 0.6449
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 3.0083 - accuracy: 0.6170 - val_loss: 3.7865 - val_accuracy: 0.6495
Epoch 4/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7279 - accuracy: 0.5990 - val_loss: 2.9353 - val_accuracy: 0.6262
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 2.5932 - accuracy: 0.6067 - val_loss: 2.4312 - val_accuracy: 0.6589
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6569 - accuracy: 0.6195 - val_loss: 2.1892 - val_accuracy: 0.6402
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3987 - accuracy: 0.5964 - val_loss: 1.9637 - val_accuracy: 0.6589
Epoch 8/1000
4/4 [=====] - 0s 16ms/step - loss: 2.1317 - accuracy: 0.6272 - val_loss: 1.8099 - val_accuracy: 0.6916
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0744 - accuracy: 0.6170 - val_loss: 1.8260 - val_accuracy: 0.7056
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0162 - accuracy: 0.6350 - val_loss: 1.8147 - val_accuracy: 0.7056
Epoch 11/1000
4/4 [=====] - 0s 15ms/step - loss: 1.9475 - accuracy: 0.6324 - val_loss: 1.7585 - val_accuracy: 0.7103
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9516 - accuracy: 0.6170 - val_loss: 1.6878 - val_accuracy: 0.7056
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7289 - accuracy: 0.6015 - val_loss: 1.6512 - val_accuracy: 0.6636
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7508 - accuracy: 0.6298 - val_loss: 1.6470 - val_accuracy: 0.6589
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5927 - accuracy: 0.6195 - val_loss: 1.5837 - val_accuracy: 0.6542

```

Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6381 - accuracy: 0.6221 - val_loss: 1.5584 - val_accuracy: 0.6542
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6303 - accuracy: 0.6118 - val_loss: 1.5405 - val_accuracy: 0.6402
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7214 - accuracy: 0.6170 - val_loss: 1.5104 - val_accuracy: 0.6449
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5785 - accuracy: 0.6272 - val_loss: 1.4936 - val_accuracy: 0.6449
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5316 - accuracy: 0.6015 - val_loss: 1.4595 - val_accuracy: 0.6495
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4985 - accuracy: 0.6221 - val_loss: 1.4202 - val_accuracy: 0.6449
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4832 - accuracy: 0.6247 - val_loss: 1.3969 - val_accuracy: 0.6262
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3170 - accuracy: 0.5938 - val_loss: 1.3618 - val_accuracy: 0.6262
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4549 - accuracy: 0.6144 - val_loss: 1.3440 - val_accuracy: 0.6262
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4285 - accuracy: 0.6015 - val_loss: 1.2925 - val_accuracy: 0.6262
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4217 - accuracy: 0.6118 - val_loss: 1.2720 - val_accuracy: 0.6215
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3720 - accuracy: 0.6067 - val_loss: 1.2765 - val_accuracy: 0.6168
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3535 - accuracy: 0.6221 - val_loss: 1.2623 - val_accuracy: 0.6215
Epoch 29/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3064 - accuracy: 0.6247 - val_loss: 1.2600 - val_accuracy: 0.6262
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0926 - accuracy: 0.6298 - val_loss: 1.1995 - val_accuracy: 0.6262
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2129 - accuracy: 0.6375 - val_loss: 1.1910 - val_accuracy: 0.6262
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2019 - accuracy: 0.5964 - val_loss: 1.1751 - val_accuracy: 0.6262
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0875 - accuracy: 0.6427 - val_loss: 1.1566 - val_accuracy: 0.6262
Epoch 34/1000
4/4 [=====] - 0s 19ms/step - loss: 1.2268 - accuracy: 0.6195 - val_loss: 1.1440 - val_accuracy: 0.6262
Epoch 35/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0413 - accuracy: 0.6272 - val_loss: 1.1690 - val_accuracy: 0.6308
Epoch 36/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0732 - accuracy: 0.6093 - val_loss: 1.1326 - val_accuracy: 0.6262
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2515 - accuracy: 0.6170 - val_loss: 1.1235 - val_accuracy: 0.6308
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1571 - accuracy: 0.6247 - val_loss: 1.1369 - val_accuracy: 0.6308
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0101 - accuracy: 0.6375 - val_loss: 1.1221 - val_accuracy: 0.6355
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9376 - accuracy: 0.6401 - val_loss: 1.0976 - val_accuracy: 0.6355
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9850 - accuracy: 0.6350 - val_loss: 1.0961 - val_accuracy: 0.6449
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9213 - accuracy: 0.6195 - val_loss: 1.0367 - val_accuracy: 0.6402
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8822 - accuracy: 0.6530 - val_loss: 1.0507 - val_accuracy: 0.7243
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1050 - accuracy: 0.6452 - val_loss: 1.0385 - val_accuracy: 0.7056
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7966 - accuracy: 0.6684 - val_loss: 1.0305 - val_accuracy: 0.6684

```
accuracy: 0.7150
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7982 - accuracy: 0.6864 - val_loss: 1.0381 - val_
accuracy: 0.6916
Epoch 47/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9362 - accuracy: 0.6478 - val_loss: 1.0277 - val_
accuracy: 0.6916
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9545 - accuracy: 0.6530 - val_loss: 1.0463 - val_
accuracy: 0.6963
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8809 - accuracy: 0.6221 - val_loss: 0.9925 - val_
accuracy: 0.7103
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7980 - accuracy: 0.6555 - val_loss: 0.9822 - val_
accuracy: 0.7009
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8334 - accuracy: 0.6838 - val_loss: 0.9670 - val_
accuracy: 0.7056
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8935 - accuracy: 0.6607 - val_loss: 0.9600 - val_
accuracy: 0.7009
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9518 - accuracy: 0.6478 - val_loss: 0.9636 - val_
accuracy: 0.6963
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9331 - accuracy: 0.6555 - val_loss: 0.9527 - val_
accuracy: 0.7009
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8211 - accuracy: 0.6607 - val_loss: 0.9391 - val_
accuracy: 0.7196
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7337 - accuracy: 0.6761 - val_loss: 0.9213 - val_
accuracy: 0.7196
Epoch 57/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8413 - accuracy: 0.6555 - val_loss: 0.9223 - val_
accuracy: 0.7150
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8629 - accuracy: 0.6530 - val_loss: 0.9150 - val_
accuracy: 0.7056
Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9541 - accuracy: 0.6324 - val_loss: 0.9367 - val_
accuracy: 0.6869
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8242 - accuracy: 0.6452 - val_loss: 0.9348 - val_
accuracy: 0.6916
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7720 - accuracy: 0.6272 - val_loss: 0.9237 - val_
accuracy: 0.6869
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8695 - accuracy: 0.6530 - val_loss: 0.9347 - val_
accuracy: 0.6869
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7024 - accuracy: 0.6375 - val_loss: 0.9518 - val_
accuracy: 0.6776
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7499 - accuracy: 0.6324 - val_loss: 0.9401 - val_
accuracy: 0.6776
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7823 - accuracy: 0.6581 - val_loss: 0.9226 - val_
accuracy: 0.6822
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7432 - accuracy: 0.6710 - val_loss: 0.9289 - val_
accuracy: 0.6729
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8668 - accuracy: 0.6504 - val_loss: 0.9298 - val_
accuracy: 0.6682
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8352 - accuracy: 0.6272 - val_loss: 0.9163 - val_
accuracy: 0.6729
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7758 - accuracy: 0.6247 - val_loss: 0.8927 - val_
accuracy: 0.6449
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8262 - accuracy: 0.6581 - val_loss: 0.8833 - val_
accuracy: 0.6589
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7457 - accuracy: 0.6889 - val_loss: 0.8001 - val_
accuracy: 0.6916
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7681 - accuracy: 0.6607 - val_loss: 0.7823 - val_
accuracy: 0.6822
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6950 - accuracy: 0.6787 - val_loss: 0.7649 - val_
accuracy: 0.6682
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7370 - accuracy: 0.6478 - val_loss: 0.7569 - val_
accuracy: 0.6729
Epoch 75/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.8051 - accuracy: 0.6170 - val_loss: 0.7688 - val_accuracy: 0.6495
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7846 - accuracy: 0.6761 - val_loss: 0.7599 - val_accuracy: 0.6589
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7445 - accuracy: 0.6401 - val_loss: 0.7504 - val_accuracy: 0.6682
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7404 - accuracy: 0.6889 - val_loss: 0.7772 - val_accuracy: 0.6682
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6140 - accuracy: 0.6684 - val_loss: 0.7692 - val_accuracy: 0.6542
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7001 - accuracy: 0.6350 - val_loss: 0.7589 - val_accuracy: 0.6776
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6591 - accuracy: 0.6504 - val_loss: 0.7491 - val_accuracy: 0.6822
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6895 - accuracy: 0.6530 - val_loss: 0.7420 - val_accuracy: 0.6776
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6839 - accuracy: 0.6298 - val_loss: 0.7431 - val_accuracy: 0.6822
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7187 - accuracy: 0.6427 - val_loss: 0.7263 - val_accuracy: 0.6776
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6529 - accuracy: 0.6144 - val_loss: 0.7371 - val_accuracy: 0.6729
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7065 - accuracy: 0.6298 - val_loss: 0.7168 - val_accuracy: 0.6776
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7157 - accuracy: 0.6427 - val_loss: 0.7242 - val_accuracy: 0.6776
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6541 - accuracy: 0.6298 - val_loss: 0.7177 - val_accuracy: 0.6776
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7223 - accuracy: 0.6452 - val_loss: 0.7073 - val_accuracy: 0.6776
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6385 - accuracy: 0.6452 - val_loss: 0.7045 - val_accuracy: 0.6589
Epoch 91/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6768 - accuracy: 0.6581 - val_loss: 0.7080 - val_accuracy: 0.6729
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6391 - accuracy: 0.6298 - val_loss: 0.6887 - val_accuracy: 0.6682
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6432 - accuracy: 0.6067 - val_loss: 0.6916 - val_accuracy: 0.6682
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6780 - accuracy: 0.6272 - val_loss: 0.6941 - val_accuracy: 0.6869
Epoch 95/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6707 - accuracy: 0.6401 - val_loss: 0.7003 - val_accuracy: 0.6776
Epoch 96/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6768 - accuracy: 0.6452 - val_loss: 0.7262 - val_accuracy: 0.7009
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6130 - accuracy: 0.6787 - val_loss: 0.7212 - val_accuracy: 0.7150
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7194 - accuracy: 0.6787 - val_loss: 0.7134 - val_accuracy: 0.6916
Epoch 99/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6893 - accuracy: 0.6735 - val_loss: 0.7347 - val_accuracy: 0.6916
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5821 - accuracy: 0.6607 - val_loss: 0.7244 - val_accuracy: 0.6916
Epoch 101/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6622 - accuracy: 0.6864 - val_loss: 0.7150 - val_accuracy: 0.6916
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5880 - accuracy: 0.6684 - val_loss: 0.7170 - val_accuracy: 0.6776
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6804 - accuracy: 0.6812 - val_loss: 0.6818 - val_accuracy: 0.6729
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6291 - accuracy: 0.6427 - val_loss: 0.6723 - val_accuracy: 0.6589
```

Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6917 - accuracy: 0.6427 - val_loss: 0.6669 - val_accuracy: 0.6589
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5970 - accuracy: 0.6812 - val_loss: 0.6860 - val_accuracy: 0.6589
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7591 - accuracy: 0.6272 - val_loss: 0.6562 - val_accuracy: 0.6636
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5764 - accuracy: 0.6581 - val_loss: 0.6524 - val_accuracy: 0.6729
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7240 - accuracy: 0.6478 - val_loss: 0.6486 - val_accuracy: 0.6589
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5725 - accuracy: 0.6272 - val_loss: 0.6632 - val_accuracy: 0.6682
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7124 - accuracy: 0.6530 - val_loss: 0.6999 - val_accuracy: 0.6682
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5228 - accuracy: 0.6735 - val_loss: 0.6831 - val_accuracy: 0.6636
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5767 - accuracy: 0.6812 - val_loss: 0.7025 - val_accuracy: 0.6682
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5417 - accuracy: 0.6632 - val_loss: 0.6864 - val_accuracy: 0.6636
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6510 - accuracy: 0.6530 - val_loss: 0.6797 - val_accuracy: 0.6916
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5987 - accuracy: 0.6632 - val_loss: 0.6780 - val_accuracy: 0.6776
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6065 - accuracy: 0.6812 - val_loss: 0.6802 - val_accuracy: 0.6729
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5954 - accuracy: 0.6735 - val_loss: 0.6723 - val_accuracy: 0.6636
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6374 - accuracy: 0.6350 - val_loss: 0.6784 - val_accuracy: 0.6355
Epoch 120/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6996 - accuracy: 0.6324 - val_loss: 0.7099 - val_accuracy: 0.6355
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5683 - accuracy: 0.6221 - val_loss: 0.7097 - val_accuracy: 0.6355
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7264 - accuracy: 0.6272 - val_loss: 0.7469 - val_accuracy: 0.6449
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5523 - accuracy: 0.6735 - val_loss: 0.6955 - val_accuracy: 0.6308
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5538 - accuracy: 0.6478 - val_loss: 0.7760 - val_accuracy: 0.6589
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5185 - accuracy: 0.6915 - val_loss: 0.7780 - val_accuracy: 0.6542
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5942 - accuracy: 0.6555 - val_loss: 0.7860 - val_accuracy: 0.6542
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6388 - accuracy: 0.7121 - val_loss: 0.7516 - val_accuracy: 0.6495
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5674 - accuracy: 0.7044 - val_loss: 0.8566 - val_accuracy: 0.6589
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7088 - accuracy: 0.6967 - val_loss: 0.8304 - val_accuracy: 0.6402
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5179 - accuracy: 0.6941 - val_loss: 0.9092 - val_accuracy: 0.6402
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5684 - accuracy: 0.6427 - val_loss: 0.9408 - val_accuracy: 0.6449
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5594 - accuracy: 0.6735 - val_loss: 0.9772 - val_accuracy: 0.6402
Epoch 133/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5472 - accuracy: 0.6684 - val_loss: 0.9179 - val_accuracy: 0.6355
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5702 - accuracy: 0.6812 - val_loss: 0.8833 - val_accuracy: 0.6449

```
accuracy: 0.6402
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6126 - accuracy: 0.6427 - val_loss: 0.8511 - val_accuracy: 0.6495
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6906 - accuracy: 0.6684 - val_loss: 0.8181 - val_accuracy: 0.6542
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6085 - accuracy: 0.6452 - val_loss: 0.7902 - val_accuracy: 0.6402
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5405 - accuracy: 0.6658 - val_loss: 0.8121 - val_accuracy: 0.6402
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6104 - accuracy: 0.6247 - val_loss: 0.8742 - val_accuracy: 0.6495
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5864 - accuracy: 0.6452 - val_loss: 0.7911 - val_accuracy: 0.6495
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5864 - accuracy: 0.6735 - val_loss: 0.7959 - val_accuracy: 0.6589
Epoch 142/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5760 - accuracy: 0.6915 - val_loss: 0.7912 - val_accuracy: 0.6542
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5711 - accuracy: 0.6684 - val_loss: 0.7954 - val_accuracy: 0.6402
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5646 - accuracy: 0.6735 - val_loss: 0.8384 - val_accuracy: 0.6308
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5769 - accuracy: 0.6272 - val_loss: 0.9441 - val_accuracy: 0.6682
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5831 - accuracy: 0.6607 - val_loss: 0.9985 - val_accuracy: 0.6495
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5330 - accuracy: 0.6735 - val_loss: 1.0709 - val_accuracy: 0.6495
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5503 - accuracy: 0.6658 - val_loss: 1.0696 - val_accuracy: 0.6495
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5024 - accuracy: 0.6324 - val_loss: 1.0641 - val_accuracy: 0.6589
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6175 - accuracy: 0.6710 - val_loss: 1.0701 - val_accuracy: 0.6402
Epoch 151/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5666 - accuracy: 0.6401 - val_loss: 1.0154 - val_accuracy: 0.6355
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4854 - accuracy: 0.6710 - val_loss: 0.9758 - val_accuracy: 0.6308
Epoch 153/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5945 - accuracy: 0.6581 - val_loss: 0.9685 - val_accuracy: 0.6355
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5564 - accuracy: 0.6555 - val_loss: 0.8681 - val_accuracy: 0.6449
Epoch 155/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5728 - accuracy: 0.6375 - val_loss: 0.8939 - val_accuracy: 0.6402
Epoch 156/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5963 - accuracy: 0.6530 - val_loss: 0.9186 - val_accuracy: 0.6308
Epoch 157/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6584 - accuracy: 0.6504 - val_loss: 0.8904 - val_accuracy: 0.6262
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6593 - accuracy: 0.6812 - val_loss: 0.8802 - val_accuracy: 0.6215
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5354 - accuracy: 0.6093 - val_loss: 0.8841 - val_accuracy: 0.6168
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5176 - accuracy: 0.6324 - val_loss: 0.8633 - val_accuracy: 0.6028
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5637 - accuracy: 0.6684 - val_loss: 0.8671 - val_accuracy: 0.6121
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5990 - accuracy: 0.6632 - val_loss: 0.9157 - val_accuracy: 0.6168
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5704 - accuracy: 0.6221 - val_loss: 0.9746 - val_accuracy: 0.6121
Epoch 164/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.5579 - accuracy: 0.6735 - val_loss: 0.9352 - val_accuracy: 0.6215
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5279 - accuracy: 0.6761 - val_loss: 0.9241 - val_accuracy: 0.5935
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5512 - accuracy: 0.6710 - val_loss: 0.8333 - val_accuracy: 0.6028
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6774 - accuracy: 0.6581 - val_loss: 0.8351 - val_accuracy: 0.6168
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6882 - accuracy: 0.6555 - val_loss: 0.8413 - val_accuracy: 0.5888
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6818 - accuracy: 0.6530 - val_loss: 0.8410 - val_accuracy: 0.5935
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5977 - accuracy: 0.6272 - val_loss: 0.8383 - val_accuracy: 0.5841
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5294 - accuracy: 0.6889 - val_loss: 0.8143 - val_accuracy: 0.5981
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5021 - accuracy: 0.6581 - val_loss: 0.8422 - val_accuracy: 0.5935
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5615 - accuracy: 0.6530 - val_loss: 0.8885 - val_accuracy: 0.5981
Epoch 174/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5274 - accuracy: 0.6658 - val_loss: 0.8521 - val_accuracy: 0.5981
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5255 - accuracy: 0.6581 - val_loss: 0.8520 - val_accuracy: 0.5935
Epoch 176/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6126 - accuracy: 0.6632 - val_loss: 0.9084 - val_accuracy: 0.5748
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5492 - accuracy: 0.6581 - val_loss: 1.0122 - val_accuracy: 0.6028
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5878 - accuracy: 0.6452 - val_loss: 1.1255 - val_accuracy: 0.5794
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5757 - accuracy: 0.6710 - val_loss: 1.1367 - val_accuracy: 0.5794
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6610 - accuracy: 0.6067 - val_loss: 1.1333 - val_accuracy: 0.5841
Epoch 181/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5730 - accuracy: 0.6581 - val_loss: 1.1301 - val_accuracy: 0.5794
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5906 - accuracy: 0.6864 - val_loss: 1.0750 - val_accuracy: 0.5841
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5325 - accuracy: 0.6504 - val_loss: 1.0769 - val_accuracy: 0.5888
Epoch 184/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6080 - accuracy: 0.6375 - val_loss: 1.0420 - val_accuracy: 0.6028
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5064 - accuracy: 0.6710 - val_loss: 0.9835 - val_accuracy: 0.6168
Epoch 186/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5490 - accuracy: 0.6787 - val_loss: 0.9819 - val_accuracy: 0.6262
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5853 - accuracy: 0.6658 - val_loss: 0.9894 - val_accuracy: 0.6262
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5313 - accuracy: 0.6915 - val_loss: 0.9807 - val_accuracy: 0.6121
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4770 - accuracy: 0.7018 - val_loss: 0.9385 - val_accuracy: 0.6215
Epoch 190/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5822 - accuracy: 0.7224 - val_loss: 0.9835 - val_accuracy: 0.6168
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5014 - accuracy: 0.6658 - val_loss: 0.9842 - val_accuracy: 0.6262
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5725 - accuracy: 0.6992 - val_loss: 1.0138 - val_accuracy: 0.6215
Epoch 193/1000
1/4 [====>.....] - ETA: 0s - loss: 0.7841 - accuracy: 0.6953Restoring model weights from the end of the best epoch: 43.
```

```
4/4 [=====] - 0s 14ms/step - loss: 0.5848 - accuracy: 0.6787 - val_loss: 1.0109 - val_accuracy: 0.6075
Epoch 193: early stopping
2/2 [=====] - 0s 3ms/step - loss: 1.1265 - accuracy: 0.6977
[CV] END .....Dense1=25, Dense2=25; total time= 10.8s
Model: "sequential_22"
```

Layer (type)	Output Shape	Param #
dense_88 (Dense)	(None, 25)	175
batch_normalization_66 (BatchNormalization)	(None, 25)	100
activation_66 (Activation)	(None, 25)	0
dense_89 (Dense)	(None, 25)	650
batch_normalization_67 (BatchNormalization)	(None, 25)	100
activation_67 (Activation)	(None, 25)	0
dense_90 (Dense)	(None, 10)	260
batch_normalization_68 (BatchNormalization)	(None, 10)	40
activation_68 (Activation)	(None, 10)	0
dense_91 (Dense)	(None, 2)	22

```
Total params: 1,347
Trainable params: 1,227
Non-trainable params: 120
```

```
Epoch 1/1000
4/4 [=====] - 1s 56ms/step - loss: 6.0437 - accuracy: 0.3805 - val_loss: 4.7137 - val_accuracy: 0.5000
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 4.6953 - accuracy: 0.4730 - val_loss: 3.9848 - val_accuracy: 0.5047
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 4.3996 - accuracy: 0.4524 - val_loss: 3.4183 - val_accuracy: 0.4860
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 3.9667 - accuracy: 0.5219 - val_loss: 3.1606 - val_accuracy: 0.5000
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9386 - accuracy: 0.5090 - val_loss: 2.9358 - val_accuracy: 0.5327
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 3.6643 - accuracy: 0.5013 - val_loss: 2.6902 - val_accuracy: 0.5421
Epoch 7/1000
4/4 [=====] - 0s 15ms/step - loss: 3.4522 - accuracy: 0.5244 - val_loss: 2.4790 - val_accuracy: 0.5467
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1090 - accuracy: 0.5553 - val_loss: 2.3793 - val_accuracy: 0.5561
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1106 - accuracy: 0.5553 - val_loss: 2.2884 - val_accuracy: 0.5561
Epoch 10/1000
4/4 [=====] - 0s 15ms/step - loss: 2.9128 - accuracy: 0.5656 - val_loss: 2.1974 - val_accuracy: 0.5701
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7871 - accuracy: 0.5733 - val_loss: 2.1543 - val_accuracy: 0.5607
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7987 - accuracy: 0.5527 - val_loss: 2.1301 - val_accuracy: 0.5748
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7049 - accuracy: 0.5861 - val_loss: 2.0825 - val_accuracy: 0.5748
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6960 - accuracy: 0.5527 - val_loss: 2.0576 - val_accuracy: 0.5794
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4308 - accuracy: 0.5733 - val_loss: 2.0474 - val_accuracy: 0.5841
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4815 - accuracy: 0.5578 - val_loss: 2.0309 - val_accuracy: 0.5841
Epoch 17/1000
4/4 [=====] - 0s 15ms/step - loss: 2.6303 - accuracy: 0.5604 - val_loss: 2.0003 - val_accuracy: 0.5935
Epoch 18/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 2.3635 - accuracy: 0.5733 - val_loss: 1.8880 - val_accuracy: 0.5935
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2200 - accuracy: 0.5913 - val_loss: 1.8680 - val_accuracy: 0.5888
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3777 - accuracy: 0.5810 - val_loss: 1.8406 - val_accuracy: 0.5935
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3064 - accuracy: 0.5810 - val_loss: 1.8178 - val_accuracy: 0.5935
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1891 - accuracy: 0.5913 - val_loss: 1.7517 - val_accuracy: 0.6262
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1450 - accuracy: 0.6093 - val_loss: 1.7450 - val_accuracy: 0.6215
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0938 - accuracy: 0.6041 - val_loss: 1.7391 - val_accuracy: 0.6215
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0799 - accuracy: 0.6247 - val_loss: 1.7035 - val_accuracy: 0.5981
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8715 - accuracy: 0.6298 - val_loss: 1.7077 - val_accuracy: 0.5794
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9347 - accuracy: 0.6221 - val_loss: 1.7131 - val_accuracy: 0.5514
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1008 - accuracy: 0.5964 - val_loss: 1.7157 - val_accuracy: 0.5514
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9997 - accuracy: 0.6118 - val_loss: 1.7205 - val_accuracy: 0.5327
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8809 - accuracy: 0.6298 - val_loss: 1.7512 - val_accuracy: 0.5421
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9416 - accuracy: 0.6015 - val_loss: 1.7525 - val_accuracy: 0.5327
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7910 - accuracy: 0.6401 - val_loss: 1.7530 - val_accuracy: 0.5280
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8591 - accuracy: 0.6272 - val_loss: 1.7549 - val_accuracy: 0.5234
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7996 - accuracy: 0.6324 - val_loss: 1.7523 - val_accuracy: 0.5047
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7580 - accuracy: 0.6530 - val_loss: 1.7505 - val_accuracy: 0.4953
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7781 - accuracy: 0.6478 - val_loss: 1.7495 - val_accuracy: 0.4766
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6678 - accuracy: 0.6324 - val_loss: 1.7469 - val_accuracy: 0.4813
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7107 - accuracy: 0.6530 - val_loss: 1.7428 - val_accuracy: 0.4720
Epoch 39/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8383 - accuracy: 0.6684 - val_loss: 1.7446 - val_accuracy: 0.4720
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8249 - accuracy: 0.6247 - val_loss: 1.7684 - val_accuracy: 0.4766
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7654 - accuracy: 0.6478 - val_loss: 1.7904 - val_accuracy: 0.4626
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7624 - accuracy: 0.6684 - val_loss: 1.7854 - val_accuracy: 0.4626
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6248 - accuracy: 0.6555 - val_loss: 1.7770 - val_accuracy: 0.4626
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5976 - accuracy: 0.6607 - val_loss: 1.7571 - val_accuracy: 0.4579
Epoch 45/1000
4/4 [=====] - 0s 11ms/step - loss: 1.6031 - accuracy: 0.6478 - val_loss: 1.7519 - val_accuracy: 0.4533
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5085 - accuracy: 0.6427 - val_loss: 1.7327 - val_accuracy: 0.4579
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5464 - accuracy: 0.6478 - val_loss: 1.7589 - val_accuracy: 0.4720
```

Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5081 - accuracy: 0.6067 - val_loss: 1.7454 - val_accuracy: 0.4579
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3915 - accuracy: 0.6298 - val_loss: 1.7359 - val_accuracy: 0.4579
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4581 - accuracy: 0.6118 - val_loss: 1.7564 - val_accuracy: 0.4579
Epoch 51/1000
4/4 [=====] - 0s 16ms/step - loss: 1.3876 - accuracy: 0.6144 - val_loss: 1.7169 - val_accuracy: 0.4533
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3718 - accuracy: 0.6015 - val_loss: 1.7043 - val_accuracy: 0.4533
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4145 - accuracy: 0.6427 - val_loss: 1.7181 - val_accuracy: 0.4439
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3049 - accuracy: 0.6298 - val_loss: 1.6817 - val_accuracy: 0.4439
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3206 - accuracy: 0.6118 - val_loss: 1.6929 - val_accuracy: 0.4299
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3123 - accuracy: 0.5861 - val_loss: 1.6624 - val_accuracy: 0.4299
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2562 - accuracy: 0.5990 - val_loss: 1.6634 - val_accuracy: 0.4252
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2583 - accuracy: 0.6427 - val_loss: 1.6194 - val_accuracy: 0.4439
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2785 - accuracy: 0.6324 - val_loss: 1.6391 - val_accuracy: 0.4393
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1796 - accuracy: 0.6093 - val_loss: 1.6281 - val_accuracy: 0.4533
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2266 - accuracy: 0.6735 - val_loss: 1.5380 - val_accuracy: 0.4533
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1663 - accuracy: 0.6530 - val_loss: 1.5534 - val_accuracy: 0.4533
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1834 - accuracy: 0.6272 - val_loss: 1.5954 - val_accuracy: 0.4579
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1485 - accuracy: 0.6093 - val_loss: 1.5313 - val_accuracy: 0.4673
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1369 - accuracy: 0.6478 - val_loss: 1.5366 - val_accuracy: 0.4907
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1269 - accuracy: 0.5938 - val_loss: 1.4585 - val_accuracy: 0.5000
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1386 - accuracy: 0.6298 - val_loss: 1.4319 - val_accuracy: 0.5234
Epoch 68/1000
4/4 [=====] - 0s 17ms/step - loss: 1.1781 - accuracy: 0.6272 - val_loss: 1.4116 - val_accuracy: 0.5374
Epoch 69/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1292 - accuracy: 0.6118 - val_loss: 1.3851 - val_accuracy: 0.5561
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0416 - accuracy: 0.6401 - val_loss: 1.2661 - val_accuracy: 0.5888
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0591 - accuracy: 0.6118 - val_loss: 1.2581 - val_accuracy: 0.5841
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0524 - accuracy: 0.6555 - val_loss: 1.2743 - val_accuracy: 0.5701
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0159 - accuracy: 0.6015 - val_loss: 1.3053 - val_accuracy: 0.5981
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9882 - accuracy: 0.6144 - val_loss: 1.3528 - val_accuracy: 0.6168
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0757 - accuracy: 0.6427 - val_loss: 1.3219 - val_accuracy: 0.5981
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9477 - accuracy: 0.6247 - val_loss: 1.2895 - val_accuracy: 0.6028
Epoch 77/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9109 - accuracy: 0.6375 - val_loss: 1.2106 - val_accuracy: 0.6028

```
accuracy: 0.6308
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9331 - accuracy: 0.6221 - val_loss: 1.1867 - val_accuracy: 0.6168
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9708 - accuracy: 0.6221 - val_loss: 1.2132 - val_accuracy: 0.6075
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9904 - accuracy: 0.6478 - val_loss: 1.1797 - val_accuracy: 0.6028
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0066 - accuracy: 0.5887 - val_loss: 1.1679 - val_accuracy: 0.5935
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9060 - accuracy: 0.5861 - val_loss: 1.1563 - val_accuracy: 0.6308
Epoch 83/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9329 - accuracy: 0.6093 - val_loss: 1.1405 - val_accuracy: 0.6075
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9327 - accuracy: 0.6041 - val_loss: 1.1443 - val_accuracy: 0.6402
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9223 - accuracy: 0.6067 - val_loss: 1.2106 - val_accuracy: 0.6355
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8557 - accuracy: 0.6607 - val_loss: 1.1852 - val_accuracy: 0.6589
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8812 - accuracy: 0.6401 - val_loss: 1.1625 - val_accuracy: 0.6402
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8247 - accuracy: 0.6041 - val_loss: 1.2062 - val_accuracy: 0.6262
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8237 - accuracy: 0.6118 - val_loss: 1.1071 - val_accuracy: 0.6402
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7587 - accuracy: 0.6324 - val_loss: 1.1053 - val_accuracy: 0.6168
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6858 - accuracy: 0.6298 - val_loss: 1.0275 - val_accuracy: 0.6308
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7871 - accuracy: 0.5887 - val_loss: 1.0391 - val_accuracy: 0.6308
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6889 - accuracy: 0.6041 - val_loss: 1.0014 - val_accuracy: 0.6262
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7558 - accuracy: 0.5964 - val_loss: 1.0333 - val_accuracy: 0.6215
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7119 - accuracy: 0.5784 - val_loss: 1.0691 - val_accuracy: 0.5654
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6833 - accuracy: 0.5835 - val_loss: 1.0519 - val_accuracy: 0.5748
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7264 - accuracy: 0.6015 - val_loss: 1.0508 - val_accuracy: 0.5841
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7541 - accuracy: 0.6118 - val_loss: 1.0153 - val_accuracy: 0.6542
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6738 - accuracy: 0.6170 - val_loss: 0.9140 - val_accuracy: 0.6355
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6482 - accuracy: 0.5990 - val_loss: 0.9017 - val_accuracy: 0.6449
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6303 - accuracy: 0.5913 - val_loss: 0.8737 - val_accuracy: 0.6215
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6270 - accuracy: 0.6041 - val_loss: 0.8648 - val_accuracy: 0.6402
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6753 - accuracy: 0.5913 - val_loss: 0.8281 - val_accuracy: 0.6449
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5764 - accuracy: 0.6195 - val_loss: 0.7850 - val_accuracy: 0.6355
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7224 - accuracy: 0.6427 - val_loss: 0.7971 - val_accuracy: 0.6308
Epoch 106/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7000 - accuracy: 0.6170 - val_loss: 0.8426 - val_accuracy: 0.6308
Epoch 107/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.6128 - accuracy: 0.6067 - val_loss: 0.7437 - val_accuracy: 0.6308
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5004 - accuracy: 0.6298 - val_loss: 0.7373 - val_accuracy: 0.6215
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5718 - accuracy: 0.6221 - val_loss: 0.7286 - val_accuracy: 0.6215
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5709 - accuracy: 0.6272 - val_loss: 0.7152 - val_accuracy: 0.6028
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5766 - accuracy: 0.5887 - val_loss: 0.7373 - val_accuracy: 0.5935
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5890 - accuracy: 0.5913 - val_loss: 0.7098 - val_accuracy: 0.5748
Epoch 113/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5125 - accuracy: 0.5990 - val_loss: 0.6983 - val_accuracy: 0.5654
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5891 - accuracy: 0.5758 - val_loss: 0.6980 - val_accuracy: 0.5794
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6191 - accuracy: 0.6144 - val_loss: 0.6983 - val_accuracy: 0.5748
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5466 - accuracy: 0.5887 - val_loss: 0.6910 - val_accuracy: 0.5935
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5370 - accuracy: 0.5578 - val_loss: 0.6401 - val_accuracy: 0.5935
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5575 - accuracy: 0.5835 - val_loss: 0.6408 - val_accuracy: 0.5935
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5585 - accuracy: 0.5681 - val_loss: 0.6379 - val_accuracy: 0.5981
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5422 - accuracy: 0.5861 - val_loss: 0.6108 - val_accuracy: 0.5888
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5232 - accuracy: 0.5887 - val_loss: 0.6426 - val_accuracy: 0.5841
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4913 - accuracy: 0.5733 - val_loss: 0.6182 - val_accuracy: 0.5841
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5060 - accuracy: 0.5553 - val_loss: 0.6597 - val_accuracy: 0.5888
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4807 - accuracy: 0.5553 - val_loss: 0.6672 - val_accuracy: 0.5841
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4569 - accuracy: 0.5476 - val_loss: 0.6558 - val_accuracy: 0.5841
Epoch 126/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4790 - accuracy: 0.5578 - val_loss: 0.6253 - val_accuracy: 0.5841
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4306 - accuracy: 0.5656 - val_loss: 0.6473 - val_accuracy: 0.5841
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4744 - accuracy: 0.5578 - val_loss: 0.6437 - val_accuracy: 0.5841
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4724 - accuracy: 0.5501 - val_loss: 0.6638 - val_accuracy: 0.6355
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5046 - accuracy: 0.5887 - val_loss: 0.6542 - val_accuracy: 0.6215
Epoch 131/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4744 - accuracy: 0.5784 - val_loss: 0.6678 - val_accuracy: 0.6262
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5180 - accuracy: 0.6144 - val_loss: 0.6692 - val_accuracy: 0.6215
Epoch 133/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4612 - accuracy: 0.5990 - val_loss: 0.6925 - val_accuracy: 0.6308
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4111 - accuracy: 0.6170 - val_loss: 0.6930 - val_accuracy: 0.6355
Epoch 135/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4277 - accuracy: 0.5964 - val_loss: 0.6915 - val_accuracy: 0.6495
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3963 - accuracy: 0.6247 - val_loss: 0.7146 - val_accuracy: 0.6495
```

Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4670 - accuracy: 0.5938 - val_loss: 0.6783 - val_accuracy: 0.6682
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4093 - accuracy: 0.6041 - val_loss: 0.6568 - val_accuracy: 0.6542
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4093 - accuracy: 0.6144 - val_loss: 0.6198 - val_accuracy: 0.6449
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4090 - accuracy: 0.6118 - val_loss: 0.6415 - val_accuracy: 0.6355
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3908 - accuracy: 0.6195 - val_loss: 0.6410 - val_accuracy: 0.6542
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4580 - accuracy: 0.6144 - val_loss: 0.6621 - val_accuracy: 0.6542
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4820 - accuracy: 0.6272 - val_loss: 0.6429 - val_accuracy: 0.6449
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4207 - accuracy: 0.6452 - val_loss: 0.6663 - val_accuracy: 0.6402
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3745 - accuracy: 0.6195 - val_loss: 0.6672 - val_accuracy: 0.6495
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3803 - accuracy: 0.6041 - val_loss: 0.6665 - val_accuracy: 0.6402
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5319 - accuracy: 0.6504 - val_loss: 0.6725 - val_accuracy: 0.6402
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3905 - accuracy: 0.6221 - val_loss: 0.7173 - val_accuracy: 0.6402
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4042 - accuracy: 0.5990 - val_loss: 0.6948 - val_accuracy: 0.6402
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3792 - accuracy: 0.6015 - val_loss: 0.6747 - val_accuracy: 0.6308
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3478 - accuracy: 0.5681 - val_loss: 0.6993 - val_accuracy: 0.6495
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3956 - accuracy: 0.6041 - val_loss: 0.7347 - val_accuracy: 0.6729
Epoch 153/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3626 - accuracy: 0.6298 - val_loss: 0.7525 - val_accuracy: 0.6682
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3584 - accuracy: 0.6401 - val_loss: 0.7555 - val_accuracy: 0.6729
Epoch 155/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4032 - accuracy: 0.6195 - val_loss: 0.7309 - val_accuracy: 0.6589
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3718 - accuracy: 0.6170 - val_loss: 0.7304 - val_accuracy: 0.6589
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4248 - accuracy: 0.6272 - val_loss: 0.7683 - val_accuracy: 0.6402
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3732 - accuracy: 0.6144 - val_loss: 0.7723 - val_accuracy: 0.6355
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3836 - accuracy: 0.5938 - val_loss: 0.7763 - val_accuracy: 0.6168
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3389 - accuracy: 0.5681 - val_loss: 0.7902 - val_accuracy: 0.6355
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3997 - accuracy: 0.5810 - val_loss: 0.7301 - val_accuracy: 0.6449
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3886 - accuracy: 0.6195 - val_loss: 0.7326 - val_accuracy: 0.6449
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3413 - accuracy: 0.5964 - val_loss: 0.7355 - val_accuracy: 0.6449
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3775 - accuracy: 0.5990 - val_loss: 0.7212 - val_accuracy: 0.6542
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4287 - accuracy: 0.6118 - val_loss: 0.8044 - val_accuracy: 0.6589
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4265 - accuracy: 0.6221 - val_loss: 0.7836 - val_accuracy: 0.6589

accuracy: 0.6636
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4373 - accuracy: 0.5913 - val_loss: 0.8143 - val_accuracy: 0.6682
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3939 - accuracy: 0.6067 - val_loss: 0.8465 - val_accuracy: 0.6449
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3596 - accuracy: 0.6170 - val_loss: 0.8223 - val_accuracy: 0.6402
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4306 - accuracy: 0.5938 - val_loss: 0.8463 - val_accuracy: 0.6355
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3372 - accuracy: 0.6015 - val_loss: 0.8140 - val_accuracy: 0.6402
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3624 - accuracy: 0.5938 - val_loss: 0.8114 - val_accuracy: 0.6355
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3547 - accuracy: 0.5913 - val_loss: 0.8280 - val_accuracy: 0.6402
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3506 - accuracy: 0.5964 - val_loss: 0.9153 - val_accuracy: 0.6402
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3625 - accuracy: 0.5835 - val_loss: 0.9058 - val_accuracy: 0.6636
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4052 - accuracy: 0.5861 - val_loss: 0.9227 - val_accuracy: 0.5654
Epoch 177/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3935 - accuracy: 0.5450 - val_loss: 0.9522 - val_accuracy: 0.5701
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4122 - accuracy: 0.5347 - val_loss: 0.9518 - val_accuracy: 0.5748
Epoch 179/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3419 - accuracy: 0.5578 - val_loss: 0.9562 - val_accuracy: 0.5514
Epoch 180/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3766 - accuracy: 0.5321 - val_loss: 0.8595 - val_accuracy: 0.5561
Epoch 181/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3510 - accuracy: 0.5219 - val_loss: 0.8528 - val_accuracy: 0.5514
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3338 - accuracy: 0.5527 - val_loss: 0.7499 - val_accuracy: 0.5607
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3829 - accuracy: 0.5141 - val_loss: 0.7625 - val_accuracy: 0.5654
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3228 - accuracy: 0.5707 - val_loss: 0.8403 - val_accuracy: 0.5654
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3205 - accuracy: 0.5167 - val_loss: 0.7928 - val_accuracy: 0.5748
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3114 - accuracy: 0.5347 - val_loss: 0.7848 - val_accuracy: 0.5935
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3590 - accuracy: 0.5373 - val_loss: 0.7858 - val_accuracy: 0.5935
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3815 - accuracy: 0.5835 - val_loss: 0.7082 - val_accuracy: 0.6682
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3667 - accuracy: 0.5810 - val_loss: 0.7259 - val_accuracy: 0.6682
Epoch 190/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3277 - accuracy: 0.6221 - val_loss: 0.7126 - val_accuracy: 0.6776
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3635 - accuracy: 0.6298 - val_loss: 0.7651 - val_accuracy: 0.6916
Epoch 192/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3680 - accuracy: 0.6221 - val_loss: 0.7629 - val_accuracy: 0.6963
Epoch 193/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3514 - accuracy: 0.6221 - val_loss: 0.7827 - val_accuracy: 0.7056
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3351 - accuracy: 0.6427 - val_loss: 0.8427 - val_accuracy: 0.7056
Epoch 195/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3124 - accuracy: 0.6504 - val_loss: 0.8638 - val_accuracy: 0.7103
Epoch 196/1000

```
4/4 [=====] - 0s 13ms/step - loss: 0.3264 - accuracy: 0.6992 - val_loss: 0.8431 - val_accuracy: 0.7150
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3124 - accuracy: 0.6787 - val_loss: 0.8335 - val_accuracy: 0.7336
Epoch 198/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3776 - accuracy: 0.6812 - val_loss: 0.9147 - val_accuracy: 0.7570
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3934 - accuracy: 0.6632 - val_loss: 0.9019 - val_accuracy: 0.7383
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3457 - accuracy: 0.6941 - val_loss: 0.8211 - val_accuracy: 0.7617
Epoch 201/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3340 - accuracy: 0.6967 - val_loss: 0.8276 - val_accuracy: 0.7664
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3599 - accuracy: 0.7352 - val_loss: 0.8412 - val_accuracy: 0.7383
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3599 - accuracy: 0.7249 - val_loss: 0.9295 - val_accuracy: 0.7383
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3583 - accuracy: 0.7198 - val_loss: 0.9478 - val_accuracy: 0.7383
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4210 - accuracy: 0.7224 - val_loss: 0.9692 - val_accuracy: 0.7290
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4288 - accuracy: 0.7455 - val_loss: 1.0007 - val_accuracy: 0.7290
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3439 - accuracy: 0.7352 - val_loss: 0.9087 - val_accuracy: 0.7196
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3184 - accuracy: 0.7147 - val_loss: 0.8926 - val_accuracy: 0.7336
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4102 - accuracy: 0.7301 - val_loss: 0.8906 - val_accuracy: 0.7430
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3226 - accuracy: 0.7404 - val_loss: 0.9432 - val_accuracy: 0.7290
Epoch 211/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3572 - accuracy: 0.7429 - val_loss: 0.8723 - val_accuracy: 0.7150
Epoch 212/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3098 - accuracy: 0.7301 - val_loss: 0.9733 - val_accuracy: 0.6963
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3534 - accuracy: 0.7326 - val_loss: 0.9533 - val_accuracy: 0.7243
Epoch 214/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3124 - accuracy: 0.7429 - val_loss: 1.0007 - val_accuracy: 0.7336
Epoch 215/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2924 - accuracy: 0.7455 - val_loss: 0.9683 - val_accuracy: 0.7196
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3364 - accuracy: 0.7404 - val_loss: 0.9607 - val_accuracy: 0.7243
Epoch 217/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3167 - accuracy: 0.7352 - val_loss: 0.9276 - val_accuracy: 0.7243
Epoch 218/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2974 - accuracy: 0.7249 - val_loss: 0.8380 - val_accuracy: 0.7290
Epoch 219/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3676 - accuracy: 0.7584 - val_loss: 0.8338 - val_accuracy: 0.7009
Epoch 220/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3341 - accuracy: 0.7378 - val_loss: 0.8557 - val_accuracy: 0.6963
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3507 - accuracy: 0.7121 - val_loss: 0.9095 - val_accuracy: 0.7150
Epoch 222/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3323 - accuracy: 0.7301 - val_loss: 0.9585 - val_accuracy: 0.7196
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3061 - accuracy: 0.7147 - val_loss: 0.9955 - val_accuracy: 0.7056
Epoch 224/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3222 - accuracy: 0.7352 - val_loss: 0.9691 - val_accuracy: 0.7290
Epoch 225/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3629 - accuracy: 0.7378 - val_loss: 0.9149 - val_accuracy: 0.7243
```

Epoch 226/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3298 - accuracy: 0.7455 - val_loss: 0.9456 - val_accuracy: 0.7430
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3637 - accuracy: 0.7429 - val_loss: 0.9812 - val_accuracy: 0.7430
Epoch 228/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4119 - accuracy: 0.7609 - val_loss: 0.8992 - val_accuracy: 0.7477
Epoch 229/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3328 - accuracy: 0.7738 - val_loss: 0.8675 - val_accuracy: 0.7523
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3507 - accuracy: 0.7532 - val_loss: 0.8606 - val_accuracy: 0.7570
Epoch 231/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3226 - accuracy: 0.7532 - val_loss: 0.8570 - val_accuracy: 0.7523
Epoch 232/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3565 - accuracy: 0.7609 - val_loss: 0.8399 - val_accuracy: 0.7523
Epoch 233/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3258 - accuracy: 0.7404 - val_loss: 0.9161 - val_accuracy: 0.7617
Epoch 234/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3178 - accuracy: 0.7506 - val_loss: 0.9493 - val_accuracy: 0.7664
Epoch 235/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3606 - accuracy: 0.7429 - val_loss: 1.0309 - val_accuracy: 0.7710
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3413 - accuracy: 0.7069 - val_loss: 1.0526 - val_accuracy: 0.7617
Epoch 237/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2847 - accuracy: 0.7224 - val_loss: 1.0906 - val_accuracy: 0.7570
Epoch 238/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2729 - accuracy: 0.7172 - val_loss: 1.0063 - val_accuracy: 0.7523
Epoch 239/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3011 - accuracy: 0.7558 - val_loss: 1.1327 - val_accuracy: 0.7523
Epoch 240/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3024 - accuracy: 0.7429 - val_loss: 1.0999 - val_accuracy: 0.7477
Epoch 241/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2799 - accuracy: 0.7481 - val_loss: 1.0451 - val_accuracy: 0.7477
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3902 - accuracy: 0.7506 - val_loss: 1.0533 - val_accuracy: 0.7336
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3039 - accuracy: 0.7275 - val_loss: 0.8924 - val_accuracy: 0.7383
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2913 - accuracy: 0.7301 - val_loss: 0.9634 - val_accuracy: 0.7196
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2798 - accuracy: 0.7198 - val_loss: 0.9705 - val_accuracy: 0.7243
Epoch 246/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2869 - accuracy: 0.7326 - val_loss: 1.0099 - val_accuracy: 0.7243
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3172 - accuracy: 0.7224 - val_loss: 1.1358 - val_accuracy: 0.7196
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2894 - accuracy: 0.7121 - val_loss: 0.9639 - val_accuracy: 0.7196
Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2899 - accuracy: 0.7172 - val_loss: 1.0129 - val_accuracy: 0.7243
Epoch 250/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3263 - accuracy: 0.6838 - val_loss: 1.1706 - val_accuracy: 0.7336
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3147 - accuracy: 0.7404 - val_loss: 1.0699 - val_accuracy: 0.7290
Epoch 252/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3288 - accuracy: 0.6864 - val_loss: 1.2264 - val_accuracy: 0.7243
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2848 - accuracy: 0.6632 - val_loss: 1.1638 - val_accuracy: 0.6869
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4528 - accuracy: 0.6093 - val_loss: 1.1976 - val_accuracy: 0.6869
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3843 - accuracy: 0.6272 - val_loss: 1.2344 - val_accuracy: 0.6869

```
accuracy: 0.6963
Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2804 - accuracy: 0.6427 - val_loss: 1.2401 - val_
accuracy: 0.7009
Epoch 257/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3133 - accuracy: 0.6504 - val_loss: 1.1949 - val_
accuracy: 0.7009
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3307 - accuracy: 0.6941 - val_loss: 1.2188 - val_
accuracy: 0.6121
Epoch 259/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4019 - accuracy: 0.5321 - val_loss: 1.2321 - val_
accuracy: 0.6589
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2662 - accuracy: 0.5887 - val_loss: 1.2858 - val_
accuracy: 0.6636
Epoch 261/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3470 - accuracy: 0.5707 - val_loss: 1.3364 - val_
accuracy: 0.6916
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3133 - accuracy: 0.6067 - val_loss: 1.2864 - val_
accuracy: 0.6963
Epoch 263/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3471 - accuracy: 0.6015 - val_loss: 1.3572 - val_
accuracy: 0.6776
Epoch 264/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3024 - accuracy: 0.5990 - val_loss: 1.2359 - val_
accuracy: 0.6729
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3064 - accuracy: 0.5964 - val_loss: 1.2026 - val_
accuracy: 0.7056
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2770 - accuracy: 0.6298 - val_loss: 1.2799 - val_
accuracy: 0.7570
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2856 - accuracy: 0.7326 - val_loss: 1.3016 - val_
accuracy: 0.7664
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3418 - accuracy: 0.7558 - val_loss: 1.2725 - val_
accuracy: 0.7430
Epoch 269/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2808 - accuracy: 0.7121 - val_loss: 1.1608 - val_
accuracy: 0.7150
Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4122 - accuracy: 0.6812 - val_loss: 1.0762 - val_
accuracy: 0.7150
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2774 - accuracy: 0.7095 - val_loss: 1.0312 - val_
accuracy: 0.7103
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2734 - accuracy: 0.6967 - val_loss: 1.1920 - val_
accuracy: 0.7290
Epoch 273/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2877 - accuracy: 0.7249 - val_loss: 1.1473 - val_
accuracy: 0.7290
Epoch 274/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3155 - accuracy: 0.7147 - val_loss: 0.9755 - val_
accuracy: 0.7056
Epoch 275/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3934 - accuracy: 0.7198 - val_loss: 1.0092 - val_
accuracy: 0.7336
Epoch 276/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3021 - accuracy: 0.7404 - val_loss: 0.9592 - val_
accuracy: 0.7477
Epoch 277/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2750 - accuracy: 0.7712 - val_loss: 1.0500 - val_
accuracy: 0.7336
Epoch 278/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3370 - accuracy: 0.7326 - val_loss: 1.0587 - val_
accuracy: 0.7290
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2534 - accuracy: 0.7609 - val_loss: 1.1653 - val_
accuracy: 0.7196
Epoch 280/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2859 - accuracy: 0.7763 - val_loss: 1.0942 - val_
accuracy: 0.7290
Epoch 281/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2780 - accuracy: 0.7815 - val_loss: 1.2504 - val_
accuracy: 0.7477
Epoch 282/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2904 - accuracy: 0.7686 - val_loss: 1.2298 - val_
accuracy: 0.7290
Epoch 283/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3356 - accuracy: 0.7763 - val_loss: 1.1304 - val_
accuracy: 0.7243
Epoch 284/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3523 - accuracy: 0.7763 - val_loss: 1.0336 - val_
accuracy: 0.7290
Epoch 285/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.2786 - accuracy: 0.7532 - val_loss: 1.0021 - val_accuracy: 0.7477
Epoch 286/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2955 - accuracy: 0.7712 - val_loss: 1.0781 - val_accuracy: 0.7243
Epoch 287/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3190 - accuracy: 0.7892 - val_loss: 1.0691 - val_accuracy: 0.6916
Epoch 288/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2809 - accuracy: 0.7789 - val_loss: 1.0704 - val_accuracy: 0.6963
Epoch 289/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3026 - accuracy: 0.7789 - val_loss: 1.0716 - val_accuracy: 0.6963
Epoch 290/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3121 - accuracy: 0.7506 - val_loss: 1.0691 - val_accuracy: 0.6916
Epoch 291/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2880 - accuracy: 0.7661 - val_loss: 1.0688 - val_accuracy: 0.6916
Epoch 292/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3028 - accuracy: 0.7686 - val_loss: 1.0546 - val_accuracy: 0.6963
Epoch 293/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3458 - accuracy: 0.7738 - val_loss: 1.0989 - val_accuracy: 0.6822
Epoch 294/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3129 - accuracy: 0.7506 - val_loss: 1.0205 - val_accuracy: 0.6916
Epoch 295/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3443 - accuracy: 0.7712 - val_loss: 0.9975 - val_accuracy: 0.6916
Epoch 296/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3201 - accuracy: 0.7455 - val_loss: 1.0466 - val_accuracy: 0.7150
Epoch 297/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2659 - accuracy: 0.7532 - val_loss: 1.0797 - val_accuracy: 0.7103
Epoch 298/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3038 - accuracy: 0.7686 - val_loss: 0.9907 - val_accuracy: 0.7056
Epoch 299/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2591 - accuracy: 0.7738 - val_loss: 1.0509 - val_accuracy: 0.7009
Epoch 300/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3465 - accuracy: 0.7635 - val_loss: 1.0720 - val_accuracy: 0.7056
Epoch 301/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2531 - accuracy: 0.7918 - val_loss: 1.1389 - val_accuracy: 0.7243
Epoch 302/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3171 - accuracy: 0.7609 - val_loss: 1.1412 - val_accuracy: 0.7243
Epoch 303/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2834 - accuracy: 0.7815 - val_loss: 1.1148 - val_accuracy: 0.7056
Epoch 304/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3242 - accuracy: 0.7558 - val_loss: 1.1105 - val_accuracy: 0.7196
Epoch 305/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2604 - accuracy: 0.7661 - val_loss: 1.1043 - val_accuracy: 0.7056
Epoch 306/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3910 - accuracy: 0.7686 - val_loss: 1.1083 - val_accuracy: 0.7009
Epoch 307/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2943 - accuracy: 0.7661 - val_loss: 1.0839 - val_accuracy: 0.6916
Epoch 308/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3361 - accuracy: 0.7841 - val_loss: 1.0751 - val_accuracy: 0.6963
Epoch 309/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2708 - accuracy: 0.7943 - val_loss: 1.1286 - val_accuracy: 0.7009
Epoch 310/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3032 - accuracy: 0.7763 - val_loss: 1.0781 - val_accuracy: 0.6916
Epoch 311/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3945 - accuracy: 0.7892 - val_loss: 1.0244 - val_accuracy: 0.6963
Epoch 312/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3114 - accuracy: 0.7918 - val_loss: 0.9847 - val_accuracy: 0.7103
Epoch 313/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3234 - accuracy: 0.7815 - val_loss: 1.0105 - val_accuracy: 0.7243
Epoch 314/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2981 - accuracy: 0.7841 - val_loss: 1.0250 - val_accuracy: 0.7150
```

Epoch 315/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3212 - accuracy: 0.7584 - val_loss: 1.0266 - val_accuracy: 0.7196
Epoch 316/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2891 - accuracy: 0.7738 - val_loss: 1.0212 - val_accuracy: 0.7150
Epoch 317/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3369 - accuracy: 0.7943 - val_loss: 1.0275 - val_accuracy: 0.6963
Epoch 318/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2346 - accuracy: 0.7866 - val_loss: 1.0618 - val_accuracy: 0.7056
Epoch 319/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2686 - accuracy: 0.7738 - val_loss: 1.0850 - val_accuracy: 0.7056
Epoch 320/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2588 - accuracy: 0.7789 - val_loss: 1.1031 - val_accuracy: 0.6963
Epoch 321/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2621 - accuracy: 0.7609 - val_loss: 1.1604 - val_accuracy: 0.7103
Epoch 322/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2775 - accuracy: 0.7686 - val_loss: 1.1891 - val_accuracy: 0.7103
Epoch 323/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2483 - accuracy: 0.7815 - val_loss: 1.1850 - val_accuracy: 0.7056
Epoch 324/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2929 - accuracy: 0.7404 - val_loss: 1.1651 - val_accuracy: 0.6822
Epoch 325/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2483 - accuracy: 0.7326 - val_loss: 1.1818 - val_accuracy: 0.6869
Epoch 326/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2505 - accuracy: 0.7224 - val_loss: 1.1096 - val_accuracy: 0.6963
Epoch 327/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2295 - accuracy: 0.7584 - val_loss: 1.1297 - val_accuracy: 0.7009
Epoch 328/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2527 - accuracy: 0.7301 - val_loss: 1.1194 - val_accuracy: 0.6916
Epoch 329/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2564 - accuracy: 0.7275 - val_loss: 1.0799 - val_accuracy: 0.6963
Epoch 330/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2651 - accuracy: 0.7275 - val_loss: 1.1463 - val_accuracy: 0.6869
Epoch 331/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3344 - accuracy: 0.7352 - val_loss: 1.2147 - val_accuracy: 0.6869
Epoch 332/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2549 - accuracy: 0.7584 - val_loss: 1.2130 - val_accuracy: 0.7056
Epoch 333/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2855 - accuracy: 0.7532 - val_loss: 1.1605 - val_accuracy: 0.6869
Epoch 334/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2479 - accuracy: 0.7481 - val_loss: 1.1568 - val_accuracy: 0.7009
Epoch 335/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2719 - accuracy: 0.7378 - val_loss: 1.1570 - val_accuracy: 0.7009
Epoch 336/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2503 - accuracy: 0.7224 - val_loss: 1.0393 - val_accuracy: 0.6729
Epoch 337/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3025 - accuracy: 0.6581 - val_loss: 1.1257 - val_accuracy: 0.7103
Epoch 338/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2526 - accuracy: 0.7558 - val_loss: 1.0454 - val_accuracy: 0.7056
Epoch 339/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2944 - accuracy: 0.7249 - val_loss: 1.0676 - val_accuracy: 0.6869
Epoch 340/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2723 - accuracy: 0.7224 - val_loss: 1.0843 - val_accuracy: 0.6682
Epoch 341/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2639 - accuracy: 0.7147 - val_loss: 1.0986 - val_accuracy: 0.6729
Epoch 342/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2816 - accuracy: 0.7635 - val_loss: 1.1230 - val_accuracy: 0.6449
Epoch 343/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2755 - accuracy: 0.7095 - val_loss: 1.0927 - val_accuracy: 0.6869
Epoch 344/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3035 - accuracy: 0.7224 - val_loss: 1.0468 - val_accuracy: 0.6869

accuracy: 0.6682
Epoch 345/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3073 - accuracy: 0.7224 - val_loss: 1.0413 - val_accuracy: 0.6822
Epoch 346/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2695 - accuracy: 0.6735 - val_loss: 1.0464 - val_accuracy: 0.6075
Epoch 347/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2511 - accuracy: 0.6350 - val_loss: 1.0884 - val_accuracy: 0.6355
Epoch 348/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2647 - accuracy: 0.6478 - val_loss: 1.1170 - val_accuracy: 0.6308
Epoch 349/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2633 - accuracy: 0.6427 - val_loss: 1.1039 - val_accuracy: 0.6402
Epoch 350/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2924 - accuracy: 0.6427 - val_loss: 1.1054 - val_accuracy: 0.7336
Epoch 351/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2553 - accuracy: 0.7969 - val_loss: 1.1056 - val_accuracy: 0.7383
Epoch 352/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2886 - accuracy: 0.7969 - val_loss: 1.0404 - val_accuracy: 0.7336
Epoch 353/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2508 - accuracy: 0.7789 - val_loss: 1.0496 - val_accuracy: 0.7150
Epoch 354/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3989 - accuracy: 0.7661 - val_loss: 1.0887 - val_accuracy: 0.7103
Epoch 355/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3220 - accuracy: 0.7918 - val_loss: 0.9715 - val_accuracy: 0.7056
Epoch 356/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2763 - accuracy: 0.7609 - val_loss: 0.9961 - val_accuracy: 0.7196
Epoch 357/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2868 - accuracy: 0.7866 - val_loss: 1.0489 - val_accuracy: 0.7009
Epoch 358/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3287 - accuracy: 0.7892 - val_loss: 0.9096 - val_accuracy: 0.7196
Epoch 359/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2364 - accuracy: 0.7969 - val_loss: 0.9809 - val_accuracy: 0.7150
Epoch 360/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3446 - accuracy: 0.7841 - val_loss: 1.0376 - val_accuracy: 0.7243
Epoch 361/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2861 - accuracy: 0.7969 - val_loss: 1.0660 - val_accuracy: 0.7290
Epoch 362/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3192 - accuracy: 0.8098 - val_loss: 1.1134 - val_accuracy: 0.7150
Epoch 363/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2375 - accuracy: 0.7995 - val_loss: 1.0553 - val_accuracy: 0.7196
Epoch 364/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3332 - accuracy: 0.7815 - val_loss: 1.0568 - val_accuracy: 0.7056
Epoch 365/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2425 - accuracy: 0.7841 - val_loss: 1.0964 - val_accuracy: 0.7150
Epoch 366/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2766 - accuracy: 0.8046 - val_loss: 1.1251 - val_accuracy: 0.6963
Epoch 367/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2639 - accuracy: 0.8046 - val_loss: 1.1040 - val_accuracy: 0.7009
Epoch 368/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5256 - accuracy: 0.7841 - val_loss: 1.0675 - val_accuracy: 0.7196
Epoch 369/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3079 - accuracy: 0.7943 - val_loss: 1.0929 - val_accuracy: 0.7196
Epoch 370/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2903 - accuracy: 0.8098 - val_loss: 1.0889 - val_accuracy: 0.7196
Epoch 371/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3621 - accuracy: 0.7969 - val_loss: 1.1564 - val_accuracy: 0.7150
Epoch 372/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2900 - accuracy: 0.7969 - val_loss: 1.1173 - val_accuracy: 0.7056
Epoch 373/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3446 - accuracy: 0.8046 - val_loss: 1.1123 - val_accuracy: 0.7196
Epoch 374/1000

```

4/4 [=====] - 0s 12ms/step - loss: 0.2641 - accuracy: 0.7943 - val_loss: 1.1144 - val_accuracy: 0.7290
Epoch 375/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2729 - accuracy: 0.7943 - val_loss: 1.2508 - val_accuracy: 0.7009
Epoch 376/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3375 - accuracy: 0.7866 - val_loss: 1.2735 - val_accuracy: 0.6682
Epoch 377/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2815 - accuracy: 0.7892 - val_loss: 1.2617 - val_accuracy: 0.6869
Epoch 378/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2674 - accuracy: 0.7969 - val_loss: 1.2342 - val_accuracy: 0.7009
Epoch 379/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2736 - accuracy: 0.8098 - val_loss: 1.2417 - val_accuracy: 0.7243
Epoch 380/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2765 - accuracy: 0.8021 - val_loss: 1.2637 - val_accuracy: 0.7103
Epoch 381/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3514 - accuracy: 0.7866 - val_loss: 1.2850 - val_accuracy: 0.7009
Epoch 382/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2506 - accuracy: 0.8149 - val_loss: 1.3358 - val_accuracy: 0.7056
Epoch 383/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2739 - accuracy: 0.7995 - val_loss: 1.3344 - val_accuracy: 0.7103
Epoch 384/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2993 - accuracy: 0.7738 - val_loss: 1.3375 - val_accuracy: 0.7103
Epoch 385/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3121 - accuracy: 0.7656Restoring model weights from the end of the best epoch: 235.
4/4 [=====] - 0s 13ms/step - loss: 0.3050 - accuracy: 0.7943 - val_loss: 1.3404 - val_accuracy: 0.7103
Epoch 385: early stopping
2/2 [=====] - 0s 3ms/step - loss: 0.3071 - accuracy: 0.7907
[CV] END .....Dense1=25, Dense2=25; total time= 18.9s
Model: "sequential_23"

```

Layer (type)	Output Shape	Param #
dense_92 (Dense)	(None, 25)	175
batch_normalization_69 (Batch Normalization)	(None, 25)	100
activation_69 (Activation)	(None, 25)	0
dense_93 (Dense)	(None, 25)	650
batch_normalization_70 (Batch Normalization)	(None, 25)	100
activation_70 (Activation)	(None, 25)	0
dense_94 (Dense)	(None, 10)	260
batch_normalization_71 (Batch Normalization)	(None, 10)	40
activation_71 (Activation)	(None, 10)	0
dense_95 (Dense)	(None, 2)	22

```

Total params: 1,347
Trainable params: 1,227
Non-trainable params: 120

```

```

Epoch 1/1000
4/4 [=====] - 1s 56ms/step - loss: 5.4684 - accuracy: 0.2751 - val_loss: 6.1556 - val_accuracy: 0.4206
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 4.6915 - accuracy: 0.2622 - val_loss: 6.3211 - val_accuracy: 0.3925
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 4.7077 - accuracy: 0.2725 - val_loss: 6.3239 - val_accuracy: 0.3411
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 4.3157 - accuracy: 0.2725 - val_loss: 5.7599 - val_accuracy: 0.3178
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 4.2794 - accuracy: 0.2828 - val_loss: 5.2385 - val_accuracy: 0.3084
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 4.1912 - accuracy: 0.3059 - val_loss: 4.6024 - val_

```

```
accuracy: 0.2897
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 4.0728 - accuracy: 0.3136 - val_loss: 4.0544 - val_
accuracy: 0.2944
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9077 - accuracy: 0.3033 - val_loss: 3.4989 - val_
accuracy: 0.2617
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8119 - accuracy: 0.3059 - val_loss: 3.2161 - val_
accuracy: 0.2617
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7340 - accuracy: 0.2956 - val_loss: 2.8635 - val_
accuracy: 0.2523
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6345 - accuracy: 0.3085 - val_loss: 2.4955 - val_
accuracy: 0.2617
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4460 - accuracy: 0.3085 - val_loss: 2.3956 - val_
accuracy: 0.2710
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4781 - accuracy: 0.3265 - val_loss: 2.1144 - val_
accuracy: 0.3084
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2161 - accuracy: 0.3419 - val_loss: 1.9078 - val_
accuracy: 0.3084
Epoch 15/1000
4/4 [=====] - 0s 12ms/step - loss: 3.2200 - accuracy: 0.3316 - val_loss: 1.8311 - val_
accuracy: 0.3131
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0229 - accuracy: 0.3316 - val_loss: 1.8316 - val_
accuracy: 0.3131
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0683 - accuracy: 0.3239 - val_loss: 1.8099 - val_
accuracy: 0.3224
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9013 - accuracy: 0.3419 - val_loss: 1.7424 - val_
accuracy: 0.3131
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9242 - accuracy: 0.3136 - val_loss: 1.6789 - val_
accuracy: 0.3131
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8995 - accuracy: 0.3188 - val_loss: 1.5947 - val_
accuracy: 0.3224
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7910 - accuracy: 0.3599 - val_loss: 1.5219 - val_
accuracy: 0.2570
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5695 - accuracy: 0.3419 - val_loss: 1.5093 - val_
accuracy: 0.2336
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7463 - accuracy: 0.3522 - val_loss: 1.5285 - val_
accuracy: 0.2383
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5001 - accuracy: 0.3548 - val_loss: 1.5119 - val_
accuracy: 0.2336
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4539 - accuracy: 0.3599 - val_loss: 1.4983 - val_
accuracy: 0.2290
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3301 - accuracy: 0.3676 - val_loss: 1.4940 - val_
accuracy: 0.2477
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3969 - accuracy: 0.3702 - val_loss: 1.4890 - val_
accuracy: 0.2523
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2882 - accuracy: 0.3548 - val_loss: 1.4432 - val_
accuracy: 0.2804
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2788 - accuracy: 0.3676 - val_loss: 1.4479 - val_
accuracy: 0.2944
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2460 - accuracy: 0.3907 - val_loss: 1.4340 - val_
accuracy: 0.2897
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0526 - accuracy: 0.3805 - val_loss: 1.4124 - val_
accuracy: 0.2850
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0958 - accuracy: 0.3779 - val_loss: 1.3689 - val_
accuracy: 0.3271
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0127 - accuracy: 0.3470 - val_loss: 1.3295 - val_
accuracy: 0.3318
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9763 - accuracy: 0.3805 - val_loss: 1.2845 - val_
accuracy: 0.3364
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0864 - accuracy: 0.3650 - val_loss: 1.2411 - val_
accuracy: 0.3318
Epoch 36/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 1.9107 - accuracy: 0.3728 - val_loss: 1.2369 - val_accuracy: 0.3318
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8978 - accuracy: 0.3907 - val_loss: 1.2353 - val_accuracy: 0.3411
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8768 - accuracy: 0.3522 - val_loss: 1.2357 - val_accuracy: 0.3411
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8333 - accuracy: 0.3702 - val_loss: 1.2212 - val_accuracy: 0.3551
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8540 - accuracy: 0.4139 - val_loss: 1.2205 - val_accuracy: 0.3551
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7743 - accuracy: 0.3907 - val_loss: 1.2190 - val_accuracy: 0.3551
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6322 - accuracy: 0.4139 - val_loss: 1.2012 - val_accuracy: 0.3645
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7039 - accuracy: 0.4010 - val_loss: 1.1927 - val_accuracy: 0.3645
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6848 - accuracy: 0.4062 - val_loss: 1.1816 - val_accuracy: 0.3551
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6558 - accuracy: 0.4267 - val_loss: 1.1954 - val_accuracy: 0.3645
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5578 - accuracy: 0.3959 - val_loss: 1.1917 - val_accuracy: 0.3692
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6055 - accuracy: 0.3728 - val_loss: 1.1776 - val_accuracy: 0.3692
Epoch 48/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5137 - accuracy: 0.4242 - val_loss: 1.1611 - val_accuracy: 0.3692
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5491 - accuracy: 0.3985 - val_loss: 1.1495 - val_accuracy: 0.3692
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4445 - accuracy: 0.4062 - val_loss: 1.1278 - val_accuracy: 0.3645
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5238 - accuracy: 0.3933 - val_loss: 1.0791 - val_accuracy: 0.3645
Epoch 52/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4672 - accuracy: 0.4165 - val_loss: 1.0746 - val_accuracy: 0.3551
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3650 - accuracy: 0.3856 - val_loss: 1.0710 - val_accuracy: 0.3645
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4531 - accuracy: 0.4165 - val_loss: 1.0918 - val_accuracy: 0.3598
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4690 - accuracy: 0.3959 - val_loss: 1.0878 - val_accuracy: 0.3738
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3110 - accuracy: 0.3959 - val_loss: 1.0983 - val_accuracy: 0.3692
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4161 - accuracy: 0.4293 - val_loss: 1.0738 - val_accuracy: 0.3738
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3558 - accuracy: 0.4062 - val_loss: 1.0656 - val_accuracy: 0.3832
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3367 - accuracy: 0.4190 - val_loss: 1.0594 - val_accuracy: 0.3692
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4021 - accuracy: 0.4242 - val_loss: 1.0527 - val_accuracy: 0.3785
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3220 - accuracy: 0.4319 - val_loss: 1.0401 - val_accuracy: 0.3785
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2650 - accuracy: 0.4422 - val_loss: 1.0290 - val_accuracy: 0.3692
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2546 - accuracy: 0.4344 - val_loss: 1.0181 - val_accuracy: 0.3551
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3669 - accuracy: 0.4499 - val_loss: 1.0119 - val_accuracy: 0.3458
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2522 - accuracy: 0.4396 - val_loss: 1.0047 - val_accuracy: 0.3598
```

Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3126 - accuracy: 0.4576 - val_loss: 0.9866 - val_accuracy: 0.3598
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1768 - accuracy: 0.4190 - val_loss: 0.9721 - val_accuracy: 0.3785
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0774 - accuracy: 0.4370 - val_loss: 0.9681 - val_accuracy: 0.3785
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1571 - accuracy: 0.4602 - val_loss: 0.9762 - val_accuracy: 0.3692
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0619 - accuracy: 0.4396 - val_loss: 0.9028 - val_accuracy: 0.3738
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1206 - accuracy: 0.4447 - val_loss: 0.8710 - val_accuracy: 0.3879
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0971 - accuracy: 0.4756 - val_loss: 0.8781 - val_accuracy: 0.4065
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1112 - accuracy: 0.4679 - val_loss: 0.8831 - val_accuracy: 0.3925
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0386 - accuracy: 0.4756 - val_loss: 0.9403 - val_accuracy: 0.3972
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0774 - accuracy: 0.4679 - val_loss: 0.9348 - val_accuracy: 0.3925
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9771 - accuracy: 0.4499 - val_loss: 0.9286 - val_accuracy: 0.3972
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0183 - accuracy: 0.4499 - val_loss: 0.9125 - val_accuracy: 0.3972
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0296 - accuracy: 0.4473 - val_loss: 0.9145 - val_accuracy: 0.3972
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9700 - accuracy: 0.4422 - val_loss: 0.9036 - val_accuracy: 0.3879
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0153 - accuracy: 0.4679 - val_loss: 0.8784 - val_accuracy: 0.3879
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0248 - accuracy: 0.4627 - val_loss: 0.9013 - val_accuracy: 0.3832
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0360 - accuracy: 0.4807 - val_loss: 0.9267 - val_accuracy: 0.3925
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9751 - accuracy: 0.4524 - val_loss: 0.9183 - val_accuracy: 0.3972
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0249 - accuracy: 0.4704 - val_loss: 0.8943 - val_accuracy: 0.3972
Epoch 85/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9822 - accuracy: 0.4524 - val_loss: 0.9317 - val_accuracy: 0.3925
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0145 - accuracy: 0.4756 - val_loss: 0.9033 - val_accuracy: 0.4019
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9378 - accuracy: 0.4447 - val_loss: 0.9049 - val_accuracy: 0.3879
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9663 - accuracy: 0.4627 - val_loss: 0.9053 - val_accuracy: 0.3832
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8877 - accuracy: 0.4602 - val_loss: 0.8985 - val_accuracy: 0.3785
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9592 - accuracy: 0.4730 - val_loss: 0.8912 - val_accuracy: 0.3832
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9634 - accuracy: 0.4859 - val_loss: 0.8716 - val_accuracy: 0.3879
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0527 - accuracy: 0.4833 - val_loss: 0.8651 - val_accuracy: 0.3972
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8844 - accuracy: 0.5193 - val_loss: 0.8555 - val_accuracy: 0.4065
Epoch 94/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9618 - accuracy: 0.4987 - val_loss: 0.8800 - val_accuracy: 0.4065
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9814 - accuracy: 0.4936 - val_loss: 0.8563 - val_accuracy: 0.4065

```
accuracy: 0.4112
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9783 - accuracy: 0.5090 - val_loss: 0.8456 - val_accuracy: 0.4159
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8519 - accuracy: 0.5141 - val_loss: 0.8384 - val_accuracy: 0.4206
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9001 - accuracy: 0.5141 - val_loss: 0.8384 - val_accuracy: 0.4159
Epoch 99/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9219 - accuracy: 0.5013 - val_loss: 0.8392 - val_accuracy: 0.4159
Epoch 100/1000
4/4 [=====] - 0s 17ms/step - loss: 0.9155 - accuracy: 0.5116 - val_loss: 0.8346 - val_accuracy: 0.4252
Epoch 101/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8311 - accuracy: 0.5116 - val_loss: 0.8343 - val_accuracy: 0.4252
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9066 - accuracy: 0.5296 - val_loss: 0.9066 - val_accuracy: 0.4299
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8423 - accuracy: 0.5270 - val_loss: 0.7446 - val_accuracy: 0.3972
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8456 - accuracy: 0.5116 - val_loss: 0.7370 - val_accuracy: 0.4065
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8768 - accuracy: 0.5193 - val_loss: 0.7779 - val_accuracy: 0.4579
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8007 - accuracy: 0.5476 - val_loss: 0.7678 - val_accuracy: 0.4579
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8385 - accuracy: 0.5758 - val_loss: 0.7670 - val_accuracy: 0.4533
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8263 - accuracy: 0.5578 - val_loss: 0.7658 - val_accuracy: 0.4626
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8608 - accuracy: 0.5553 - val_loss: 0.7592 - val_accuracy: 0.4766
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8479 - accuracy: 0.5527 - val_loss: 0.7564 - val_accuracy: 0.4860
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8128 - accuracy: 0.5758 - val_loss: 0.7781 - val_accuracy: 0.4720
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8197 - accuracy: 0.5835 - val_loss: 0.7536 - val_accuracy: 0.4907
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7864 - accuracy: 0.5527 - val_loss: 0.7253 - val_accuracy: 0.4907
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7856 - accuracy: 0.5784 - val_loss: 0.7437 - val_accuracy: 0.4907
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7929 - accuracy: 0.5630 - val_loss: 0.7165 - val_accuracy: 0.4766
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7937 - accuracy: 0.5733 - val_loss: 0.7370 - val_accuracy: 0.4907
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8129 - accuracy: 0.5733 - val_loss: 0.7361 - val_accuracy: 0.4907
Epoch 118/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8074 - accuracy: 0.5527 - val_loss: 0.7364 - val_accuracy: 0.4953
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7456 - accuracy: 0.5938 - val_loss: 0.7879 - val_accuracy: 0.4907
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8066 - accuracy: 0.5990 - val_loss: 0.7579 - val_accuracy: 0.4626
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7945 - accuracy: 0.5630 - val_loss: 0.7576 - val_accuracy: 0.4579
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7620 - accuracy: 0.5527 - val_loss: 0.7866 - val_accuracy: 0.4252
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7641 - accuracy: 0.5373 - val_loss: 0.8115 - val_accuracy: 0.4252
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7841 - accuracy: 0.5193 - val_loss: 0.8114 - val_accuracy: 0.4206
Epoch 125/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.7906 - accuracy: 0.5347 - val_loss: 0.8112 - val_accuracy: 0.4346
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7957 - accuracy: 0.5296 - val_loss: 0.8081 - val_accuracy: 0.4439
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7796 - accuracy: 0.5398 - val_loss: 0.8058 - val_accuracy: 0.4439
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8291 - accuracy: 0.5784 - val_loss: 0.7974 - val_accuracy: 0.4953
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7528 - accuracy: 0.5501 - val_loss: 0.7996 - val_accuracy: 0.4860
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8023 - accuracy: 0.5424 - val_loss: 0.8760 - val_accuracy: 0.4720
Epoch 131/1000
4/4 [=====] - 0s 18ms/step - loss: 0.7865 - accuracy: 0.5424 - val_loss: 0.9214 - val_accuracy: 0.4953
Epoch 132/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7208 - accuracy: 0.5424 - val_loss: 0.8877 - val_accuracy: 0.4860
Epoch 133/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7745 - accuracy: 0.5578 - val_loss: 0.8855 - val_accuracy: 0.5140
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7387 - accuracy: 0.5656 - val_loss: 0.9162 - val_accuracy: 0.5047
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7104 - accuracy: 0.5553 - val_loss: 0.8911 - val_accuracy: 0.5093
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6936 - accuracy: 0.5656 - val_loss: 0.8866 - val_accuracy: 0.5140
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7328 - accuracy: 0.5450 - val_loss: 0.8674 - val_accuracy: 0.5280
Epoch 138/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8842 - accuracy: 0.5578 - val_loss: 0.9089 - val_accuracy: 0.5467
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7178 - accuracy: 0.5835 - val_loss: 0.8859 - val_accuracy: 0.5421
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7058 - accuracy: 0.5604 - val_loss: 0.8850 - val_accuracy: 0.5187
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7807 - accuracy: 0.5630 - val_loss: 0.8052 - val_accuracy: 0.5093
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6799 - accuracy: 0.5501 - val_loss: 0.8018 - val_accuracy: 0.5140
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6733 - accuracy: 0.5527 - val_loss: 0.8195 - val_accuracy: 0.5000
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7374 - accuracy: 0.5707 - val_loss: 0.8471 - val_accuracy: 0.5093
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7304 - accuracy: 0.5604 - val_loss: 0.8427 - val_accuracy: 0.5047
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6929 - accuracy: 0.5501 - val_loss: 0.8417 - val_accuracy: 0.5000
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8117 - accuracy: 0.5784 - val_loss: 0.8448 - val_accuracy: 0.5000
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7012 - accuracy: 0.5630 - val_loss: 0.8396 - val_accuracy: 0.5047
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6809 - accuracy: 0.5347 - val_loss: 0.8494 - val_accuracy: 0.4953
Epoch 150/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7697 - accuracy: 0.5501 - val_loss: 0.8402 - val_accuracy: 0.4860
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7961 - accuracy: 0.5450 - val_loss: 0.9150 - val_accuracy: 0.5280
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7737 - accuracy: 0.5733 - val_loss: 0.9110 - val_accuracy: 0.5047
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7279 - accuracy: 0.5578 - val_loss: 0.9078 - val_accuracy: 0.5093
Epoch 154/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7229 - accuracy: 0.5604 - val_loss: 0.9101 - val_accuracy: 0.5187
```

Epoch 155/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7170 - accuracy: 0.5604 - val_loss: 0.9367 - val_accuracy: 0.5234
Epoch 156/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6863 - accuracy: 0.5578 - val_loss: 0.9086 - val_accuracy: 0.5187
Epoch 157/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8073 - accuracy: 0.5424 - val_loss: 0.8405 - val_accuracy: 0.4860
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6588 - accuracy: 0.5476 - val_loss: 0.8239 - val_accuracy: 0.4860
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6970 - accuracy: 0.5424 - val_loss: 0.8209 - val_accuracy: 0.5000
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6929 - accuracy: 0.5578 - val_loss: 0.7777 - val_accuracy: 0.4907
Epoch 161/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6806 - accuracy: 0.5501 - val_loss: 0.7770 - val_accuracy: 0.4860
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6932 - accuracy: 0.5501 - val_loss: 0.7448 - val_accuracy: 0.5000
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7353 - accuracy: 0.5861 - val_loss: 0.7388 - val_accuracy: 0.4860
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6795 - accuracy: 0.6067 - val_loss: 0.7418 - val_accuracy: 0.4953
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6981 - accuracy: 0.5527 - val_loss: 0.7542 - val_accuracy: 0.5187
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6719 - accuracy: 0.5784 - val_loss: 0.7854 - val_accuracy: 0.4813
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7485 - accuracy: 0.5321 - val_loss: 0.8225 - val_accuracy: 0.5047
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6893 - accuracy: 0.5424 - val_loss: 0.8247 - val_accuracy: 0.5093
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7265 - accuracy: 0.5527 - val_loss: 0.9316 - val_accuracy: 0.5234
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7720 - accuracy: 0.5398 - val_loss: 0.9253 - val_accuracy: 0.5280
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6754 - accuracy: 0.5656 - val_loss: 0.8395 - val_accuracy: 0.5140
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6962 - accuracy: 0.5450 - val_loss: 0.8383 - val_accuracy: 0.5140
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6479 - accuracy: 0.5527 - val_loss: 0.8387 - val_accuracy: 0.5140
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7361 - accuracy: 0.5501 - val_loss: 0.8649 - val_accuracy: 0.4907
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6803 - accuracy: 0.5373 - val_loss: 0.8648 - val_accuracy: 0.4813
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6125 - accuracy: 0.5630 - val_loss: 0.8344 - val_accuracy: 0.4953
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7125 - accuracy: 0.5758 - val_loss: 0.8392 - val_accuracy: 0.5000
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7054 - accuracy: 0.5733 - val_loss: 0.8367 - val_accuracy: 0.5047
Epoch 179/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6210 - accuracy: 0.5604 - val_loss: 0.7484 - val_accuracy: 0.4953
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6964 - accuracy: 0.5990 - val_loss: 0.7498 - val_accuracy: 0.5000
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7324 - accuracy: 0.5784 - val_loss: 0.7487 - val_accuracy: 0.5000
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6718 - accuracy: 0.5681 - val_loss: 0.7736 - val_accuracy: 0.4953
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6836 - accuracy: 0.5604 - val_loss: 0.7666 - val_accuracy: 0.5093
Epoch 184/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6516 - accuracy: 0.5733 - val_loss: 0.7716 - val_accuracy: 0.5093

```
accuracy: 0.5000
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6947 - accuracy: 0.5604 - val_loss: 0.7689 - val_
accuracy: 0.5047
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6711 - accuracy: 0.5193 - val_loss: 0.7684 - val_
accuracy: 0.5047
Epoch 187/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6182 - accuracy: 0.5476 - val_loss: 0.7738 - val_
accuracy: 0.5140
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6582 - accuracy: 0.5630 - val_loss: 0.8107 - val_
accuracy: 0.5327
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6251 - accuracy: 0.5733 - val_loss: 0.8472 - val_
accuracy: 0.5374
Epoch 190/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6375 - accuracy: 0.5476 - val_loss: 0.8037 - val_
accuracy: 0.5140
Epoch 191/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6748 - accuracy: 0.5501 - val_loss: 0.8651 - val_
accuracy: 0.4953
Epoch 192/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5875 - accuracy: 0.5578 - val_loss: 0.8215 - val_
accuracy: 0.5000
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6482 - accuracy: 0.5450 - val_loss: 0.8146 - val_
accuracy: 0.5047
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6655 - accuracy: 0.5681 - val_loss: 0.7827 - val_
accuracy: 0.4953
Epoch 195/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6353 - accuracy: 0.5733 - val_loss: 0.8974 - val_
accuracy: 0.5187
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6895 - accuracy: 0.5476 - val_loss: 0.8116 - val_
accuracy: 0.5327
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6236 - accuracy: 0.5604 - val_loss: 0.8074 - val_
accuracy: 0.5327
Epoch 198/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6910 - accuracy: 0.5553 - val_loss: 0.8232 - val_
accuracy: 0.5374
Epoch 199/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6132 - accuracy: 0.5424 - val_loss: 0.8155 - val_
accuracy: 0.5514
Epoch 200/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6399 - accuracy: 0.5861 - val_loss: 0.7783 - val_
accuracy: 0.5374
Epoch 201/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6261 - accuracy: 0.5887 - val_loss: 0.7726 - val_
accuracy: 0.5467
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6355 - accuracy: 0.5887 - val_loss: 0.7730 - val_
accuracy: 0.5374
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5815 - accuracy: 0.5733 - val_loss: 0.7769 - val_
accuracy: 0.5514
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6854 - accuracy: 0.5758 - val_loss: 0.7562 - val_
accuracy: 0.5327
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6100 - accuracy: 0.5707 - val_loss: 0.6961 - val_
accuracy: 0.5327
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6774 - accuracy: 0.5733 - val_loss: 0.7213 - val_
accuracy: 0.5280
Epoch 207/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5906 - accuracy: 0.5758 - val_loss: 0.7169 - val_
accuracy: 0.5327
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6235 - accuracy: 0.5964 - val_loss: 0.8277 - val_
accuracy: 0.5514
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6586 - accuracy: 0.6015 - val_loss: 0.7810 - val_
accuracy: 0.5327
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6235 - accuracy: 0.5578 - val_loss: 0.8025 - val_
accuracy: 0.5794
Epoch 211/1000
4/4 [=====] - 0s 16ms/step - loss: 0.6773 - accuracy: 0.5835 - val_loss: 0.8327 - val_
accuracy: 0.5748
Epoch 212/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6587 - accuracy: 0.6247 - val_loss: 0.8362 - val_
accuracy: 0.5421
Epoch 213/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6965 - accuracy: 0.5887 - val_loss: 0.8327 - val_
accuracy: 0.5327
Epoch 214/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.6401 - accuracy: 0.5887 - val_loss: 0.8136 - val_accuracy: 0.5514
Epoch 215/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6583 - accuracy: 0.5707 - val_loss: 0.8079 - val_accuracy: 0.5467
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6014 - accuracy: 0.5990 - val_loss: 0.8056 - val_accuracy: 0.5514
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6797 - accuracy: 0.5501 - val_loss: 0.8325 - val_accuracy: 0.5561
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7446 - accuracy: 0.5784 - val_loss: 0.8163 - val_accuracy: 0.5607
Epoch 219/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5941 - accuracy: 0.5553 - val_loss: 0.8181 - val_accuracy: 0.5701
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5539 - accuracy: 0.5424 - val_loss: 0.7893 - val_accuracy: 0.5561
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5815 - accuracy: 0.5733 - val_loss: 0.8060 - val_accuracy: 0.5561
Epoch 222/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6300 - accuracy: 0.5835 - val_loss: 0.8044 - val_accuracy: 0.5701
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6420 - accuracy: 0.5990 - val_loss: 0.7823 - val_accuracy: 0.5748
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6169 - accuracy: 0.5758 - val_loss: 0.8717 - val_accuracy: 0.5654
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6328 - accuracy: 0.5964 - val_loss: 0.7860 - val_accuracy: 0.5654
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7180 - accuracy: 0.5913 - val_loss: 0.8081 - val_accuracy: 0.5561
Epoch 227/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6573 - accuracy: 0.6015 - val_loss: 0.8153 - val_accuracy: 0.5514
Epoch 228/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5848 - accuracy: 0.6015 - val_loss: 0.8313 - val_accuracy: 0.5607
Epoch 229/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7049 - accuracy: 0.5835 - val_loss: 0.8295 - val_accuracy: 0.5748
Epoch 230/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6139 - accuracy: 0.6041 - val_loss: 0.8028 - val_accuracy: 0.5748
Epoch 231/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6713 - accuracy: 0.5964 - val_loss: 0.7803 - val_accuracy: 0.5888
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6500 - accuracy: 0.5990 - val_loss: 0.8058 - val_accuracy: 0.5467
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6800 - accuracy: 0.5553 - val_loss: 0.7972 - val_accuracy: 0.5561
Epoch 234/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6690 - accuracy: 0.6144 - val_loss: 0.7853 - val_accuracy: 0.5748
Epoch 235/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6091 - accuracy: 0.5810 - val_loss: 0.7366 - val_accuracy: 0.5607
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6728 - accuracy: 0.5578 - val_loss: 0.7374 - val_accuracy: 0.5607
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5667 - accuracy: 0.5758 - val_loss: 0.7392 - val_accuracy: 0.5701
Epoch 238/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6631 - accuracy: 0.5733 - val_loss: 0.6698 - val_accuracy: 0.5514
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6768 - accuracy: 0.5707 - val_loss: 0.6506 - val_accuracy: 0.5514
Epoch 240/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6222 - accuracy: 0.5424 - val_loss: 0.6777 - val_accuracy: 0.5561
Epoch 241/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5728 - accuracy: 0.5707 - val_loss: 0.6931 - val_accuracy: 0.5607
Epoch 242/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5845 - accuracy: 0.5835 - val_loss: 0.6493 - val_accuracy: 0.5421
Epoch 243/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6603 - accuracy: 0.5476 - val_loss: 0.6590 - val_accuracy: 0.5421
```

Epoch 244/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5952 - accuracy: 0.5501 - val_loss: 0.6973 - val_accuracy: 0.5140
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6454 - accuracy: 0.5887 - val_loss: 0.7272 - val_accuracy: 0.5140
Epoch 246/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6281 - accuracy: 0.5373 - val_loss: 0.6773 - val_accuracy: 0.5187
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6851 - accuracy: 0.5424 - val_loss: 0.6983 - val_accuracy: 0.4860
Epoch 248/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6348 - accuracy: 0.5476 - val_loss: 0.6458 - val_accuracy: 0.4766
Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6443 - accuracy: 0.5116 - val_loss: 0.6732 - val_accuracy: 0.4907
Epoch 250/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6302 - accuracy: 0.5424 - val_loss: 0.6694 - val_accuracy: 0.4766
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6506 - accuracy: 0.5630 - val_loss: 0.6688 - val_accuracy: 0.4766
Epoch 252/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5511 - accuracy: 0.5681 - val_loss: 0.6222 - val_accuracy: 0.4766
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6495 - accuracy: 0.5578 - val_loss: 0.6573 - val_accuracy: 0.4393
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6017 - accuracy: 0.5244 - val_loss: 0.6150 - val_accuracy: 0.4533
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6235 - accuracy: 0.5064 - val_loss: 0.6398 - val_accuracy: 0.4626
Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5646 - accuracy: 0.5501 - val_loss: 0.6863 - val_accuracy: 0.4720
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6948 - accuracy: 0.5527 - val_loss: 0.6599 - val_accuracy: 0.4766
Epoch 258/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5904 - accuracy: 0.5501 - val_loss: 0.7129 - val_accuracy: 0.4486
Epoch 259/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5529 - accuracy: 0.5398 - val_loss: 0.7673 - val_accuracy: 0.4720
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5784 - accuracy: 0.5347 - val_loss: 0.7390 - val_accuracy: 0.4393
Epoch 261/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5848 - accuracy: 0.5064 - val_loss: 0.7427 - val_accuracy: 0.4486
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5309 - accuracy: 0.5373 - val_loss: 0.7628 - val_accuracy: 0.4346
Epoch 263/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6001 - accuracy: 0.5270 - val_loss: 0.7619 - val_accuracy: 0.4486
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5772 - accuracy: 0.4833 - val_loss: 0.7921 - val_accuracy: 0.4673
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5506 - accuracy: 0.5090 - val_loss: 0.7326 - val_accuracy: 0.4673
Epoch 266/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6009 - accuracy: 0.5116 - val_loss: 0.7519 - val_accuracy: 0.4579
Epoch 267/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5634 - accuracy: 0.4910 - val_loss: 0.7622 - val_accuracy: 0.4673
Epoch 268/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5838 - accuracy: 0.5193 - val_loss: 0.7140 - val_accuracy: 0.4673
Epoch 269/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5581 - accuracy: 0.5553 - val_loss: 0.7291 - val_accuracy: 0.4907
Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6662 - accuracy: 0.5244 - val_loss: 0.6997 - val_accuracy: 0.4766
Epoch 271/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5983 - accuracy: 0.5347 - val_loss: 0.6938 - val_accuracy: 0.5374
Epoch 272/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5709 - accuracy: 0.5398 - val_loss: 0.6646 - val_accuracy: 0.5234
Epoch 273/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5273 - accuracy: 0.5604 - val_loss: 0.6674 - val_accuracy: 0.5374

```
accuracy: 0.5327
Epoch 274/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4844 - accuracy: 0.5861 - val_loss: 0.6358 - val_accuracy: 0.5467
Epoch 275/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5059 - accuracy: 0.5398 - val_loss: 0.6367 - val_accuracy: 0.5327
Epoch 276/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5525 - accuracy: 0.5758 - val_loss: 0.6586 - val_accuracy: 0.5607
Epoch 277/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5217 - accuracy: 0.6350 - val_loss: 0.6775 - val_accuracy: 0.5654
Epoch 278/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5548 - accuracy: 0.6144 - val_loss: 0.6096 - val_accuracy: 0.5607
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4622 - accuracy: 0.6427 - val_loss: 0.6607 - val_accuracy: 0.5654
Epoch 280/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5075 - accuracy: 0.6144 - val_loss: 0.6335 - val_accuracy: 0.5748
Epoch 281/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4920 - accuracy: 0.5887 - val_loss: 0.6969 - val_accuracy: 0.5701
Epoch 282/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4950 - accuracy: 0.5938 - val_loss: 0.6968 - val_accuracy: 0.5701
Epoch 283/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5326 - accuracy: 0.5913 - val_loss: 0.6655 - val_accuracy: 0.5888
Epoch 284/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5336 - accuracy: 0.6067 - val_loss: 0.7026 - val_accuracy: 0.5701
Epoch 285/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5638 - accuracy: 0.5758 - val_loss: 0.7064 - val_accuracy: 0.5701
Epoch 286/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4493 - accuracy: 0.5810 - val_loss: 0.7276 - val_accuracy: 0.5654
Epoch 287/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4726 - accuracy: 0.5835 - val_loss: 0.7273 - val_accuracy: 0.5607
Epoch 288/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4877 - accuracy: 0.5347 - val_loss: 0.7296 - val_accuracy: 0.5654
Epoch 289/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4931 - accuracy: 0.5707 - val_loss: 0.6440 - val_accuracy: 0.5654
Epoch 290/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4556 - accuracy: 0.5810 - val_loss: 0.6719 - val_accuracy: 0.5654
Epoch 291/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4556 - accuracy: 0.5887 - val_loss: 0.6666 - val_accuracy: 0.5654
Epoch 292/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4677 - accuracy: 0.5656 - val_loss: 0.6651 - val_accuracy: 0.5561
Epoch 293/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4997 - accuracy: 0.5656 - val_loss: 0.6788 - val_accuracy: 0.5654
Epoch 294/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4314 - accuracy: 0.5553 - val_loss: 0.6979 - val_accuracy: 0.5654
Epoch 295/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4310 - accuracy: 0.5553 - val_loss: 0.7177 - val_accuracy: 0.5514
Epoch 296/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4699 - accuracy: 0.5630 - val_loss: 0.7180 - val_accuracy: 0.5234
Epoch 297/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5116 - accuracy: 0.5887 - val_loss: 0.7186 - val_accuracy: 0.5467
Epoch 298/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4780 - accuracy: 0.5990 - val_loss: 0.6944 - val_accuracy: 0.5421
Epoch 299/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5144 - accuracy: 0.6041 - val_loss: 0.6891 - val_accuracy: 0.5421
Epoch 300/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4451 - accuracy: 0.5964 - val_loss: 0.7130 - val_accuracy: 0.5280
Epoch 301/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5122 - accuracy: 0.5861 - val_loss: 0.6831 - val_accuracy: 0.5421
Epoch 302/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5435 - accuracy: 0.6324 - val_loss: 0.7314 - val_accuracy: 0.5234
Epoch 303/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.4195 - accuracy: 0.5810 - val_loss: 0.7300 - val_accuracy: 0.5374
Epoch 304/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5197 - accuracy: 0.5887 - val_loss: 0.7580 - val_accuracy: 0.5374
Epoch 305/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4836 - accuracy: 0.5887 - val_loss: 0.7561 - val_accuracy: 0.5421
Epoch 306/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4674 - accuracy: 0.5938 - val_loss: 0.7850 - val_accuracy: 0.5607
Epoch 307/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4788 - accuracy: 0.6144 - val_loss: 0.8035 - val_accuracy: 0.5654
Epoch 308/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4589 - accuracy: 0.6195 - val_loss: 0.7785 - val_accuracy: 0.5654
Epoch 309/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4715 - accuracy: 0.5938 - val_loss: 0.7757 - val_accuracy: 0.5701
Epoch 310/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4854 - accuracy: 0.6041 - val_loss: 0.7795 - val_accuracy: 0.5467
Epoch 311/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4915 - accuracy: 0.6195 - val_loss: 0.8000 - val_accuracy: 0.5374
Epoch 312/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4962 - accuracy: 0.6272 - val_loss: 0.7999 - val_accuracy: 0.5327
Epoch 313/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5186 - accuracy: 0.6015 - val_loss: 0.8111 - val_accuracy: 0.5467
Epoch 314/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4405 - accuracy: 0.5964 - val_loss: 0.8512 - val_accuracy: 0.5654
Epoch 315/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4695 - accuracy: 0.6350 - val_loss: 0.8384 - val_accuracy: 0.5794
Epoch 316/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4378 - accuracy: 0.6272 - val_loss: 0.8479 - val_accuracy: 0.5701
Epoch 317/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3897 - accuracy: 0.5887 - val_loss: 0.8463 - val_accuracy: 0.5654
Epoch 318/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5364 - accuracy: 0.6195 - val_loss: 0.8534 - val_accuracy: 0.5701
Epoch 319/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4565 - accuracy: 0.6247 - val_loss: 0.8811 - val_accuracy: 0.5701
Epoch 320/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4385 - accuracy: 0.6093 - val_loss: 0.8521 - val_accuracy: 0.5701
Epoch 321/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4327 - accuracy: 0.6272 - val_loss: 0.8483 - val_accuracy: 0.5701
Epoch 322/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6135 - accuracy: 0.6375 - val_loss: 0.8513 - val_accuracy: 0.5654
Epoch 323/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4234 - accuracy: 0.6478 - val_loss: 0.8509 - val_accuracy: 0.5794
Epoch 324/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4568 - accuracy: 0.6452 - val_loss: 0.8801 - val_accuracy: 0.5514
Epoch 325/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4557 - accuracy: 0.6324 - val_loss: 0.8814 - val_accuracy: 0.5514
Epoch 326/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3878 - accuracy: 0.6118 - val_loss: 0.8555 - val_accuracy: 0.5421
Epoch 327/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5052 - accuracy: 0.6350 - val_loss: 0.8475 - val_accuracy: 0.5607
Epoch 328/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4286 - accuracy: 0.6401 - val_loss: 0.8488 - val_accuracy: 0.5794
Epoch 329/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4969 - accuracy: 0.6401 - val_loss: 0.8518 - val_accuracy: 0.5794
Epoch 330/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5153 - accuracy: 0.6401 - val_loss: 0.8527 - val_accuracy: 0.5748
Epoch 331/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4572 - accuracy: 0.6761 - val_loss: 0.8176 - val_accuracy: 0.5794
Epoch 332/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5048 - accuracy: 0.6710 - val_loss: 0.8363 - val_accuracy: 0.5701
```

Epoch 333/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3800 - accuracy: 0.6761 - val_loss: 0.8635 - val_accuracy: 0.5748
Epoch 334/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4532 - accuracy: 0.6684 - val_loss: 0.8234 - val_accuracy: 0.5841
Epoch 335/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4082 - accuracy: 0.6632 - val_loss: 0.8576 - val_accuracy: 0.5794
Epoch 336/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3846 - accuracy: 0.6735 - val_loss: 0.8363 - val_accuracy: 0.5841
Epoch 337/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4354 - accuracy: 0.7018 - val_loss: 0.7903 - val_accuracy: 0.5841
Epoch 338/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4155 - accuracy: 0.6889 - val_loss: 0.7894 - val_accuracy: 0.5841
Epoch 339/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4024 - accuracy: 0.6915 - val_loss: 0.7911 - val_accuracy: 0.5841
Epoch 340/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4486 - accuracy: 0.6992 - val_loss: 0.7884 - val_accuracy: 0.5888
Epoch 341/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3774 - accuracy: 0.6787 - val_loss: 0.7897 - val_accuracy: 0.5935
Epoch 342/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4173 - accuracy: 0.6941 - val_loss: 0.7890 - val_accuracy: 0.5981
Epoch 343/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3311 - accuracy: 0.6889 - val_loss: 0.7887 - val_accuracy: 0.6028
Epoch 344/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3957 - accuracy: 0.6504 - val_loss: 0.8148 - val_accuracy: 0.5981
Epoch 345/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3912 - accuracy: 0.6607 - val_loss: 0.8149 - val_accuracy: 0.6028
Epoch 346/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3584 - accuracy: 0.6607 - val_loss: 0.8144 - val_accuracy: 0.6028
Epoch 347/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4054 - accuracy: 0.6684 - val_loss: 0.8221 - val_accuracy: 0.6168
Epoch 348/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4515 - accuracy: 0.6941 - val_loss: 0.7975 - val_accuracy: 0.6215
Epoch 349/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3763 - accuracy: 0.6684 - val_loss: 0.7650 - val_accuracy: 0.6215
Epoch 350/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3608 - accuracy: 0.6632 - val_loss: 0.7772 - val_accuracy: 0.6308
Epoch 351/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4130 - accuracy: 0.6735 - val_loss: 0.7682 - val_accuracy: 0.6262
Epoch 352/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3830 - accuracy: 0.6607 - val_loss: 0.7647 - val_accuracy: 0.6215
Epoch 353/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3590 - accuracy: 0.6838 - val_loss: 0.8180 - val_accuracy: 0.6168
Epoch 354/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3363 - accuracy: 0.6632 - val_loss: 0.8159 - val_accuracy: 0.6075
Epoch 355/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3479 - accuracy: 0.6607 - val_loss: 0.8360 - val_accuracy: 0.6075
Epoch 356/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4252 - accuracy: 0.6761 - val_loss: 0.8145 - val_accuracy: 0.5981
Epoch 357/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3222 - accuracy: 0.6658 - val_loss: 0.8507 - val_accuracy: 0.5935
Epoch 358/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3304 - accuracy: 0.6221 - val_loss: 0.8293 - val_accuracy: 0.6028
Epoch 359/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4175 - accuracy: 0.6452 - val_loss: 0.8286 - val_accuracy: 0.6168
Epoch 360/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3424 - accuracy: 0.6452 - val_loss: 0.8319 - val_accuracy: 0.6215
Epoch 361/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3802 - accuracy: 0.6324 - val_loss: 0.8315 - val_accuracy: 0.6215
Epoch 362/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3578 - accuracy: 0.6298 - val_loss: 0.8537 - val_accuracy: 0.6215

```
accuracy: 0.6168
Epoch 363/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3865 - accuracy: 0.6812 - val_loss: 0.8251 - val_accuracy: 0.6121
Epoch 364/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3216 - accuracy: 0.6555 - val_loss: 0.8221 - val_accuracy: 0.6121
Epoch 365/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3517 - accuracy: 0.6838 - val_loss: 0.7958 - val_accuracy: 0.6308
Epoch 366/1000
4/4 [=====] - 0s 19ms/step - loss: 0.3424 - accuracy: 0.6915 - val_loss: 0.8366 - val_accuracy: 0.6168
Epoch 367/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4207 - accuracy: 0.6324 - val_loss: 0.8443 - val_accuracy: 0.6075
Epoch 368/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3293 - accuracy: 0.6401 - val_loss: 0.8850 - val_accuracy: 0.6121
Epoch 369/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3353 - accuracy: 0.6272 - val_loss: 0.8823 - val_accuracy: 0.6121
Epoch 370/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3687 - accuracy: 0.6247 - val_loss: 0.8611 - val_accuracy: 0.6168
Epoch 371/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3430 - accuracy: 0.6658 - val_loss: 0.8577 - val_accuracy: 0.6121
Epoch 372/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3801 - accuracy: 0.6324 - val_loss: 0.8530 - val_accuracy: 0.6168
Epoch 373/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3425 - accuracy: 0.6838 - val_loss: 0.8483 - val_accuracy: 0.6215
Epoch 374/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4895 - accuracy: 0.6915 - val_loss: 0.8442 - val_accuracy: 0.6121
Epoch 375/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3479 - accuracy: 0.6350 - val_loss: 0.8192 - val_accuracy: 0.6168
Epoch 376/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3490 - accuracy: 0.6710 - val_loss: 0.8187 - val_accuracy: 0.6168
Epoch 377/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3711 - accuracy: 0.6735 - val_loss: 0.8168 - val_accuracy: 0.6168
Epoch 378/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3905 - accuracy: 0.6889 - val_loss: 0.8461 - val_accuracy: 0.6028
Epoch 379/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3473 - accuracy: 0.6838 - val_loss: 0.8235 - val_accuracy: 0.6028
Epoch 380/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4269 - accuracy: 0.6710 - val_loss: 0.8148 - val_accuracy: 0.5935
Epoch 381/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4322 - accuracy: 0.6864 - val_loss: 0.8154 - val_accuracy: 0.6028
Epoch 382/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4079 - accuracy: 0.6787 - val_loss: 0.8051 - val_accuracy: 0.6075
Epoch 383/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3957 - accuracy: 0.6401 - val_loss: 0.8447 - val_accuracy: 0.6075
Epoch 384/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4097 - accuracy: 0.6864 - val_loss: 0.8180 - val_accuracy: 0.6028
Epoch 385/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4014 - accuracy: 0.6607 - val_loss: 0.8151 - val_accuracy: 0.6168
Epoch 386/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3728 - accuracy: 0.6632 - val_loss: 0.8125 - val_accuracy: 0.6215
Epoch 387/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3873 - accuracy: 0.6838 - val_loss: 0.8141 - val_accuracy: 0.6355
Epoch 388/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3291 - accuracy: 0.6967 - val_loss: 0.8108 - val_accuracy: 0.6402
Epoch 389/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3603 - accuracy: 0.6889 - val_loss: 0.8163 - val_accuracy: 0.6168
Epoch 390/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3844 - accuracy: 0.6710 - val_loss: 0.8687 - val_accuracy: 0.6121
Epoch 391/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3905 - accuracy: 0.6401 - val_loss: 0.8691 - val_accuracy: 0.6028
Epoch 392/1000
```

```
4/4 [=====] - 0s 11ms/step - loss: 0.3150 - accuracy: 0.6632 - val_loss: 0.8695 - val_accuracy: 0.6075
Epoch 393/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3641 - accuracy: 0.6941 - val_loss: 0.8452 - val_accuracy: 0.5935
Epoch 394/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3517 - accuracy: 0.6247 - val_loss: 0.7886 - val_accuracy: 0.6028
Epoch 395/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3407 - accuracy: 0.6684 - val_loss: 0.7892 - val_accuracy: 0.5981
Epoch 396/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4064 - accuracy: 0.6118 - val_loss: 0.7956 - val_accuracy: 0.6028
Epoch 397/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4709 - accuracy: 0.6504 - val_loss: 0.7900 - val_accuracy: 0.6028
Epoch 398/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3535 - accuracy: 0.6684 - val_loss: 0.7907 - val_accuracy: 0.6121
Epoch 399/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3681 - accuracy: 0.6452 - val_loss: 0.8346 - val_accuracy: 0.5841
Epoch 400/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3723 - accuracy: 0.6530 - val_loss: 0.7893 - val_accuracy: 0.6121
Epoch 401/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3860 - accuracy: 0.6710 - val_loss: 0.7864 - val_accuracy: 0.6121
Epoch 402/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3605 - accuracy: 0.6632 - val_loss: 0.7551 - val_accuracy: 0.6121
Epoch 403/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3047 - accuracy: 0.6864 - val_loss: 0.7489 - val_accuracy: 0.6262
Epoch 404/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3052 - accuracy: 0.6607 - val_loss: 0.7542 - val_accuracy: 0.6262
Epoch 405/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3995 - accuracy: 0.6941 - val_loss: 0.7276 - val_accuracy: 0.6168
Epoch 406/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3804 - accuracy: 0.7198 - val_loss: 0.6939 - val_accuracy: 0.5888
Epoch 407/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3531 - accuracy: 0.6864 - val_loss: 0.7028 - val_accuracy: 0.5841
Epoch 408/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3649 - accuracy: 0.6787 - val_loss: 0.7037 - val_accuracy: 0.5748
Epoch 409/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3181 - accuracy: 0.6864 - val_loss: 0.6787 - val_accuracy: 0.5794
Epoch 410/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4045 - accuracy: 0.6607 - val_loss: 0.7071 - val_accuracy: 0.5841
Epoch 411/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4107 - accuracy: 0.6915 - val_loss: 0.7738 - val_accuracy: 0.6028
Epoch 412/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3484 - accuracy: 0.6787 - val_loss: 0.8454 - val_accuracy: 0.6121
Epoch 413/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3604 - accuracy: 0.6941 - val_loss: 0.7062 - val_accuracy: 0.5748
Epoch 414/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3271 - accuracy: 0.6787 - val_loss: 0.7296 - val_accuracy: 0.5748
Epoch 415/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3525 - accuracy: 0.6735 - val_loss: 0.7574 - val_accuracy: 0.5701
Epoch 416/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2842 - accuracy: 0.6967 - val_loss: 0.7539 - val_accuracy: 0.6028
Epoch 417/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3454 - accuracy: 0.6787 - val_loss: 0.7750 - val_accuracy: 0.5981
Epoch 418/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3045 - accuracy: 0.6812 - val_loss: 0.7906 - val_accuracy: 0.5888
Epoch 419/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3425 - accuracy: 0.6710 - val_loss: 0.8854 - val_accuracy: 0.5888
Epoch 420/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3539 - accuracy: 0.6710 - val_loss: 0.7977 - val_accuracy: 0.5794
Epoch 421/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3871 - accuracy: 0.6658 - val_loss: 0.8002 - val_accuracy: 0.5701
```

Epoch 422/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3212 - accuracy: 0.6478 - val_loss: 0.7950 - val_accuracy: 0.5794
Epoch 423/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3582 - accuracy: 0.6838 - val_loss: 0.8873 - val_accuracy: 0.5561
Epoch 424/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3263 - accuracy: 0.6658 - val_loss: 0.8314 - val_accuracy: 0.5654
Epoch 425/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3361 - accuracy: 0.6298 - val_loss: 0.8513 - val_accuracy: 0.5607
Epoch 426/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3657 - accuracy: 0.6427 - val_loss: 0.8500 - val_accuracy: 0.5561
Epoch 427/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3145 - accuracy: 0.6658 - val_loss: 0.8048 - val_accuracy: 0.5607
Epoch 428/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3715 - accuracy: 0.6915 - val_loss: 0.8577 - val_accuracy: 0.5607
Epoch 429/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2942 - accuracy: 0.6427 - val_loss: 0.8251 - val_accuracy: 0.5654
Epoch 430/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4113 - accuracy: 0.6478 - val_loss: 0.8118 - val_accuracy: 0.5748
Epoch 431/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3692 - accuracy: 0.6555 - val_loss: 0.7925 - val_accuracy: 0.5701
Epoch 432/1000
4/4 [=====] - 0s 17ms/step - loss: 0.3573 - accuracy: 0.7044 - val_loss: 0.7887 - val_accuracy: 0.5748
Epoch 433/1000
4/4 [=====] - 0s 17ms/step - loss: 0.3544 - accuracy: 0.6812 - val_loss: 0.7862 - val_accuracy: 0.5841
Epoch 434/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3360 - accuracy: 0.6555 - val_loss: 0.7861 - val_accuracy: 0.5841
Epoch 435/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3729 - accuracy: 0.6452 - val_loss: 0.8495 - val_accuracy: 0.5888
Epoch 436/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3245 - accuracy: 0.6761 - val_loss: 0.8289 - val_accuracy: 0.5888
Epoch 437/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3148 - accuracy: 0.6838 - val_loss: 0.8305 - val_accuracy: 0.5841
Epoch 438/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3313 - accuracy: 0.7249 - val_loss: 0.8477 - val_accuracy: 0.5935
Epoch 439/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2961 - accuracy: 0.6761 - val_loss: 0.8436 - val_accuracy: 0.5935
Epoch 440/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3882 - accuracy: 0.6812 - val_loss: 0.8405 - val_accuracy: 0.5935
Epoch 441/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3825 - accuracy: 0.6710 - val_loss: 0.8139 - val_accuracy: 0.5981
Epoch 442/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3260 - accuracy: 0.7069 - val_loss: 0.8420 - val_accuracy: 0.5514
Epoch 443/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3465 - accuracy: 0.6992 - val_loss: 0.8442 - val_accuracy: 0.5561
Epoch 444/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3678 - accuracy: 0.6838 - val_loss: 0.8439 - val_accuracy: 0.5607
Epoch 445/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3462 - accuracy: 0.6812 - val_loss: 0.8192 - val_accuracy: 0.5561
Epoch 446/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3523 - accuracy: 0.6710 - val_loss: 0.7534 - val_accuracy: 0.5514
Epoch 447/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3465 - accuracy: 0.6581 - val_loss: 0.7639 - val_accuracy: 0.5561
Epoch 448/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3606 - accuracy: 0.6684 - val_loss: 0.7697 - val_accuracy: 0.5561
Epoch 449/1000
4/4 [=====] - 0s 18ms/step - loss: 0.4187 - accuracy: 0.6581 - val_loss: 0.7615 - val_accuracy: 0.5701
Epoch 450/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2875 - accuracy: 0.6761 - val_loss: 0.7589 - val_accuracy: 0.5701
Epoch 451/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3648 - accuracy: 0.6504 - val_loss: 0.7598 - val_accuracy: 0.5701

```
accuracy: 0.5748
Epoch 452/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3830 - accuracy: 0.6478 - val_loss: 0.7560 - val_
accuracy: 0.5794
Epoch 453/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2991 - accuracy: 0.6375 - val_loss: 0.8418 - val_
accuracy: 0.5654
Epoch 454/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3902 - accuracy: 0.6478 - val_loss: 0.8146 - val_
accuracy: 0.5701
Epoch 455/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3707 - accuracy: 0.6375 - val_loss: 0.7981 - val_
accuracy: 0.5794
Epoch 456/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3660 - accuracy: 0.6632 - val_loss: 0.8176 - val_
accuracy: 0.5701
Epoch 457/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3343 - accuracy: 0.6452 - val_loss: 0.8197 - val_
accuracy: 0.5794
Epoch 458/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3236 - accuracy: 0.6632 - val_loss: 0.8890 - val_
accuracy: 0.5935
Epoch 459/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3169 - accuracy: 0.6530 - val_loss: 0.8869 - val_
accuracy: 0.5935
Epoch 460/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3285 - accuracy: 0.6941 - val_loss: 0.8875 - val_
accuracy: 0.6075
Epoch 461/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3618 - accuracy: 0.6684 - val_loss: 0.8788 - val_
accuracy: 0.6075
Epoch 462/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3703 - accuracy: 0.6812 - val_loss: 0.8786 - val_
accuracy: 0.6215
Epoch 463/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3352 - accuracy: 0.6478 - val_loss: 0.8776 - val_
accuracy: 0.6075
Epoch 464/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3687 - accuracy: 0.6684 - val_loss: 0.8879 - val_
accuracy: 0.6262
Epoch 465/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3262 - accuracy: 0.6710 - val_loss: 0.9142 - val_
accuracy: 0.6215
Epoch 466/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3269 - accuracy: 0.6375 - val_loss: 0.9211 - val_
accuracy: 0.6168
Epoch 467/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3262 - accuracy: 0.6735 - val_loss: 0.9902 - val_
accuracy: 0.6262
Epoch 468/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3180 - accuracy: 0.6915 - val_loss: 0.9605 - val_
accuracy: 0.6168
Epoch 469/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3295 - accuracy: 0.6838 - val_loss: 0.9668 - val_
accuracy: 0.6168
Epoch 470/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3209 - accuracy: 0.6735 - val_loss: 0.9338 - val_
accuracy: 0.6215
Epoch 471/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3097 - accuracy: 0.6992 - val_loss: 0.9910 - val_
accuracy: 0.6075
Epoch 472/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3691 - accuracy: 0.6787 - val_loss: 0.9930 - val_
accuracy: 0.6028
Epoch 473/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3213 - accuracy: 0.6787 - val_loss: 0.9980 - val_
accuracy: 0.6075
Epoch 474/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2911 - accuracy: 0.6658 - val_loss: 1.0337 - val_
accuracy: 0.5981
Epoch 475/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4705 - accuracy: 0.6504 - val_loss: 1.0052 - val_
accuracy: 0.6075
Epoch 476/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3640 - accuracy: 0.6787 - val_loss: 0.9825 - val_
accuracy: 0.5935
Epoch 477/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3419 - accuracy: 0.6864 - val_loss: 0.9267 - val_
accuracy: 0.6075
Epoch 478/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3236 - accuracy: 0.6632 - val_loss: 0.9783 - val_
accuracy: 0.6121
Epoch 479/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3779 - accuracy: 0.6478 - val_loss: 1.0019 - val_
accuracy: 0.6215
Epoch 480/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3577 - accuracy: 0.6632 - val_loss: 1.0271 - val_
accuracy: 0.6262
Epoch 481/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.4344 - accuracy: 0.6504 - val_loss: 1.0357 - val_accuracy: 0.6168
Epoch 482/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3198 - accuracy: 0.6915 - val_loss: 1.0716 - val_accuracy: 0.6215
Epoch 483/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2973 - accuracy: 0.6761 - val_loss: 1.0391 - val_accuracy: 0.5981
Epoch 484/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3427 - accuracy: 0.6864 - val_loss: 1.0418 - val_accuracy: 0.6355
Epoch 485/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3901 - accuracy: 0.6915 - val_loss: 1.0454 - val_accuracy: 0.6355
Epoch 486/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3282 - accuracy: 0.6761 - val_loss: 1.0493 - val_accuracy: 0.6308
Epoch 487/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3328 - accuracy: 0.6941 - val_loss: 1.0496 - val_accuracy: 0.6215
Epoch 488/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2836 - accuracy: 0.6761 - val_loss: 1.0288 - val_accuracy: 0.6308
Epoch 489/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3542 - accuracy: 0.6915 - val_loss: 0.9498 - val_accuracy: 0.5888
Epoch 490/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2908 - accuracy: 0.6812 - val_loss: 0.9304 - val_accuracy: 0.5888
Epoch 491/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3848 - accuracy: 0.6941 - val_loss: 0.9209 - val_accuracy: 0.5888
Epoch 492/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3198 - accuracy: 0.6812 - val_loss: 0.9184 - val_accuracy: 0.5888
Epoch 493/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3228 - accuracy: 0.6967 - val_loss: 0.9177 - val_accuracy: 0.5841
Epoch 494/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2889 - accuracy: 0.6864 - val_loss: 0.9136 - val_accuracy: 0.5654
Epoch 495/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3207 - accuracy: 0.6941 - val_loss: 0.9108 - val_accuracy: 0.5935
Epoch 496/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2707 - accuracy: 0.7249 - val_loss: 0.9070 - val_accuracy: 0.5888
Epoch 497/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3788 - accuracy: 0.6864 - val_loss: 0.9051 - val_accuracy: 0.5888
Epoch 498/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2944 - accuracy: 0.6915 - val_loss: 0.9064 - val_accuracy: 0.5981
Epoch 499/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3309 - accuracy: 0.7069 - val_loss: 0.9003 - val_accuracy: 0.5981
Epoch 500/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3223 - accuracy: 0.6710 - val_loss: 0.8993 - val_accuracy: 0.6075
Epoch 501/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3095 - accuracy: 0.7069 - val_loss: 0.8995 - val_accuracy: 0.6028
Epoch 502/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3446 - accuracy: 0.7069 - val_loss: 0.8993 - val_accuracy: 0.5981
Epoch 503/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3302 - accuracy: 0.6992 - val_loss: 0.9058 - val_accuracy: 0.5841
Epoch 504/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2975 - accuracy: 0.6607 - val_loss: 0.9022 - val_accuracy: 0.5888
Epoch 505/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2920 - accuracy: 0.6401 - val_loss: 0.8474 - val_accuracy: 0.6262
Epoch 506/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3642 - accuracy: 0.6632 - val_loss: 0.9016 - val_accuracy: 0.5981
Epoch 507/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3188 - accuracy: 0.6632 - val_loss: 0.9010 - val_accuracy: 0.6075
Epoch 508/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4426 - accuracy: 0.6787 - val_loss: 0.8954 - val_accuracy: 0.5841
Epoch 509/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3290 - accuracy: 0.6812 - val_loss: 0.8734 - val_accuracy: 0.5841
Epoch 510/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3299 - accuracy: 0.6632 - val_loss: 0.8942 - val_accuracy: 0.5888
```

Epoch 511/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3196 - accuracy: 0.6941 - val_loss: 0.8770 - val_accuracy: 0.5841
Epoch 512/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2871 - accuracy: 0.6967 - val_loss: 0.8671 - val_accuracy: 0.5888
Epoch 513/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2906 - accuracy: 0.6787 - val_loss: 0.8423 - val_accuracy: 0.5935
Epoch 514/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3998 - accuracy: 0.6530 - val_loss: 0.8502 - val_accuracy: 0.5981
Epoch 515/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3901 - accuracy: 0.6967 - val_loss: 0.8680 - val_accuracy: 0.6168
Epoch 516/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3351 - accuracy: 0.7147 - val_loss: 0.8700 - val_accuracy: 0.6075
Epoch 517/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3683 - accuracy: 0.7224 - val_loss: 0.8709 - val_accuracy: 0.6075
Epoch 518/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3735 - accuracy: 0.6967 - val_loss: 0.8691 - val_accuracy: 0.6075
Epoch 519/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3238 - accuracy: 0.6915 - val_loss: 0.8483 - val_accuracy: 0.6028
Epoch 520/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4504 - accuracy: 0.6812 - val_loss: 0.8490 - val_accuracy: 0.6075
Epoch 521/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2781 - accuracy: 0.6864 - val_loss: 0.8704 - val_accuracy: 0.6075
Epoch 522/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4055 - accuracy: 0.6864 - val_loss: 0.8768 - val_accuracy: 0.6262
Epoch 523/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3290 - accuracy: 0.6992 - val_loss: 0.9129 - val_accuracy: 0.6402
Epoch 524/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3000 - accuracy: 0.6838 - val_loss: 0.9043 - val_accuracy: 0.6308
Epoch 525/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3447 - accuracy: 0.6735 - val_loss: 0.9374 - val_accuracy: 0.6308
Epoch 526/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2779 - accuracy: 0.6838 - val_loss: 0.8859 - val_accuracy: 0.6308
Epoch 527/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3527 - accuracy: 0.6864 - val_loss: 0.9027 - val_accuracy: 0.6215
Epoch 528/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3168 - accuracy: 0.6812 - val_loss: 0.8753 - val_accuracy: 0.6262
Epoch 529/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3227 - accuracy: 0.6684 - val_loss: 0.8749 - val_accuracy: 0.6262
Epoch 530/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3745 - accuracy: 0.6710 - val_loss: 0.8467 - val_accuracy: 0.6355
Epoch 531/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3177 - accuracy: 0.6915 - val_loss: 0.8503 - val_accuracy: 0.6402
Epoch 532/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2842 - accuracy: 0.7069 - val_loss: 0.9047 - val_accuracy: 0.6449
Epoch 533/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3463 - accuracy: 0.6761 - val_loss: 0.9010 - val_accuracy: 0.6636
Epoch 534/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3572 - accuracy: 0.6992 - val_loss: 0.9065 - val_accuracy: 0.6449
Epoch 535/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3818 - accuracy: 0.7172 - val_loss: 0.9026 - val_accuracy: 0.6402
Epoch 536/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3833 - accuracy: 0.7069 - val_loss: 0.9050 - val_accuracy: 0.6449
Epoch 537/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3587 - accuracy: 0.7378 - val_loss: 0.8697 - val_accuracy: 0.6589
Epoch 538/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2752 - accuracy: 0.6967 - val_loss: 0.8681 - val_accuracy: 0.6495
Epoch 539/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3177 - accuracy: 0.7198 - val_loss: 0.8677 - val_accuracy: 0.6589
Epoch 540/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2913 - accuracy: 0.7224 - val_loss: 0.8665 - val_accuracy: 0.6589

```
accuracy: 0.6682
Epoch 541/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3298 - accuracy: 0.6889 - val_loss: 0.8434 - val_accuracy: 0.6542
Epoch 542/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2660 - accuracy: 0.7198 - val_loss: 0.8411 - val_accuracy: 0.6402
Epoch 543/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3325 - accuracy: 0.7147 - val_loss: 0.8444 - val_accuracy: 0.6542
Epoch 544/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2783 - accuracy: 0.7172 - val_loss: 0.8431 - val_accuracy: 0.6355
Epoch 545/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4593 - accuracy: 0.6889 - val_loss: 0.8572 - val_accuracy: 0.6308
Epoch 546/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3577 - accuracy: 0.7121 - val_loss: 0.9110 - val_accuracy: 0.6449
Epoch 547/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3330 - accuracy: 0.7095 - val_loss: 0.8787 - val_accuracy: 0.6449
Epoch 548/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3111 - accuracy: 0.6710 - val_loss: 0.9134 - val_accuracy: 0.6355
Epoch 549/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2805 - accuracy: 0.6864 - val_loss: 0.8845 - val_accuracy: 0.6495
Epoch 550/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3117 - accuracy: 0.6761 - val_loss: 0.9089 - val_accuracy: 0.6822
Epoch 551/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3135 - accuracy: 0.6761 - val_loss: 0.9101 - val_accuracy: 0.6822
Epoch 552/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3107 - accuracy: 0.6735 - val_loss: 0.9705 - val_accuracy: 0.6636
Epoch 553/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3652 - accuracy: 0.6710 - val_loss: 0.9050 - val_accuracy: 0.6729
Epoch 554/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2975 - accuracy: 0.7121 - val_loss: 0.9000 - val_accuracy: 0.6729
Epoch 555/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3376 - accuracy: 0.6838 - val_loss: 0.9021 - val_accuracy: 0.6636
Epoch 556/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2797 - accuracy: 0.6735 - val_loss: 0.9028 - val_accuracy: 0.6822
Epoch 557/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2692 - accuracy: 0.6915 - val_loss: 0.8974 - val_accuracy: 0.6822
Epoch 558/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3337 - accuracy: 0.6735 - val_loss: 0.8747 - val_accuracy: 0.6776
Epoch 559/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3384 - accuracy: 0.7069 - val_loss: 0.8387 - val_accuracy: 0.6822
Epoch 560/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2825 - accuracy: 0.7069 - val_loss: 0.8419 - val_accuracy: 0.6542
Epoch 561/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2936 - accuracy: 0.6812 - val_loss: 0.8966 - val_accuracy: 0.6542
Epoch 562/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3390 - accuracy: 0.6787 - val_loss: 0.8895 - val_accuracy: 0.6636
Epoch 563/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3493 - accuracy: 0.6992 - val_loss: 0.8377 - val_accuracy: 0.6542
Epoch 564/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3101 - accuracy: 0.6967 - val_loss: 0.8389 - val_accuracy: 0.6682
Epoch 565/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3146 - accuracy: 0.6992 - val_loss: 0.8602 - val_accuracy: 0.6215
Epoch 566/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2722 - accuracy: 0.6710 - val_loss: 0.8289 - val_accuracy: 0.6402
Epoch 567/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3492 - accuracy: 0.6607 - val_loss: 0.8879 - val_accuracy: 0.6308
Epoch 568/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3605 - accuracy: 0.6658 - val_loss: 0.8887 - val_accuracy: 0.6449
Epoch 569/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2831 - accuracy: 0.6889 - val_loss: 0.8401 - val_accuracy: 0.6729
Epoch 570/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.2791 - accuracy: 0.6864 - val_loss: 0.8960 - val_accuracy: 0.6636
Epoch 571/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2674 - accuracy: 0.6710 - val_loss: 0.8617 - val_accuracy: 0.6449
Epoch 572/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2742 - accuracy: 0.6967 - val_loss: 0.8723 - val_accuracy: 0.6636
Epoch 573/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2661 - accuracy: 0.6838 - val_loss: 0.8740 - val_accuracy: 0.6495
Epoch 574/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2869 - accuracy: 0.6864 - val_loss: 0.8770 - val_accuracy: 0.6402
Epoch 575/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2605 - accuracy: 0.7147 - val_loss: 0.9248 - val_accuracy: 0.6308
Epoch 576/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3380 - accuracy: 0.6967 - val_loss: 0.9008 - val_accuracy: 0.6262
Epoch 577/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3622 - accuracy: 0.6889 - val_loss: 0.8206 - val_accuracy: 0.6262
Epoch 578/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3334 - accuracy: 0.6889 - val_loss: 0.8171 - val_accuracy: 0.6168
Epoch 579/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2971 - accuracy: 0.6787 - val_loss: 0.8718 - val_accuracy: 0.6262
Epoch 580/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2907 - accuracy: 0.6812 - val_loss: 0.8738 - val_accuracy: 0.6308
Epoch 581/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3621 - accuracy: 0.6941 - val_loss: 0.8773 - val_accuracy: 0.6355
Epoch 582/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2852 - accuracy: 0.6941 - val_loss: 0.8358 - val_accuracy: 0.6168
Epoch 583/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2832 - accuracy: 0.7018 - val_loss: 0.8877 - val_accuracy: 0.6215
Epoch 584/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3746 - accuracy: 0.6838 - val_loss: 0.8868 - val_accuracy: 0.6121
Epoch 585/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2573 - accuracy: 0.6992 - val_loss: 0.8860 - val_accuracy: 0.6168
Epoch 586/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2686 - accuracy: 0.6967 - val_loss: 0.9150 - val_accuracy: 0.6168
Epoch 587/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2693 - accuracy: 0.7069 - val_loss: 0.9403 - val_accuracy: 0.6075
Epoch 588/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2648 - accuracy: 0.7018 - val_loss: 0.9402 - val_accuracy: 0.6075
Epoch 589/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2760 - accuracy: 0.7121 - val_loss: 0.9166 - val_accuracy: 0.5981
Epoch 590/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2624 - accuracy: 0.7326 - val_loss: 0.8888 - val_accuracy: 0.5888
Epoch 591/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2596 - accuracy: 0.7095 - val_loss: 0.8850 - val_accuracy: 0.5935
Epoch 592/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2913 - accuracy: 0.6632 - val_loss: 0.8958 - val_accuracy: 0.6168
Epoch 593/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3106 - accuracy: 0.6632 - val_loss: 0.8951 - val_accuracy: 0.6215
Epoch 594/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3269 - accuracy: 0.6735 - val_loss: 0.8943 - val_accuracy: 0.6215
Epoch 595/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2819 - accuracy: 0.7018 - val_loss: 0.8911 - val_accuracy: 0.6168
Epoch 596/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3382 - accuracy: 0.6941 - val_loss: 0.9030 - val_accuracy: 0.6262
Epoch 597/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3110 - accuracy: 0.7069 - val_loss: 0.8990 - val_accuracy: 0.6215
Epoch 598/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3557 - accuracy: 0.6967 - val_loss: 0.8979 - val_accuracy: 0.6215
Epoch 599/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2968 - accuracy: 0.7121 - val_loss: 0.8988 - val_accuracy: 0.6215
```

Epoch 600/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2883 - accuracy: 0.6915 - val_loss: 0.8722 - val_accuracy: 0.6215
Epoch 601/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2977 - accuracy: 0.7044 - val_loss: 0.8684 - val_accuracy: 0.6168
Epoch 602/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2822 - accuracy: 0.6941 - val_loss: 0.8389 - val_accuracy: 0.6308
Epoch 603/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2689 - accuracy: 0.7301 - val_loss: 0.8389 - val_accuracy: 0.6262
Epoch 604/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2609 - accuracy: 0.6992 - val_loss: 0.8390 - val_accuracy: 0.6168
Epoch 605/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2714 - accuracy: 0.6915 - val_loss: 0.8346 - val_accuracy: 0.6121
Epoch 606/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3660 - accuracy: 0.7121 - val_loss: 0.8163 - val_accuracy: 0.6075
Epoch 607/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2895 - accuracy: 0.6684 - val_loss: 0.8047 - val_accuracy: 0.6121
Epoch 608/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3037 - accuracy: 0.7095 - val_loss: 0.8020 - val_accuracy: 0.6121
Epoch 609/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2619 - accuracy: 0.7455 - val_loss: 0.8059 - val_accuracy: 0.6215
Epoch 610/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3374 - accuracy: 0.6864 - val_loss: 0.8015 - val_accuracy: 0.6308
Epoch 611/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2646 - accuracy: 0.7095 - val_loss: 0.8134 - val_accuracy: 0.6215
Epoch 612/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2858 - accuracy: 0.7249 - val_loss: 0.8371 - val_accuracy: 0.6262
Epoch 613/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2737 - accuracy: 0.7172 - val_loss: 0.7835 - val_accuracy: 0.6215
Epoch 614/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2574 - accuracy: 0.7352 - val_loss: 0.7727 - val_accuracy: 0.5981
Epoch 615/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3277 - accuracy: 0.6812 - val_loss: 0.7743 - val_accuracy: 0.6168
Epoch 616/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3066 - accuracy: 0.7095 - val_loss: 0.7846 - val_accuracy: 0.6449
Epoch 617/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4588 - accuracy: 0.7018 - val_loss: 0.8041 - val_accuracy: 0.6402
Epoch 618/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4467 - accuracy: 0.6992 - val_loss: 0.8131 - val_accuracy: 0.6589
Epoch 619/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3533 - accuracy: 0.6710 - val_loss: 0.8286 - val_accuracy: 0.6402
Epoch 620/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3375 - accuracy: 0.7095 - val_loss: 0.8339 - val_accuracy: 0.6355
Epoch 621/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2690 - accuracy: 0.6684 - val_loss: 0.8316 - val_accuracy: 0.6168
Epoch 622/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2738 - accuracy: 0.6787 - val_loss: 0.8055 - val_accuracy: 0.6121
Epoch 623/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3458 - accuracy: 0.6992 - val_loss: 0.7592 - val_accuracy: 0.6121
Epoch 624/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3104 - accuracy: 0.7121 - val_loss: 0.7519 - val_accuracy: 0.6402
Epoch 625/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2816 - accuracy: 0.6684 - val_loss: 0.7557 - val_accuracy: 0.6402
Epoch 626/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3449 - accuracy: 0.6838 - val_loss: 0.7606 - val_accuracy: 0.6449
Epoch 627/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2861 - accuracy: 0.6941 - val_loss: 0.7869 - val_accuracy: 0.6355
Epoch 628/1000
4/4 [=====] - 0s 19ms/step - loss: 0.2943 - accuracy: 0.6530 - val_loss: 0.7912 - val_accuracy: 0.6262
Epoch 629/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3202 - accuracy: 0.6710 - val_loss: 0.7948 - val_accuracy: 0.6262

```
accuracy: 0.6028
Epoch 630/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2794 - accuracy: 0.6632 - val_loss: 0.8186 - val_
accuracy: 0.6028
Epoch 631/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2555 - accuracy: 0.6658 - val_loss: 0.8394 - val_
accuracy: 0.6168
Epoch 632/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2681 - accuracy: 0.7121 - val_loss: 0.8691 - val_
accuracy: 0.6495
Epoch 633/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3635 - accuracy: 0.6812 - val_loss: 0.8907 - val_
accuracy: 0.6495
Epoch 634/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3290 - accuracy: 0.6838 - val_loss: 0.8934 - val_
accuracy: 0.6542
Epoch 635/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3028 - accuracy: 0.6710 - val_loss: 0.9022 - val_
accuracy: 0.6589
Epoch 636/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3922 - accuracy: 0.6787 - val_loss: 0.8772 - val_
accuracy: 0.6589
Epoch 637/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2769 - accuracy: 0.6735 - val_loss: 0.8705 - val_
accuracy: 0.6495
Epoch 638/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2596 - accuracy: 0.6812 - val_loss: 0.8722 - val_
accuracy: 0.6355
Epoch 639/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3224 - accuracy: 0.6812 - val_loss: 0.9382 - val_
accuracy: 0.6449
Epoch 640/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2926 - accuracy: 0.6864 - val_loss: 0.9291 - val_
accuracy: 0.6495
Epoch 641/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3961 - accuracy: 0.6992 - val_loss: 0.9044 - val_
accuracy: 0.6495
Epoch 642/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2593 - accuracy: 0.6761 - val_loss: 0.8619 - val_
accuracy: 0.6355
Epoch 643/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3590 - accuracy: 0.6967 - val_loss: 0.9344 - val_
accuracy: 0.6495
Epoch 644/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3192 - accuracy: 0.7095 - val_loss: 0.9138 - val_
accuracy: 0.6682
Epoch 645/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3075 - accuracy: 0.6941 - val_loss: 0.9427 - val_
accuracy: 0.6729
Epoch 646/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2807 - accuracy: 0.7172 - val_loss: 0.9768 - val_
accuracy: 0.6682
Epoch 647/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2946 - accuracy: 0.7095 - val_loss: 0.9675 - val_
accuracy: 0.6636
Epoch 648/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3108 - accuracy: 0.7172 - val_loss: 0.9665 - val_
accuracy: 0.6729
Epoch 649/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2532 - accuracy: 0.6864 - val_loss: 0.9964 - val_
accuracy: 0.6589
Epoch 650/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3324 - accuracy: 0.6710 - val_loss: 0.9236 - val_
accuracy: 0.6355
Epoch 651/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2917 - accuracy: 0.6889 - val_loss: 0.9806 - val_
accuracy: 0.6449
Epoch 652/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2950 - accuracy: 0.6787 - val_loss: 0.9183 - val_
accuracy: 0.6449
Epoch 653/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2833 - accuracy: 0.6530 - val_loss: 0.9217 - val_
accuracy: 0.6542
Epoch 654/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2995 - accuracy: 0.6915 - val_loss: 0.9394 - val_
accuracy: 0.6589
Epoch 655/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2435 - accuracy: 0.6452 - val_loss: 0.9427 - val_
accuracy: 0.6589
Epoch 656/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3748 - accuracy: 0.6967 - val_loss: 0.8893 - val_
accuracy: 0.6495
Epoch 657/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3345 - accuracy: 0.6992 - val_loss: 0.9174 - val_
accuracy: 0.6495
Epoch 658/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3497 - accuracy: 0.6812 - val_loss: 0.9443 - val_
accuracy: 0.6542
Epoch 659/1000
```

4/4 [=====] - 0s 12ms/step - loss: 0.2539 - accuracy: 0.6838 - val_loss: 0.9149 - val_accuracy: 0.6542
Epoch 660/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3199 - accuracy: 0.6761 - val_loss: 0.9135 - val_accuracy: 0.6449
Epoch 661/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3726 - accuracy: 0.6838 - val_loss: 0.9403 - val_accuracy: 0.6449
Epoch 662/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3646 - accuracy: 0.7147 - val_loss: 0.9133 - val_accuracy: 0.6355
Epoch 663/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3199 - accuracy: 0.6710 - val_loss: 0.9113 - val_accuracy: 0.6215
Epoch 664/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3223 - accuracy: 0.6684 - val_loss: 0.8883 - val_accuracy: 0.6262
Epoch 665/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3446 - accuracy: 0.6710 - val_loss: 0.8749 - val_accuracy: 0.6308
Epoch 666/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2941 - accuracy: 0.6864 - val_loss: 0.8980 - val_accuracy: 0.6215
Epoch 667/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2543 - accuracy: 0.6812 - val_loss: 0.8713 - val_accuracy: 0.6262
Epoch 668/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3307 - accuracy: 0.7172 - val_loss: 0.8166 - val_accuracy: 0.6262
Epoch 669/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3194 - accuracy: 0.6710 - val_loss: 0.8437 - val_accuracy: 0.6355
Epoch 670/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3086 - accuracy: 0.6632 - val_loss: 0.8951 - val_accuracy: 0.6121
Epoch 671/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2831 - accuracy: 0.6298 - val_loss: 0.8329 - val_accuracy: 0.6075
Epoch 672/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2761 - accuracy: 0.6452 - val_loss: 0.9287 - val_accuracy: 0.6355
Epoch 673/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2702 - accuracy: 0.6632 - val_loss: 0.8902 - val_accuracy: 0.6402
Epoch 674/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3244 - accuracy: 0.6375 - val_loss: 0.8913 - val_accuracy: 0.6308
Epoch 675/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2619 - accuracy: 0.6452 - val_loss: 0.9288 - val_accuracy: 0.6402
Epoch 676/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2894 - accuracy: 0.6864 - val_loss: 0.9101 - val_accuracy: 0.6355
Epoch 677/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3509 - accuracy: 0.6195 - val_loss: 0.9087 - val_accuracy: 0.6262
Epoch 678/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3152 - accuracy: 0.6530 - val_loss: 0.8775 - val_accuracy: 0.6215
Epoch 679/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3638 - accuracy: 0.6761 - val_loss: 0.8741 - val_accuracy: 0.6168
Epoch 680/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2693 - accuracy: 0.6632 - val_loss: 0.8760 - val_accuracy: 0.6215
Epoch 681/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3644 - accuracy: 0.6581 - val_loss: 0.9046 - val_accuracy: 0.6168
Epoch 682/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2549 - accuracy: 0.6452 - val_loss: 0.8854 - val_accuracy: 0.6215
Epoch 683/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3256 - accuracy: 0.6478 - val_loss: 0.8730 - val_accuracy: 0.6215
Epoch 684/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2809 - accuracy: 0.6684 - val_loss: 0.8114 - val_accuracy: 0.6168
Epoch 685/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2848 - accuracy: 0.6658 - val_loss: 0.8145 - val_accuracy: 0.6121
Epoch 686/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3547 - accuracy: 0.6555 - val_loss: 0.8257 - val_accuracy: 0.6215
Epoch 687/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2506 - accuracy: 0.6658 - val_loss: 0.7739 - val_accuracy: 0.6075
Epoch 688/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2560 - accuracy: 0.6607 - val_loss: 0.8826 - val_accuracy: 0.6075

Epoch 689/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3364 - accuracy: 0.6427 - val_loss: 0.9106 - val_accuracy: 0.6028
 Epoch 690/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.2704 - accuracy: 0.6581 - val_loss: 0.8824 - val_accuracy: 0.6075
 Epoch 691/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3301 - accuracy: 0.6067 - val_loss: 0.8706 - val_accuracy: 0.6449
 Epoch 692/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2904 - accuracy: 0.6684 - val_loss: 0.8627 - val_accuracy: 0.6402
 Epoch 693/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2912 - accuracy: 0.6452 - val_loss: 0.8304 - val_accuracy: 0.6308
 Epoch 694/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3679 - accuracy: 0.6401 - val_loss: 0.8255 - val_accuracy: 0.6215
 Epoch 695/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2719 - accuracy: 0.6427 - val_loss: 0.8524 - val_accuracy: 0.6121
 Epoch 696/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2572 - accuracy: 0.6838 - val_loss: 0.9292 - val_accuracy: 0.6121
 Epoch 697/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2696 - accuracy: 0.6735 - val_loss: 0.8891 - val_accuracy: 0.6215
 Epoch 698/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2972 - accuracy: 0.6761 - val_loss: 0.9347 - val_accuracy: 0.6215
 Epoch 699/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3345 - accuracy: 0.6581 - val_loss: 0.9382 - val_accuracy: 0.6168
 Epoch 700/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.5024 - accuracy: 0.6797 Restoring model weights from the end of the best epoch: 550.
 4/4 [=====] - 0s 14ms/step - loss: 0.4274 - accuracy: 0.6324 - val_loss: 0.9873 - val_accuracy: 0.6121
 Epoch 700: early stopping
 2/2 [=====] - 0s 4ms/step - loss: 0.5798 - accuracy: 0.6279
 [CV] END Dense1=25, Dense2=25; total time= 33.7s
 Model: "sequential_24"

Layer (type)	Output Shape	Param #
dense_96 (Dense)	(None, 25)	175
batch_normalization_72 (Batch Normalization)	(None, 25)	100
activation_72 (Activation)	(None, 25)	0
dense_97 (Dense)	(None, 25)	650
batch_normalization_73 (Batch Normalization)	(None, 25)	100
activation_73 (Activation)	(None, 25)	0
dense_98 (Dense)	(None, 10)	260
batch_normalization_74 (Batch Normalization)	(None, 10)	40
activation_74 (Activation)	(None, 10)	0
dense_99 (Dense)	(None, 2)	22

Total params: 1,347
 Trainable params: 1,227
 Non-trainable params: 120

Epoch 1/1000
 4/4 [=====] - 1s 56ms/step - loss: 6.3249 - accuracy: 0.4704 - val_loss: 6.0324 - val_accuracy: 0.5748
 Epoch 2/1000
 4/4 [=====] - 0s 16ms/step - loss: 5.5528 - accuracy: 0.4550 - val_loss: 5.2410 - val_accuracy: 0.5935
 Epoch 3/1000
 4/4 [=====] - 0s 14ms/step - loss: 5.3359 - accuracy: 0.4756 - val_loss: 5.1167 - val_accuracy: 0.5935
 Epoch 4/1000
 4/4 [=====] - 0s 14ms/step - loss: 4.8520 - accuracy: 0.4910 - val_loss: 4.5806 - val_accuracy: 0.6028
 Epoch 5/1000
 4/4 [=====] - 0s 14ms/step - loss: 5.2105 - accuracy: 0.4550 - val_loss: 4.3482 - val_accuracy: 0.5841
 Epoch 6/1000

4/4 [=====] - 0s 13ms/step - loss: 4.9752 - accuracy: 0.4833 - val_loss: 3.9523 - val_accuracy: 0.5701
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 4.7694 - accuracy: 0.4936 - val_loss: 3.7636 - val_accuracy: 0.5327
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 4.6872 - accuracy: 0.4859 - val_loss: 3.5905 - val_accuracy: 0.5280
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 4.6169 - accuracy: 0.5039 - val_loss: 3.3931 - val_accuracy: 0.5047
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 4.2316 - accuracy: 0.5116 - val_loss: 3.1910 - val_accuracy: 0.5000
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 4.3427 - accuracy: 0.5013 - val_loss: 3.0395 - val_accuracy: 0.5093
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 4.1947 - accuracy: 0.5039 - val_loss: 2.8149 - val_accuracy: 0.5327
Epoch 13/1000
4/4 [=====] - 0s 12ms/step - loss: 4.2219 - accuracy: 0.5116 - val_loss: 2.7671 - val_accuracy: 0.5514
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 4.1969 - accuracy: 0.5064 - val_loss: 2.7018 - val_accuracy: 0.5467
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 4.1633 - accuracy: 0.5064 - val_loss: 2.6551 - val_accuracy: 0.5514
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 3.9673 - accuracy: 0.4936 - val_loss: 2.5524 - val_accuracy: 0.5374
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7738 - accuracy: 0.5116 - val_loss: 2.3727 - val_accuracy: 0.5280
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 3.4482 - accuracy: 0.5270 - val_loss: 2.3405 - val_accuracy: 0.5421
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5113 - accuracy: 0.5141 - val_loss: 2.3228 - val_accuracy: 0.5374
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5842 - accuracy: 0.5013 - val_loss: 2.2975 - val_accuracy: 0.5327
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4370 - accuracy: 0.5193 - val_loss: 2.2797 - val_accuracy: 0.5374
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2992 - accuracy: 0.5219 - val_loss: 2.2004 - val_accuracy: 0.5421
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1836 - accuracy: 0.5039 - val_loss: 2.1468 - val_accuracy: 0.5327
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1183 - accuracy: 0.5296 - val_loss: 2.2349 - val_accuracy: 0.5467
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0179 - accuracy: 0.5090 - val_loss: 2.2941 - val_accuracy: 0.5421
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9809 - accuracy: 0.5193 - val_loss: 2.2704 - val_accuracy: 0.5467
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1531 - accuracy: 0.5064 - val_loss: 2.2651 - val_accuracy: 0.5421
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1432 - accuracy: 0.4987 - val_loss: 2.2587 - val_accuracy: 0.5514
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8288 - accuracy: 0.5064 - val_loss: 2.2293 - val_accuracy: 0.5421
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0575 - accuracy: 0.4987 - val_loss: 2.2178 - val_accuracy: 0.5467
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8350 - accuracy: 0.5219 - val_loss: 2.2205 - val_accuracy: 0.5467
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9275 - accuracy: 0.5244 - val_loss: 2.2153 - val_accuracy: 0.5607
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8979 - accuracy: 0.4910 - val_loss: 2.2114 - val_accuracy: 0.5561
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7652 - accuracy: 0.4961 - val_loss: 2.1743 - val_accuracy: 0.5467
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9355 - accuracy: 0.5141 - val_loss: 2.1696 - val_accuracy: 0.5514

Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6828 - accuracy: 0.4884 - val_loss: 2.1553 - val_accuracy: 0.5654
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6553 - accuracy: 0.5039 - val_loss: 2.1451 - val_accuracy: 0.5654
Epoch 38/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6943 - accuracy: 0.4910 - val_loss: 2.1643 - val_accuracy: 0.5607
Epoch 39/1000
4/4 [=====] - 0s 15ms/step - loss: 2.6566 - accuracy: 0.4987 - val_loss: 2.1810 - val_accuracy: 0.5561
Epoch 40/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6523 - accuracy: 0.4987 - val_loss: 2.1709 - val_accuracy: 0.5607
Epoch 41/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6465 - accuracy: 0.4961 - val_loss: 2.1510 - val_accuracy: 0.5467
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6777 - accuracy: 0.5013 - val_loss: 2.1358 - val_accuracy: 0.5514
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5024 - accuracy: 0.4961 - val_loss: 2.1289 - val_accuracy: 0.5374
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5014 - accuracy: 0.5090 - val_loss: 2.1086 - val_accuracy: 0.5374
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4534 - accuracy: 0.4961 - val_loss: 2.0992 - val_accuracy: 0.5374
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4063 - accuracy: 0.4936 - val_loss: 2.1111 - val_accuracy: 0.5514
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3833 - accuracy: 0.4807 - val_loss: 2.0850 - val_accuracy: 0.5514
Epoch 48/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3700 - accuracy: 0.5270 - val_loss: 2.0792 - val_accuracy: 0.5280
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3093 - accuracy: 0.5064 - val_loss: 2.0551 - val_accuracy: 0.5234
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1753 - accuracy: 0.5193 - val_loss: 2.0308 - val_accuracy: 0.5187
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0531 - accuracy: 0.5013 - val_loss: 1.9806 - val_accuracy: 0.4860
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1020 - accuracy: 0.5578 - val_loss: 1.9182 - val_accuracy: 0.4860
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0775 - accuracy: 0.5450 - val_loss: 1.9180 - val_accuracy: 0.4860
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0153 - accuracy: 0.5244 - val_loss: 1.9537 - val_accuracy: 0.4720
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1361 - accuracy: 0.5141 - val_loss: 1.9161 - val_accuracy: 0.4813
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8704 - accuracy: 0.5270 - val_loss: 1.9053 - val_accuracy: 0.4533
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9797 - accuracy: 0.5707 - val_loss: 1.8068 - val_accuracy: 0.4486
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9396 - accuracy: 0.5707 - val_loss: 1.7967 - val_accuracy: 0.4626
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9560 - accuracy: 0.5630 - val_loss: 1.7440 - val_accuracy: 0.4159
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8900 - accuracy: 0.5527 - val_loss: 1.6744 - val_accuracy: 0.4065
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9483 - accuracy: 0.5270 - val_loss: 1.6853 - val_accuracy: 0.3972
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7975 - accuracy: 0.5193 - val_loss: 1.7276 - val_accuracy: 0.3879
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8075 - accuracy: 0.5193 - val_loss: 1.6856 - val_accuracy: 0.3925
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6859 - accuracy: 0.5193 - val_loss: 1.6120 - val_accuracy: 0.3972
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6394 - accuracy: 0.5141 - val_loss: 1.6194 - val_accuracy: 0.3972

```
accuracy: 0.4252
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6205 - accuracy: 0.5064 - val_loss: 1.5905 - val_
accuracy: 0.3785
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6331 - accuracy: 0.5219 - val_loss: 1.5895 - val_
accuracy: 0.3785
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6006 - accuracy: 0.5167 - val_loss: 1.5907 - val_
accuracy: 0.3785
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5980 - accuracy: 0.5039 - val_loss: 1.5786 - val_
accuracy: 0.3788
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5977 - accuracy: 0.4987 - val_loss: 1.5619 - val_
accuracy: 0.3879
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5170 - accuracy: 0.5039 - val_loss: 1.5400 - val_
accuracy: 0.3972
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4683 - accuracy: 0.5064 - val_loss: 1.5331 - val_
accuracy: 0.3925
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5472 - accuracy: 0.4859 - val_loss: 1.5182 - val_
accuracy: 0.3925
Epoch 74/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5054 - accuracy: 0.5296 - val_loss: 1.4981 - val_
accuracy: 0.4019
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5244 - accuracy: 0.5244 - val_loss: 1.5210 - val_
accuracy: 0.3972
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4963 - accuracy: 0.5501 - val_loss: 1.4788 - val_
accuracy: 0.3972
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4104 - accuracy: 0.5270 - val_loss: 1.4987 - val_
accuracy: 0.3972
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3673 - accuracy: 0.5270 - val_loss: 1.4389 - val_
accuracy: 0.4065
Epoch 79/1000
4/4 [=====] - 0s 11ms/step - loss: 1.4814 - accuracy: 0.5450 - val_loss: 1.4313 - val_
accuracy: 0.3785
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3572 - accuracy: 0.5296 - val_loss: 1.4225 - val_
accuracy: 0.3925
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4187 - accuracy: 0.5450 - val_loss: 1.4097 - val_
accuracy: 0.3925
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4347 - accuracy: 0.5553 - val_loss: 1.3998 - val_
accuracy: 0.3879
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3787 - accuracy: 0.5321 - val_loss: 1.3525 - val_
accuracy: 0.3925
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2870 - accuracy: 0.5373 - val_loss: 1.2487 - val_
accuracy: 0.3972
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2896 - accuracy: 0.5553 - val_loss: 1.2164 - val_
accuracy: 0.3925
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3261 - accuracy: 0.5630 - val_loss: 1.2115 - val_
accuracy: 0.3879
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1881 - accuracy: 0.5219 - val_loss: 1.1729 - val_
accuracy: 0.3925
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2574 - accuracy: 0.5347 - val_loss: 1.1483 - val_
accuracy: 0.3972
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1759 - accuracy: 0.5553 - val_loss: 1.1139 - val_
accuracy: 0.3972
Epoch 90/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2297 - accuracy: 0.5270 - val_loss: 1.1027 - val_
accuracy: 0.4019
Epoch 91/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2208 - accuracy: 0.5193 - val_loss: 1.0984 - val_
accuracy: 0.4159
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1839 - accuracy: 0.5116 - val_loss: 1.0706 - val_
accuracy: 0.3925
Epoch 93/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1347 - accuracy: 0.5090 - val_loss: 1.0201 - val_
accuracy: 0.3972
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1190 - accuracy: 0.5193 - val_loss: 1.0134 - val_
accuracy: 0.4579
Epoch 95/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 1.1774 - accuracy: 0.5424 - val_loss: 1.0062 - val_accuracy: 0.4579
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0638 - accuracy: 0.5450 - val_loss: 0.9649 - val_accuracy: 0.4533
Epoch 97/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1004 - accuracy: 0.5578 - val_loss: 0.8921 - val_accuracy: 0.4579
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0343 - accuracy: 0.5321 - val_loss: 0.8516 - val_accuracy: 0.4439
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0563 - accuracy: 0.5630 - val_loss: 0.8485 - val_accuracy: 0.4533
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0195 - accuracy: 0.5553 - val_loss: 0.8738 - val_accuracy: 0.4533
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9203 - accuracy: 0.5656 - val_loss: 0.8624 - val_accuracy: 0.4626
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8795 - accuracy: 0.5707 - val_loss: 0.8156 - val_accuracy: 0.4626
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9678 - accuracy: 0.5630 - val_loss: 0.8768 - val_accuracy: 0.4720
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9579 - accuracy: 0.5630 - val_loss: 0.8739 - val_accuracy: 0.4720
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8635 - accuracy: 0.5707 - val_loss: 0.8716 - val_accuracy: 0.4673
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8153 - accuracy: 0.5578 - val_loss: 0.7655 - val_accuracy: 0.4720
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8971 - accuracy: 0.5630 - val_loss: 0.7643 - val_accuracy: 0.4720
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8568 - accuracy: 0.5501 - val_loss: 0.7252 - val_accuracy: 0.4813
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8683 - accuracy: 0.5810 - val_loss: 0.7236 - val_accuracy: 0.4907
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7952 - accuracy: 0.5578 - val_loss: 0.7094 - val_accuracy: 0.5140
Epoch 111/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7182 - accuracy: 0.5373 - val_loss: 0.7022 - val_accuracy: 0.5093
Epoch 112/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7771 - accuracy: 0.5681 - val_loss: 0.6985 - val_accuracy: 0.5093
Epoch 113/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7236 - accuracy: 0.5758 - val_loss: 0.7302 - val_accuracy: 0.5140
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7447 - accuracy: 0.5758 - val_loss: 0.7264 - val_accuracy: 0.5187
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6759 - accuracy: 0.5861 - val_loss: 0.7185 - val_accuracy: 0.5234
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6269 - accuracy: 0.5733 - val_loss: 0.6841 - val_accuracy: 0.5280
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6586 - accuracy: 0.5835 - val_loss: 0.6698 - val_accuracy: 0.5374
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6180 - accuracy: 0.6041 - val_loss: 0.6669 - val_accuracy: 0.5607
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6728 - accuracy: 0.5733 - val_loss: 0.6611 - val_accuracy: 0.5514
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6150 - accuracy: 0.5913 - val_loss: 0.6562 - val_accuracy: 0.5467
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6842 - accuracy: 0.6118 - val_loss: 0.6576 - val_accuracy: 0.5514
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6312 - accuracy: 0.5887 - val_loss: 0.6539 - val_accuracy: 0.5607
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7098 - accuracy: 0.6067 - val_loss: 0.6539 - val_accuracy: 0.5514
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6328 - accuracy: 0.6093 - val_loss: 0.6793 - val_accuracy: 0.5654
```

Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5537 - accuracy: 0.5964 - val_loss: 0.6869 - val_accuracy: 0.5748
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5903 - accuracy: 0.6067 - val_loss: 0.7608 - val_accuracy: 0.5935
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5955 - accuracy: 0.6195 - val_loss: 0.6880 - val_accuracy: 0.5701
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6181 - accuracy: 0.6298 - val_loss: 0.7231 - val_accuracy: 0.5794
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6360 - accuracy: 0.6093 - val_loss: 0.7294 - val_accuracy: 0.5794
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5363 - accuracy: 0.6195 - val_loss: 0.7546 - val_accuracy: 0.5888
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5560 - accuracy: 0.6375 - val_loss: 0.7509 - val_accuracy: 0.5935
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6338 - accuracy: 0.6324 - val_loss: 0.7311 - val_accuracy: 0.5888
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6410 - accuracy: 0.6015 - val_loss: 0.6817 - val_accuracy: 0.5561
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5084 - accuracy: 0.6093 - val_loss: 0.7029 - val_accuracy: 0.5607
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5360 - accuracy: 0.6195 - val_loss: 0.7047 - val_accuracy: 0.5561
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5483 - accuracy: 0.6144 - val_loss: 0.7031 - val_accuracy: 0.5514
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5158 - accuracy: 0.5835 - val_loss: 0.7525 - val_accuracy: 0.5607
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6251 - accuracy: 0.6247 - val_loss: 0.7099 - val_accuracy: 0.5607
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5178 - accuracy: 0.6118 - val_loss: 0.7533 - val_accuracy: 0.5654
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5999 - accuracy: 0.5887 - val_loss: 0.7604 - val_accuracy: 0.5841
Epoch 141/1000
4/4 [=====] - 0s 20ms/step - loss: 0.5303 - accuracy: 0.6118 - val_loss: 0.7591 - val_accuracy: 0.5701
Epoch 142/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4857 - accuracy: 0.6272 - val_loss: 0.7541 - val_accuracy: 0.5654
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5197 - accuracy: 0.6144 - val_loss: 0.7331 - val_accuracy: 0.5748
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5214 - accuracy: 0.6195 - val_loss: 0.7526 - val_accuracy: 0.5607
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4988 - accuracy: 0.6041 - val_loss: 0.7503 - val_accuracy: 0.5607
Epoch 146/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5998 - accuracy: 0.5835 - val_loss: 0.7718 - val_accuracy: 0.5514
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6324 - accuracy: 0.6067 - val_loss: 0.7427 - val_accuracy: 0.5467
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5408 - accuracy: 0.6144 - val_loss: 0.6996 - val_accuracy: 0.5421
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4920 - accuracy: 0.5861 - val_loss: 0.7074 - val_accuracy: 0.5187
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4691 - accuracy: 0.5810 - val_loss: 0.6966 - val_accuracy: 0.5187
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4748 - accuracy: 0.5758 - val_loss: 0.6869 - val_accuracy: 0.5234
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4816 - accuracy: 0.5861 - val_loss: 0.7558 - val_accuracy: 0.5327
Epoch 153/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5291 - accuracy: 0.5810 - val_loss: 0.7520 - val_accuracy: 0.5421
Epoch 154/1000
1/4 [=====>.....] - ETA: 0s - loss: 0.5440 - accuracy: 0.5156Restoring model weights from th

e end of the best epoch: 4.
4/4 [=====] - 0s 13ms/step - loss: 0.5723 - accuracy: 0.5604 - val_loss: 0.7235 - val_accuracy: 0.5374
Epoch 154: early stopping
2/2 [=====] - 0s 4ms/step - loss: 3.5848 - accuracy: 0.6047
[CV] ENDDense1=25, Dense2=25; total time= 9.0s
Model: "sequential_25"

Layer (type)	Output Shape	Param #
dense_100 (Dense)	(None, 25)	175
batch_normalization_75 (Batch Normalization)	(None, 25)	100
activation_75 (Activation)	(None, 25)	0
dense_101 (Dense)	(None, 25)	650
batch_normalization_76 (Batch Normalization)	(None, 25)	100
activation_76 (Activation)	(None, 25)	0
dense_102 (Dense)	(None, 10)	260
batch_normalization_77 (Batch Normalization)	(None, 10)	40
activation_77 (Activation)	(None, 10)	0
dense_103 (Dense)	(None, 2)	22

Total params: 1,347
Trainable params: 1,227
Non-trainable params: 120

Epoch 1/1000
4/4 [=====] - 1s 57ms/step - loss: 6.0319 - accuracy: 0.4859 - val_loss: 2.8870 - val_accuracy: 0.4065
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 5.2503 - accuracy: 0.5398 - val_loss: 2.5551 - val_accuracy: 0.4486
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 5.0931 - accuracy: 0.5064 - val_loss: 2.4121 - val_accuracy: 0.4533
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 4.8986 - accuracy: 0.5219 - val_loss: 2.3320 - val_accuracy: 0.4626
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 4.9037 - accuracy: 0.5296 - val_loss: 2.1682 - val_accuracy: 0.4907
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 4.7596 - accuracy: 0.5167 - val_loss: 2.1448 - val_accuracy: 0.5280
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 4.5781 - accuracy: 0.5553 - val_loss: 2.0804 - val_accuracy: 0.5654
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 4.3748 - accuracy: 0.5553 - val_loss: 2.0454 - val_accuracy: 0.5841
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 4.3260 - accuracy: 0.5887 - val_loss: 2.0777 - val_accuracy: 0.5748
Epoch 10/1000
4/4 [=====] - 0s 12ms/step - loss: 4.1173 - accuracy: 0.5553 - val_loss: 1.9965 - val_accuracy: 0.5701
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 4.0211 - accuracy: 0.5424 - val_loss: 2.0028 - val_accuracy: 0.5794
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 3.9308 - accuracy: 0.5501 - val_loss: 1.9846 - val_accuracy: 0.6075
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7668 - accuracy: 0.5810 - val_loss: 1.8958 - val_accuracy: 0.6262
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 3.8355 - accuracy: 0.5681 - val_loss: 1.8215 - val_accuracy: 0.6168
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7648 - accuracy: 0.5604 - val_loss: 1.8012 - val_accuracy: 0.6262
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5072 - accuracy: 0.5707 - val_loss: 1.7894 - val_accuracy: 0.6168
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 3.3118 - accuracy: 0.5758 - val_loss: 1.7601 - val_accuracy: 0.6262

Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2455 - accuracy: 0.6067 - val_loss: 1.6632 - val_accuracy: 0.6215
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1528 - accuracy: 0.5887 - val_loss: 1.6629 - val_accuracy: 0.6262
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1161 - accuracy: 0.6067 - val_loss: 1.6289 - val_accuracy: 0.6308
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9225 - accuracy: 0.5913 - val_loss: 1.6197 - val_accuracy: 0.6168
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8827 - accuracy: 0.5938 - val_loss: 1.6120 - val_accuracy: 0.6121
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9249 - accuracy: 0.6041 - val_loss: 1.5916 - val_accuracy: 0.6168
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7494 - accuracy: 0.6298 - val_loss: 1.5406 - val_accuracy: 0.6121
Epoch 25/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8745 - accuracy: 0.6427 - val_loss: 1.4982 - val_accuracy: 0.6168
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8553 - accuracy: 0.6272 - val_loss: 1.4570 - val_accuracy: 0.6121
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6382 - accuracy: 0.6067 - val_loss: 1.4545 - val_accuracy: 0.6215
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7977 - accuracy: 0.6375 - val_loss: 1.4446 - val_accuracy: 0.6168
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5641 - accuracy: 0.6118 - val_loss: 1.3710 - val_accuracy: 0.6168
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6275 - accuracy: 0.6093 - val_loss: 1.3575 - val_accuracy: 0.6168
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7350 - accuracy: 0.6170 - val_loss: 1.3429 - val_accuracy: 0.6215
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3798 - accuracy: 0.6144 - val_loss: 1.2692 - val_accuracy: 0.6215
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5584 - accuracy: 0.5938 - val_loss: 1.2084 - val_accuracy: 0.6215
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5435 - accuracy: 0.5990 - val_loss: 1.2100 - val_accuracy: 0.6168
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5158 - accuracy: 0.6015 - val_loss: 1.1957 - val_accuracy: 0.6308
Epoch 36/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3939 - accuracy: 0.6272 - val_loss: 1.2343 - val_accuracy: 0.6262
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4270 - accuracy: 0.6093 - val_loss: 1.2269 - val_accuracy: 0.6215
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4009 - accuracy: 0.6272 - val_loss: 1.2100 - val_accuracy: 0.6215
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4254 - accuracy: 0.6093 - val_loss: 1.1952 - val_accuracy: 0.6262
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2446 - accuracy: 0.6093 - val_loss: 1.1843 - val_accuracy: 0.6168
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2725 - accuracy: 0.6118 - val_loss: 1.1596 - val_accuracy: 0.6168
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2502 - accuracy: 0.6298 - val_loss: 1.1534 - val_accuracy: 0.6262
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1974 - accuracy: 0.6401 - val_loss: 1.1462 - val_accuracy: 0.6308
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2323 - accuracy: 0.6118 - val_loss: 1.1372 - val_accuracy: 0.6308
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1278 - accuracy: 0.6015 - val_loss: 1.1241 - val_accuracy: 0.6262
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1675 - accuracy: 0.5990 - val_loss: 1.1161 - val_accuracy: 0.6308
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0940 - accuracy: 0.6221 - val_loss: 1.1004 - val_accuracy: 0.6215

```
accuracy: 0.6168
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0210 - accuracy: 0.6221 - val_loss: 1.0930 - val_accuracy: 0.6215
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1454 - accuracy: 0.6195 - val_loss: 1.0790 - val_accuracy: 0.6402
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0946 - accuracy: 0.5913 - val_loss: 1.0683 - val_accuracy: 0.6449
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8505 - accuracy: 0.6247 - val_loss: 1.0666 - val_accuracy: 0.6542
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9811 - accuracy: 0.6221 - val_loss: 1.0577 - val_accuracy: 0.6542
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0114 - accuracy: 0.6324 - val_loss: 1.0457 - val_accuracy: 0.6589
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9610 - accuracy: 0.6504 - val_loss: 1.0325 - val_accuracy: 0.6589
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8632 - accuracy: 0.5938 - val_loss: 1.0284 - val_accuracy: 0.6542
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6403 - accuracy: 0.6350 - val_loss: 1.0159 - val_accuracy: 0.6402
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6516 - accuracy: 0.6118 - val_loss: 1.0136 - val_accuracy: 0.6589
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6442 - accuracy: 0.6221 - val_loss: 0.9997 - val_accuracy: 0.6495
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6270 - accuracy: 0.6247 - val_loss: 0.9712 - val_accuracy: 0.6495
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5499 - accuracy: 0.6555 - val_loss: 0.9802 - val_accuracy: 0.6542
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4331 - accuracy: 0.6478 - val_loss: 0.9705 - val_accuracy: 0.6542
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4711 - accuracy: 0.6452 - val_loss: 0.9640 - val_accuracy: 0.6495
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4674 - accuracy: 0.6478 - val_loss: 0.9627 - val_accuracy: 0.6355
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2272 - accuracy: 0.6298 - val_loss: 0.9551 - val_accuracy: 0.6262
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3216 - accuracy: 0.6195 - val_loss: 0.9393 - val_accuracy: 0.6168
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2172 - accuracy: 0.6375 - val_loss: 0.9321 - val_accuracy: 0.6215
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2801 - accuracy: 0.6350 - val_loss: 0.9200 - val_accuracy: 0.6215
Epoch 68/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3321 - accuracy: 0.6195 - val_loss: 0.9142 - val_accuracy: 0.6402
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1218 - accuracy: 0.6375 - val_loss: 0.9092 - val_accuracy: 0.6308
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1732 - accuracy: 0.6272 - val_loss: 0.8983 - val_accuracy: 0.6402
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3482 - accuracy: 0.6375 - val_loss: 0.9177 - val_accuracy: 0.6308
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1596 - accuracy: 0.6195 - val_loss: 0.9027 - val_accuracy: 0.6308
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1249 - accuracy: 0.6144 - val_loss: 0.9048 - val_accuracy: 0.6215
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1603 - accuracy: 0.6298 - val_loss: 0.8981 - val_accuracy: 0.6168
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1123 - accuracy: 0.5964 - val_loss: 0.8816 - val_accuracy: 0.6121
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0729 - accuracy: 0.6041 - val_loss: 0.8719 - val_accuracy: 0.6168
Epoch 77/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 1.2108 - accuracy: 0.6093 - val_loss: 0.8906 - val_accuracy: 0.6075
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0712 - accuracy: 0.6221 - val_loss: 0.8779 - val_accuracy: 0.6121
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1813 - accuracy: 0.6350 - val_loss: 0.8674 - val_accuracy: 0.6168
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1799 - accuracy: 0.6221 - val_loss: 0.8655 - val_accuracy: 0.6168
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0259 - accuracy: 0.6041 - val_loss: 0.8505 - val_accuracy: 0.6028
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9550 - accuracy: 0.5835 - val_loss: 0.8478 - val_accuracy: 0.5888
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1716 - accuracy: 0.6041 - val_loss: 0.8317 - val_accuracy: 0.5841
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0039 - accuracy: 0.6041 - val_loss: 0.8936 - val_accuracy: 0.5888
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9509 - accuracy: 0.6144 - val_loss: 0.8682 - val_accuracy: 0.5841
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0150 - accuracy: 0.5810 - val_loss: 0.8864 - val_accuracy: 0.5888
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0036 - accuracy: 0.5938 - val_loss: 0.8557 - val_accuracy: 0.5794
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0098 - accuracy: 0.6144 - val_loss: 0.8467 - val_accuracy: 0.5794
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0568 - accuracy: 0.5990 - val_loss: 0.8569 - val_accuracy: 0.6028
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9704 - accuracy: 0.5938 - val_loss: 0.8311 - val_accuracy: 0.5794
Epoch 91/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9690 - accuracy: 0.6015 - val_loss: 0.8515 - val_accuracy: 0.5981
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9037 - accuracy: 0.5964 - val_loss: 0.8792 - val_accuracy: 0.6075
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0098 - accuracy: 0.6118 - val_loss: 0.8558 - val_accuracy: 0.6075
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9011 - accuracy: 0.5887 - val_loss: 0.8732 - val_accuracy: 0.5981
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8330 - accuracy: 0.6015 - val_loss: 0.8642 - val_accuracy: 0.5981
Epoch 96/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8850 - accuracy: 0.5887 - val_loss: 0.8275 - val_accuracy: 0.5888
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8803 - accuracy: 0.6093 - val_loss: 0.8696 - val_accuracy: 0.5748
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8195 - accuracy: 0.6247 - val_loss: 0.8642 - val_accuracy: 0.5888
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8322 - accuracy: 0.6041 - val_loss: 0.8568 - val_accuracy: 0.5841
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7614 - accuracy: 0.6041 - val_loss: 0.8197 - val_accuracy: 0.5794
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9347 - accuracy: 0.5990 - val_loss: 0.8714 - val_accuracy: 0.5607
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6932 - accuracy: 0.6093 - val_loss: 0.8703 - val_accuracy: 0.5701
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8106 - accuracy: 0.6093 - val_loss: 0.8815 - val_accuracy: 0.5654
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7854 - accuracy: 0.5913 - val_loss: 0.8363 - val_accuracy: 0.5467
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6990 - accuracy: 0.5964 - val_loss: 0.8348 - val_accuracy: 0.5467
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7293 - accuracy: 0.5861 - val_loss: 0.8309 - val_accuracy: 0.5421
```

Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8511 - accuracy: 0.6067 - val_loss: 0.8328 - val_accuracy: 0.5327
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7800 - accuracy: 0.5656 - val_loss: 0.8548 - val_accuracy: 0.5280
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8644 - accuracy: 0.6015 - val_loss: 0.8978 - val_accuracy: 0.5234
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8370 - accuracy: 0.5964 - val_loss: 0.8965 - val_accuracy: 0.5234
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7764 - accuracy: 0.5604 - val_loss: 0.8682 - val_accuracy: 0.5327
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7719 - accuracy: 0.6195 - val_loss: 0.8695 - val_accuracy: 0.5514
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7782 - accuracy: 0.5861 - val_loss: 0.8946 - val_accuracy: 0.5607
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6773 - accuracy: 0.6067 - val_loss: 0.9439 - val_accuracy: 0.5794
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7736 - accuracy: 0.6015 - val_loss: 0.9199 - val_accuracy: 0.5654
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7808 - accuracy: 0.6015 - val_loss: 0.9130 - val_accuracy: 0.5514
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8095 - accuracy: 0.5835 - val_loss: 0.9196 - val_accuracy: 0.5654
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6906 - accuracy: 0.5810 - val_loss: 0.9077 - val_accuracy: 0.5607
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7885 - accuracy: 0.5810 - val_loss: 0.9109 - val_accuracy: 0.5467
Epoch 120/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7358 - accuracy: 0.5476 - val_loss: 0.9313 - val_accuracy: 0.5421
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7449 - accuracy: 0.5347 - val_loss: 0.9263 - val_accuracy: 0.5327
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7439 - accuracy: 0.5527 - val_loss: 0.9245 - val_accuracy: 0.5327
Epoch 123/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7157 - accuracy: 0.5553 - val_loss: 0.9203 - val_accuracy: 0.5467
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7225 - accuracy: 0.5733 - val_loss: 0.9436 - val_accuracy: 0.5374
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6489 - accuracy: 0.5476 - val_loss: 0.9545 - val_accuracy: 0.5701
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6599 - accuracy: 0.5450 - val_loss: 0.9191 - val_accuracy: 0.5701
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6787 - accuracy: 0.5733 - val_loss: 0.8852 - val_accuracy: 0.5607
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7361 - accuracy: 0.5784 - val_loss: 0.9103 - val_accuracy: 0.5514
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6137 - accuracy: 0.5990 - val_loss: 0.9033 - val_accuracy: 0.5421
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7005 - accuracy: 0.5656 - val_loss: 0.9083 - val_accuracy: 0.5280
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6471 - accuracy: 0.6015 - val_loss: 0.8968 - val_accuracy: 0.5327
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6161 - accuracy: 0.6041 - val_loss: 0.8948 - val_accuracy: 0.5280
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6738 - accuracy: 0.6067 - val_loss: 0.8725 - val_accuracy: 0.5140
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6561 - accuracy: 0.5604 - val_loss: 0.8815 - val_accuracy: 0.5654
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5481 - accuracy: 0.6221 - val_loss: 0.9503 - val_accuracy: 0.5748
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6537 - accuracy: 0.6350 - val_loss: 0.9218 - val_accuracy: 0.5654

```
accuracy: 0.5467
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7091 - accuracy: 0.6221 - val_loss: 0.9175 - val_accuracy: 0.5607
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6517 - accuracy: 0.6324 - val_loss: 0.9258 - val_accuracy: 0.5607
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6417 - accuracy: 0.6041 - val_loss: 0.9833 - val_accuracy: 0.5654
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6015 - accuracy: 0.6195 - val_loss: 0.9779 - val_accuracy: 0.5280
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6091 - accuracy: 0.5990 - val_loss: 1.0014 - val_accuracy: 0.5467
Epoch 142/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6017 - accuracy: 0.6195 - val_loss: 0.9727 - val_accuracy: 0.5514
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6048 - accuracy: 0.5835 - val_loss: 0.9495 - val_accuracy: 0.5514
Epoch 144/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6329 - accuracy: 0.6221 - val_loss: 0.9795 - val_accuracy: 0.5514
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6328 - accuracy: 0.6221 - val_loss: 0.9914 - val_accuracy: 0.5374
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6092 - accuracy: 0.5913 - val_loss: 0.9307 - val_accuracy: 0.5467
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5918 - accuracy: 0.6144 - val_loss: 0.9517 - val_accuracy: 0.5374
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5799 - accuracy: 0.6067 - val_loss: 1.0038 - val_accuracy: 0.5421
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6261 - accuracy: 0.6015 - val_loss: 0.9471 - val_accuracy: 0.5467
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5722 - accuracy: 0.6272 - val_loss: 0.9649 - val_accuracy: 0.5421
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6317 - accuracy: 0.6067 - val_loss: 0.9480 - val_accuracy: 0.5374
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7191 - accuracy: 0.5913 - val_loss: 1.0131 - val_accuracy: 0.5374
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4999 - accuracy: 0.5810 - val_loss: 0.9831 - val_accuracy: 0.5607
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5604 - accuracy: 0.6118 - val_loss: 0.9776 - val_accuracy: 0.5888
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5577 - accuracy: 0.6093 - val_loss: 0.9726 - val_accuracy: 0.5935
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5456 - accuracy: 0.6144 - val_loss: 0.9041 - val_accuracy: 0.6028
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6315 - accuracy: 0.6170 - val_loss: 0.8402 - val_accuracy: 0.6168
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5344 - accuracy: 0.6118 - val_loss: 0.8274 - val_accuracy: 0.5981
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5628 - accuracy: 0.6375 - val_loss: 0.8554 - val_accuracy: 0.6075
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6185 - accuracy: 0.5835 - val_loss: 0.8995 - val_accuracy: 0.5794
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5463 - accuracy: 0.6093 - val_loss: 0.9066 - val_accuracy: 0.5935
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5527 - accuracy: 0.6118 - val_loss: 0.8873 - val_accuracy: 0.5841
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4951 - accuracy: 0.6170 - val_loss: 0.9346 - val_accuracy: 0.5888
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5830 - accuracy: 0.5887 - val_loss: 0.9554 - val_accuracy: 0.5561
Epoch 165/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5428 - accuracy: 0.5964 - val_loss: 0.8358 - val_accuracy: 0.5607
Epoch 166/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.5525 - accuracy: 0.5938 - val_loss: 0.8884 - val_accuracy: 0.5561
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5802 - accuracy: 0.5887 - val_loss: 0.8083 - val_accuracy: 0.5561
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4911 - accuracy: 0.6015 - val_loss: 0.9192 - val_accuracy: 0.5421
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5361 - accuracy: 0.5861 - val_loss: 0.9656 - val_accuracy: 0.5421
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4842 - accuracy: 0.6118 - val_loss: 0.9230 - val_accuracy: 0.5374
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4625 - accuracy: 0.5990 - val_loss: 0.8717 - val_accuracy: 0.5327
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5061 - accuracy: 0.6015 - val_loss: 0.8154 - val_accuracy: 0.5327
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6249 - accuracy: 0.5964 - val_loss: 0.8614 - val_accuracy: 0.5327
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5331 - accuracy: 0.5913 - val_loss: 0.8476 - val_accuracy: 0.5467
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5470 - accuracy: 0.6221 - val_loss: 0.8846 - val_accuracy: 0.5374
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5045 - accuracy: 0.6015 - val_loss: 0.9107 - val_accuracy: 0.5327
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5833 - accuracy: 0.6093 - val_loss: 0.9461 - val_accuracy: 0.5140
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5629 - accuracy: 0.6118 - val_loss: 0.9260 - val_accuracy: 0.5000
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5923 - accuracy: 0.5835 - val_loss: 0.9524 - val_accuracy: 0.4860
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5147 - accuracy: 0.6118 - val_loss: 0.9913 - val_accuracy: 0.5093
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5577 - accuracy: 0.5913 - val_loss: 0.8746 - val_accuracy: 0.5047
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4425 - accuracy: 0.6041 - val_loss: 0.9330 - val_accuracy: 0.5047
Epoch 183/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5026 - accuracy: 0.5990 - val_loss: 0.9364 - val_accuracy: 0.5000
Epoch 184/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4974 - accuracy: 0.6015 - val_loss: 0.9488 - val_accuracy: 0.5187
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6052 - accuracy: 0.5810 - val_loss: 0.9077 - val_accuracy: 0.5280
Epoch 186/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5793 - accuracy: 0.5964 - val_loss: 0.9101 - val_accuracy: 0.5047
Epoch 187/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5037 - accuracy: 0.6067 - val_loss: 0.9922 - val_accuracy: 0.5234
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4591 - accuracy: 0.6041 - val_loss: 0.9283 - val_accuracy: 0.5421
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5145 - accuracy: 0.6093 - val_loss: 0.9269 - val_accuracy: 0.5421
Epoch 190/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4488 - accuracy: 0.5990 - val_loss: 0.8745 - val_accuracy: 0.5561
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4646 - accuracy: 0.5990 - val_loss: 0.8991 - val_accuracy: 0.5607
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4819 - accuracy: 0.6015 - val_loss: 0.9246 - val_accuracy: 0.5561
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4321 - accuracy: 0.5990 - val_loss: 0.9235 - val_accuracy: 0.5561
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4632 - accuracy: 0.6144 - val_loss: 0.9333 - val_accuracy: 0.5514
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4401 - accuracy: 0.6118 - val_loss: 0.9028 - val_accuracy: 0.5607
```

Epoch 196/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.5203 - accuracy: 0.6170 - val_loss: 0.8701 - val_accuracy: 0.5888
 Epoch 197/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.5381 - accuracy: 0.6170 - val_loss: 0.9178 - val_accuracy: 0.5794
 Epoch 198/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.5409 - accuracy: 0.6093 - val_loss: 0.9927 - val_accuracy: 0.5794
 Epoch 199/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.5975 - accuracy: 0.6093 - val_loss: 0.9642 - val_accuracy: 0.5794
 Epoch 200/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.5966 - accuracy: 0.6118 - val_loss: 0.9747 - val_accuracy: 0.5794
 Epoch 201/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4863 - accuracy: 0.6272 - val_loss: 1.0040 - val_accuracy: 0.5607
 Epoch 202/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.5218 - accuracy: 0.6221 - val_loss: 0.9813 - val_accuracy: 0.5607
 Epoch 203/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.4176 - accuracy: 0.5000 Restoring model weights from the end of the best epoch: 53.
 4/4 [=====] - 0s 14ms/step - loss: 0.4439 - accuracy: 0.5656 - val_loss: 0.9858 - val_accuracy: 0.5607
 Epoch 203: early stopping
 2/2 [=====] - 0s 3ms/step - loss: 0.9102 - accuracy: 0.5814
 [CV] END Dense1=25, Dense2=25; total time= 10.7s
 Model: "sequential_26"

Layer (type)	Output Shape	Param #
<hr/>		
dense_104 (Dense)	(None, 25)	175
batch_normalization_78 (Batch Normalization)	(None, 25)	100
activation_78 (Activation)	(None, 25)	0
dense_105 (Dense)	(None, 25)	650
batch_normalization_79 (Batch Normalization)	(None, 25)	100
activation_79 (Activation)	(None, 25)	0
dense_106 (Dense)	(None, 10)	260
batch_normalization_80 (Batch Normalization)	(None, 10)	40
activation_80 (Activation)	(None, 10)	0
dense_107 (Dense)	(None, 2)	22
<hr/>		
Total params: 1,347		
Trainable params: 1,227		
Non-trainable params: 120		

Epoch 1/1000
 4/4 [=====] - 1s 54ms/step - loss: 6.9148 - accuracy: 0.3573 - val_loss: 5.6960 - val_accuracy: 0.4953
 Epoch 2/1000
 4/4 [=====] - 0s 13ms/step - loss: 3.9598 - accuracy: 0.5116 - val_loss: 4.4260 - val_accuracy: 0.5794
 Epoch 3/1000
 4/4 [=====] - 0s 13ms/step - loss: 3.5026 - accuracy: 0.5141 - val_loss: 3.5534 - val_accuracy: 0.5748
 Epoch 4/1000
 4/4 [=====] - 0s 13ms/step - loss: 3.4358 - accuracy: 0.4910 - val_loss: 3.1127 - val_accuracy: 0.5514
 Epoch 5/1000
 4/4 [=====] - 0s 14ms/step - loss: 3.3129 - accuracy: 0.5013 - val_loss: 2.8541 - val_accuracy: 0.5794
 Epoch 6/1000
 4/4 [=====] - 0s 13ms/step - loss: 3.2407 - accuracy: 0.5244 - val_loss: 2.7597 - val_accuracy: 0.5794
 Epoch 7/1000
 4/4 [=====] - 0s 14ms/step - loss: 3.1442 - accuracy: 0.5193 - val_loss: 2.6479 - val_accuracy: 0.5935
 Epoch 8/1000
 4/4 [=====] - 0s 14ms/step - loss: 3.0318 - accuracy: 0.5013 - val_loss: 2.5167 - val_accuracy: 0.5794
 Epoch 9/1000
 4/4 [=====] - 0s 14ms/step - loss: 2.8926 - accuracy: 0.5116 - val_loss: 2.3538 - val_accuracy: 0.6028
 Epoch 10/1000

```
4/4 [=====] - 0s 14ms/step - loss: 2.9606 - accuracy: 0.5167 - val_loss: 2.3249 - val_accuracy: 0.6075
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6928 - accuracy: 0.5476 - val_loss: 2.2820 - val_accuracy: 0.6075
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6227 - accuracy: 0.5424 - val_loss: 2.2453 - val_accuracy: 0.5981
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5821 - accuracy: 0.5450 - val_loss: 2.2370 - val_accuracy: 0.5888
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3801 - accuracy: 0.5913 - val_loss: 2.1825 - val_accuracy: 0.5888
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5722 - accuracy: 0.5527 - val_loss: 2.1521 - val_accuracy: 0.5888
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2199 - accuracy: 0.5938 - val_loss: 2.1473 - val_accuracy: 0.5561
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1972 - accuracy: 0.6067 - val_loss: 2.1266 - val_accuracy: 0.5654
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0091 - accuracy: 0.5964 - val_loss: 2.0737 - val_accuracy: 0.5561
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9268 - accuracy: 0.5887 - val_loss: 2.0157 - val_accuracy: 0.5514
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8076 - accuracy: 0.5990 - val_loss: 1.9079 - val_accuracy: 0.5467
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6694 - accuracy: 0.6041 - val_loss: 1.8889 - val_accuracy: 0.5421
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6623 - accuracy: 0.5990 - val_loss: 1.8728 - val_accuracy: 0.5421
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5840 - accuracy: 0.6272 - val_loss: 1.8909 - val_accuracy: 0.5561
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5943 - accuracy: 0.6144 - val_loss: 1.8926 - val_accuracy: 0.5607
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4686 - accuracy: 0.6195 - val_loss: 1.8292 - val_accuracy: 0.5607
Epoch 26/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5230 - accuracy: 0.6041 - val_loss: 1.7814 - val_accuracy: 0.5654
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4290 - accuracy: 0.6375 - val_loss: 1.7948 - val_accuracy: 0.5561
Epoch 28/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4021 - accuracy: 0.6221 - val_loss: 1.7475 - val_accuracy: 0.5607
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3554 - accuracy: 0.6375 - val_loss: 1.7318 - val_accuracy: 0.5654
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3039 - accuracy: 0.6555 - val_loss: 1.7117 - val_accuracy: 0.5654
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2619 - accuracy: 0.6298 - val_loss: 1.7075 - val_accuracy: 0.5561
Epoch 32/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3137 - accuracy: 0.6298 - val_loss: 1.6910 - val_accuracy: 0.5561
Epoch 33/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2514 - accuracy: 0.6375 - val_loss: 1.6375 - val_accuracy: 0.5607
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2300 - accuracy: 0.6221 - val_loss: 1.6192 - val_accuracy: 0.5607
Epoch 35/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2636 - accuracy: 0.6324 - val_loss: 1.5824 - val_accuracy: 0.5607
Epoch 36/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1892 - accuracy: 0.6298 - val_loss: 1.5830 - val_accuracy: 0.5748
Epoch 37/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1361 - accuracy: 0.6324 - val_loss: 1.5510 - val_accuracy: 0.5748
Epoch 38/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0748 - accuracy: 0.6555 - val_loss: 1.5232 - val_accuracy: 0.5748
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0863 - accuracy: 0.6118 - val_loss: 1.5063 - val_accuracy: 0.5701
```

```
Epoch 40/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1396 - accuracy: 0.6401 - val_loss: 1.4858 - val_accuracy: 0.5701
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1304 - accuracy: 0.6401 - val_loss: 1.4830 - val_accuracy: 0.5701
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0359 - accuracy: 0.6375 - val_loss: 1.4260 - val_accuracy: 0.5748
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0717 - accuracy: 0.6195 - val_loss: 1.4065 - val_accuracy: 0.5701
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0647 - accuracy: 0.6272 - val_loss: 1.3877 - val_accuracy: 0.5888
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9591 - accuracy: 0.6324 - val_loss: 1.3712 - val_accuracy: 0.5981
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9947 - accuracy: 0.6272 - val_loss: 1.3447 - val_accuracy: 0.5888
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9020 - accuracy: 0.6298 - val_loss: 1.3344 - val_accuracy: 0.5888
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9326 - accuracy: 0.6272 - val_loss: 1.3249 - val_accuracy: 0.5888
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9385 - accuracy: 0.6170 - val_loss: 1.3170 - val_accuracy: 0.5888
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9420 - accuracy: 0.6144 - val_loss: 1.3062 - val_accuracy: 0.5794
Epoch 51/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9298 - accuracy: 0.6221 - val_loss: 1.2997 - val_accuracy: 0.5514
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9558 - accuracy: 0.6170 - val_loss: 1.2872 - val_accuracy: 0.5701
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9740 - accuracy: 0.6067 - val_loss: 1.2747 - val_accuracy: 0.5701
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9256 - accuracy: 0.6375 - val_loss: 1.2630 - val_accuracy: 0.5701
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9585 - accuracy: 0.6298 - val_loss: 1.2525 - val_accuracy: 0.5654
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9499 - accuracy: 0.6170 - val_loss: 1.2378 - val_accuracy: 0.5701
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9144 - accuracy: 0.6118 - val_loss: 1.2241 - val_accuracy: 0.5701
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8189 - accuracy: 0.6015 - val_loss: 1.2107 - val_accuracy: 0.5748
Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9521 - accuracy: 0.6041 - val_loss: 1.1664 - val_accuracy: 0.5794
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8727 - accuracy: 0.6144 - val_loss: 1.1753 - val_accuracy: 0.5794
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8751 - accuracy: 0.6118 - val_loss: 1.1381 - val_accuracy: 0.5794
Epoch 62/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8703 - accuracy: 0.6093 - val_loss: 1.1447 - val_accuracy: 0.5748
Epoch 63/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8632 - accuracy: 0.6195 - val_loss: 1.1084 - val_accuracy: 0.5841
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8861 - accuracy: 0.5990 - val_loss: 1.1219 - val_accuracy: 0.5794
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8292 - accuracy: 0.6118 - val_loss: 1.1147 - val_accuracy: 0.5794
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7839 - accuracy: 0.6195 - val_loss: 1.0821 - val_accuracy: 0.5794
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8317 - accuracy: 0.6041 - val_loss: 1.1013 - val_accuracy: 0.5748
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8472 - accuracy: 0.5913 - val_loss: 1.1141 - val_accuracy: 0.5794
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7686 - accuracy: 0.6067 - val_loss: 1.0819 - val_accuracy: 0.5794
```

```
accuracy: 0.5841
Epoch 70/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7751 - accuracy: 0.6144 - val_loss: 1.1026 - val_
accuracy: 0.5841
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7438 - accuracy: 0.5913 - val_loss: 1.1259 - val_
accuracy: 0.5794
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7994 - accuracy: 0.5990 - val_loss: 1.0959 - val_
accuracy: 0.5748
Epoch 73/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7795 - accuracy: 0.6118 - val_loss: 1.0620 - val_
accuracy: 0.5701
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7659 - accuracy: 0.6247 - val_loss: 1.0557 - val_
accuracy: 0.5794
Epoch 75/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7749 - accuracy: 0.6195 - val_loss: 1.0540 - val_
accuracy: 0.5794
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8091 - accuracy: 0.6093 - val_loss: 1.0447 - val_
accuracy: 0.5794
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7615 - accuracy: 0.6170 - val_loss: 1.0377 - val_
accuracy: 0.5794
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7644 - accuracy: 0.5938 - val_loss: 1.0350 - val_
accuracy: 0.5935
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7896 - accuracy: 0.6221 - val_loss: 1.0249 - val_
accuracy: 0.5888
Epoch 80/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7449 - accuracy: 0.6144 - val_loss: 1.0188 - val_
accuracy: 0.5935
Epoch 81/1000
4/4 [=====] - 0s 16ms/step - loss: 0.7791 - accuracy: 0.6247 - val_loss: 1.0075 - val_
accuracy: 0.5935
Epoch 82/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7667 - accuracy: 0.6015 - val_loss: 1.0020 - val_
accuracy: 0.6075
Epoch 83/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7842 - accuracy: 0.5964 - val_loss: 1.0021 - val_
accuracy: 0.6121
Epoch 84/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7982 - accuracy: 0.6015 - val_loss: 1.0288 - val_
accuracy: 0.5981
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7773 - accuracy: 0.5887 - val_loss: 1.0223 - val_
accuracy: 0.5981
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7440 - accuracy: 0.5938 - val_loss: 1.0144 - val_
accuracy: 0.6028
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7119 - accuracy: 0.5476 - val_loss: 1.0397 - val_
accuracy: 0.5654
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8072 - accuracy: 0.5373 - val_loss: 1.0345 - val_
accuracy: 0.5748
Epoch 89/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8108 - accuracy: 0.5450 - val_loss: 0.9973 - val_
accuracy: 0.5701
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7596 - accuracy: 0.5476 - val_loss: 0.9970 - val_
accuracy: 0.5607
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7015 - accuracy: 0.5450 - val_loss: 0.9923 - val_
accuracy: 0.5607
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7065 - accuracy: 0.5244 - val_loss: 0.9839 - val_
accuracy: 0.5561
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6661 - accuracy: 0.5219 - val_loss: 1.0063 - val_
accuracy: 0.5701
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7020 - accuracy: 0.5733 - val_loss: 1.0041 - val_
accuracy: 0.5607
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6729 - accuracy: 0.5270 - val_loss: 1.0003 - val_
accuracy: 0.5561
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6920 - accuracy: 0.5398 - val_loss: 0.9925 - val_
accuracy: 0.5607
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7148 - accuracy: 0.5296 - val_loss: 0.9875 - val_
accuracy: 0.5654
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7742 - accuracy: 0.5090 - val_loss: 0.9852 - val_
accuracy: 0.5748
Epoch 99/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.7025 - accuracy: 0.5167 - val_loss: 0.9884 - val_accuracy: 0.5748
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6950 - accuracy: 0.5270 - val_loss: 0.9758 - val_accuracy: 0.5654
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6969 - accuracy: 0.5219 - val_loss: 0.9642 - val_accuracy: 0.5888
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6546 - accuracy: 0.5347 - val_loss: 0.9351 - val_accuracy: 0.5981
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6189 - accuracy: 0.5450 - val_loss: 0.9321 - val_accuracy: 0.5935
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6972 - accuracy: 0.5013 - val_loss: 0.9303 - val_accuracy: 0.5935
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6746 - accuracy: 0.5296 - val_loss: 0.9536 - val_accuracy: 0.5935
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6848 - accuracy: 0.5270 - val_loss: 0.9344 - val_accuracy: 0.5981
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6684 - accuracy: 0.5347 - val_loss: 0.9528 - val_accuracy: 0.5981
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6248 - accuracy: 0.5347 - val_loss: 0.9170 - val_accuracy: 0.5981
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6387 - accuracy: 0.5321 - val_loss: 0.9112 - val_accuracy: 0.5935
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7051 - accuracy: 0.4987 - val_loss: 0.9141 - val_accuracy: 0.5981
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6631 - accuracy: 0.5656 - val_loss: 0.9383 - val_accuracy: 0.5935
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6243 - accuracy: 0.5450 - val_loss: 0.9415 - val_accuracy: 0.5888
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6144 - accuracy: 0.5398 - val_loss: 0.9703 - val_accuracy: 0.5935
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6384 - accuracy: 0.5398 - val_loss: 0.9680 - val_accuracy: 0.6121
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6819 - accuracy: 0.5527 - val_loss: 0.9687 - val_accuracy: 0.6075
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6024 - accuracy: 0.5630 - val_loss: 0.9904 - val_accuracy: 0.5935
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6175 - accuracy: 0.5707 - val_loss: 0.9594 - val_accuracy: 0.6028
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6019 - accuracy: 0.5681 - val_loss: 0.9602 - val_accuracy: 0.5981
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6378 - accuracy: 0.5398 - val_loss: 0.9499 - val_accuracy: 0.5935
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6328 - accuracy: 0.5630 - val_loss: 0.9681 - val_accuracy: 0.5888
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6442 - accuracy: 0.5450 - val_loss: 0.9669 - val_accuracy: 0.5935
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6394 - accuracy: 0.5630 - val_loss: 0.9603 - val_accuracy: 0.5748
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6023 - accuracy: 0.5810 - val_loss: 0.9574 - val_accuracy: 0.5935
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5936 - accuracy: 0.5707 - val_loss: 0.9510 - val_accuracy: 0.5654
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5745 - accuracy: 0.5810 - val_loss: 0.9439 - val_accuracy: 0.5701
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5498 - accuracy: 0.5373 - val_loss: 0.9418 - val_accuracy: 0.5701
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5940 - accuracy: 0.5450 - val_loss: 0.9374 - val_accuracy: 0.5561
Epoch 128/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6066 - accuracy: 0.5758 - val_loss: 0.9345 - val_accuracy: 0.5607
```

Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6387 - accuracy: 0.5733 - val_loss: 0.9568 - val_accuracy: 0.5748
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6292 - accuracy: 0.5887 - val_loss: 0.9553 - val_accuracy: 0.5514
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6147 - accuracy: 0.5733 - val_loss: 0.9488 - val_accuracy: 0.5467
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5509 - accuracy: 0.5553 - val_loss: 0.9503 - val_accuracy: 0.5514
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5192 - accuracy: 0.5681 - val_loss: 0.9499 - val_accuracy: 0.5514
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5503 - accuracy: 0.5424 - val_loss: 0.9444 - val_accuracy: 0.5561
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5083 - accuracy: 0.5758 - val_loss: 0.9409 - val_accuracy: 0.5654
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5453 - accuracy: 0.5553 - val_loss: 0.9393 - val_accuracy: 0.5841
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5096 - accuracy: 0.6093 - val_loss: 0.9414 - val_accuracy: 0.5888
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5462 - accuracy: 0.5810 - val_loss: 0.9375 - val_accuracy: 0.5748
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5430 - accuracy: 0.5964 - val_loss: 0.9263 - val_accuracy: 0.5888
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5361 - accuracy: 0.6221 - val_loss: 0.9233 - val_accuracy: 0.5841
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5437 - accuracy: 0.5887 - val_loss: 0.9173 - val_accuracy: 0.5841
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4903 - accuracy: 0.5887 - val_loss: 0.9200 - val_accuracy: 0.5748
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5418 - accuracy: 0.5913 - val_loss: 0.9110 - val_accuracy: 0.5748
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4857 - accuracy: 0.5887 - val_loss: 0.9410 - val_accuracy: 0.5748
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5453 - accuracy: 0.5810 - val_loss: 0.9696 - val_accuracy: 0.5701
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5461 - accuracy: 0.6170 - val_loss: 0.9443 - val_accuracy: 0.5561
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5109 - accuracy: 0.5887 - val_loss: 0.9657 - val_accuracy: 0.5607
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4847 - accuracy: 0.5913 - val_loss: 0.9578 - val_accuracy: 0.5701
Epoch 149/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4610 - accuracy: 0.6015 - val_loss: 0.9542 - val_accuracy: 0.5654
Epoch 150/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4764 - accuracy: 0.6093 - val_loss: 0.9540 - val_accuracy: 0.5654
Epoch 151/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5885 - accuracy: 0.6272 - val_loss: 0.9517 - val_accuracy: 0.5701
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5782 - accuracy: 0.6221 - val_loss: 0.9230 - val_accuracy: 0.5748
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4915 - accuracy: 0.5681 - val_loss: 0.9498 - val_accuracy: 0.5561
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5171 - accuracy: 0.5861 - val_loss: 0.9457 - val_accuracy: 0.5607
Epoch 155/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4903 - accuracy: 0.5887 - val_loss: 0.9135 - val_accuracy: 0.5561
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4749 - accuracy: 0.5784 - val_loss: 0.9178 - val_accuracy: 0.5607
Epoch 157/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5381 - accuracy: 0.6041 - val_loss: 0.9446 - val_accuracy: 0.5654
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4862 - accuracy: 0.6093 - val_loss: 0.9453 - val_accuracy: 0.5654

```
accuracy: 0.5561
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5099 - accuracy: 0.5835 - val_loss: 0.9093 - val_
accuracy: 0.5607
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4708 - accuracy: 0.5835 - val_loss: 0.9089 - val_
accuracy: 0.5561
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5752 - accuracy: 0.5758 - val_loss: 0.9063 - val_
accuracy: 0.5654
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5372 - accuracy: 0.5887 - val_loss: 0.9112 - val_
accuracy: 0.5421
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4955 - accuracy: 0.6195 - val_loss: 0.9094 - val_
accuracy: 0.5421
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4533 - accuracy: 0.5681 - val_loss: 0.9065 - val_
accuracy: 0.5374
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4897 - accuracy: 0.5527 - val_loss: 0.9266 - val_
accuracy: 0.5467
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4815 - accuracy: 0.5861 - val_loss: 0.9246 - val_
accuracy: 0.5514
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4484 - accuracy: 0.5913 - val_loss: 0.9277 - val_
accuracy: 0.5514
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4601 - accuracy: 0.5964 - val_loss: 0.9269 - val_
accuracy: 0.5421
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4594 - accuracy: 0.6041 - val_loss: 0.9510 - val_
accuracy: 0.5561
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4896 - accuracy: 0.6015 - val_loss: 0.9842 - val_
accuracy: 0.5561
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5771 - accuracy: 0.5964 - val_loss: 0.9831 - val_
accuracy: 0.5374
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5736 - accuracy: 0.6093 - val_loss: 0.9619 - val_
accuracy: 0.5467
Epoch 173/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4424 - accuracy: 0.5810 - val_loss: 0.9597 - val_
accuracy: 0.5374
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5065 - accuracy: 0.5887 - val_loss: 0.9582 - val_
accuracy: 0.5374
Epoch 175/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4238 - accuracy: 0.5990 - val_loss: 0.9550 - val_
accuracy: 0.5374
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4527 - accuracy: 0.6093 - val_loss: 0.9602 - val_
accuracy: 0.5421
Epoch 177/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4716 - accuracy: 0.6093 - val_loss: 0.9635 - val_
accuracy: 0.5467
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4938 - accuracy: 0.6041 - val_loss: 0.9964 - val_
accuracy: 0.5234
Epoch 179/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4905 - accuracy: 0.6093 - val_loss: 1.0154 - val_
accuracy: 0.5374
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4799 - accuracy: 0.6041 - val_loss: 1.0125 - val_
accuracy: 0.5374
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4720 - accuracy: 0.5990 - val_loss: 1.0114 - val_
accuracy: 0.5374
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4754 - accuracy: 0.5964 - val_loss: 1.0098 - val_
accuracy: 0.5421
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4608 - accuracy: 0.6067 - val_loss: 1.0090 - val_
accuracy: 0.5280
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4954 - accuracy: 0.6144 - val_loss: 1.0085 - val_
accuracy: 0.5234
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4258 - accuracy: 0.6067 - val_loss: 1.0314 - val_
accuracy: 0.5280
Epoch 186/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4412 - accuracy: 0.6144 - val_loss: 1.0076 - val_
accuracy: 0.5234
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4890 - accuracy: 0.6015 - val_loss: 1.0133 - val_
accuracy: 0.5234
Epoch 188/1000
```

4/4 [=====] - 0s 12ms/step - loss: 0.4017 - accuracy: 0.6195 - val_loss: 1.0344 - val_accuracy: 0.5280
Epoch 189/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4611 - accuracy: 0.6401 - val_loss: 1.0293 - val_accuracy: 0.5421
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4865 - accuracy: 0.6118 - val_loss: 1.0614 - val_accuracy: 0.5467
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5051 - accuracy: 0.6170 - val_loss: 1.0075 - val_accuracy: 0.5374
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4250 - accuracy: 0.6324 - val_loss: 0.9816 - val_accuracy: 0.5327
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5285 - accuracy: 0.6427 - val_loss: 0.9821 - val_accuracy: 0.5374
Epoch 194/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5794 - accuracy: 0.5990 - val_loss: 1.0009 - val_accuracy: 0.5514
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4200 - accuracy: 0.6427 - val_loss: 0.9393 - val_accuracy: 0.5654
Epoch 196/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4595 - accuracy: 0.6375 - val_loss: 0.9375 - val_accuracy: 0.5561
Epoch 197/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5276 - accuracy: 0.6478 - val_loss: 0.9962 - val_accuracy: 0.5561
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4495 - accuracy: 0.6530 - val_loss: 1.0005 - val_accuracy: 0.5748
Epoch 199/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4580 - accuracy: 0.6170 - val_loss: 1.0065 - val_accuracy: 0.5607
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4342 - accuracy: 0.6401 - val_loss: 1.0028 - val_accuracy: 0.5561
Epoch 201/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4482 - accuracy: 0.6581 - val_loss: 1.0053 - val_accuracy: 0.5467
Epoch 202/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4497 - accuracy: 0.6632 - val_loss: 1.0288 - val_accuracy: 0.5561
Epoch 203/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4841 - accuracy: 0.6478 - val_loss: 0.9832 - val_accuracy: 0.5514
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4785 - accuracy: 0.6555 - val_loss: 1.0075 - val_accuracy: 0.5514
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4304 - accuracy: 0.6247 - val_loss: 0.9674 - val_accuracy: 0.5748
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4957 - accuracy: 0.6375 - val_loss: 0.9681 - val_accuracy: 0.5748
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4629 - accuracy: 0.6401 - val_loss: 0.9679 - val_accuracy: 0.5467
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4310 - accuracy: 0.6684 - val_loss: 0.9648 - val_accuracy: 0.5654
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4056 - accuracy: 0.6247 - val_loss: 0.9632 - val_accuracy: 0.5561
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4261 - accuracy: 0.5990 - val_loss: 0.9911 - val_accuracy: 0.5561
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4116 - accuracy: 0.6401 - val_loss: 0.9911 - val_accuracy: 0.5561
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4726 - accuracy: 0.6118 - val_loss: 0.9893 - val_accuracy: 0.5561
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4185 - accuracy: 0.6350 - val_loss: 0.9884 - val_accuracy: 0.5561
Epoch 214/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5024 - accuracy: 0.6401 - val_loss: 0.9831 - val_accuracy: 0.5607
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5084 - accuracy: 0.6298 - val_loss: 0.9882 - val_accuracy: 0.5561
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4357 - accuracy: 0.6195 - val_loss: 1.0169 - val_accuracy: 0.5561
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4110 - accuracy: 0.6221 - val_loss: 0.9804 - val_accuracy: 0.5421

Epoch 218/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4563 - accuracy: 0.6324 - val_loss: 1.0159 - val_accuracy: 0.5607
 Epoch 219/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.4831 - accuracy: 0.6118 - val_loss: 0.9925 - val_accuracy: 0.5421
 Epoch 220/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4230 - accuracy: 0.6195 - val_loss: 0.9633 - val_accuracy: 0.5327
 Epoch 221/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.4330 - accuracy: 0.6015 - val_loss: 0.9350 - val_accuracy: 0.5514
 Epoch 222/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4277 - accuracy: 0.5887 - val_loss: 0.9982 - val_accuracy: 0.5187
 Epoch 223/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4300 - accuracy: 0.6144 - val_loss: 0.9986 - val_accuracy: 0.5187
 Epoch 224/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.4684 - accuracy: 0.5835 - val_loss: 0.9667 - val_accuracy: 0.5280
 Epoch 225/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3834 - accuracy: 0.6067 - val_loss: 0.9620 - val_accuracy: 0.5327
 Epoch 226/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4471 - accuracy: 0.5938 - val_loss: 0.9606 - val_accuracy: 0.5327
 Epoch 227/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.4166 - accuracy: 0.6195 - val_loss: 0.9589 - val_accuracy: 0.5374
 Epoch 228/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4142 - accuracy: 0.6170 - val_loss: 0.9594 - val_accuracy: 0.5374
 Epoch 229/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3938 - accuracy: 0.6144 - val_loss: 0.9877 - val_accuracy: 0.5514
 Epoch 230/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4449 - accuracy: 0.6093 - val_loss: 0.9902 - val_accuracy: 0.5514
 Epoch 231/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4114 - accuracy: 0.6118 - val_loss: 0.9781 - val_accuracy: 0.5514
 Epoch 232/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3948 - accuracy: 0.6015 - val_loss: 0.9798 - val_accuracy: 0.5467
 Epoch 233/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.4175 - accuracy: 0.6016 Restoring model weights from the end of the best epoch: 83.
 4/4 [=====] - 0s 14ms/step - loss: 0.3897 - accuracy: 0.6144 - val_loss: 0.9776 - val_accuracy: 0.5374
 Epoch 233: early stopping
 2/2 [=====] - 0s 3ms/step - loss: 0.7993 - accuracy: 0.4884
 [CV] END Dense1=25, Dense2=25; total time= 12.1s
 Model: "sequential_27"

Layer (type)	Output Shape	Param #
<hr/>		
dense_108 (Dense)	(None, 25)	175
batch_normalization_81 (Batch Normalization)	(None, 25)	100
activation_81 (Activation)	(None, 25)	0
dense_109 (Dense)	(None, 25)	650
batch_normalization_82 (Batch Normalization)	(None, 25)	100
activation_82 (Activation)	(None, 25)	0
dense_110 (Dense)	(None, 10)	260
batch_normalization_83 (Batch Normalization)	(None, 10)	40
activation_83 (Activation)	(None, 10)	0
dense_111 (Dense)	(None, 2)	22
<hr/>		

Total params: 1,347
 Trainable params: 1,227
 Non-trainable params: 120

Epoch 1/1000
 4/4 [=====] - 1s 55ms/step - loss: 7.5863 - accuracy: 0.4730 - val_loss: 1.4918 - val_accuracy: 0.6449
 Epoch 2/1000

4/4 [=====] - 0s 13ms/step - loss: 5.3030 - accuracy: 0.6735 - val_loss: 1.7045 - val_accuracy: 0.6308
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 3.7324 - accuracy: 0.6735 - val_loss: 1.9911 - val_accuracy: 0.6449
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4764 - accuracy: 0.6684 - val_loss: 2.1699 - val_accuracy: 0.6168
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 3.3886 - accuracy: 0.6915 - val_loss: 2.1696 - val_accuracy: 0.5981
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2086 - accuracy: 0.6812 - val_loss: 2.1442 - val_accuracy: 0.6308
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1192 - accuracy: 0.6889 - val_loss: 2.0272 - val_accuracy: 0.6215
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0181 - accuracy: 0.6684 - val_loss: 1.9939 - val_accuracy: 0.6449
Epoch 9/1000
4/4 [=====] - 0s 15ms/step - loss: 3.0188 - accuracy: 0.6761 - val_loss: 1.9868 - val_accuracy: 0.6495
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8457 - accuracy: 0.6710 - val_loss: 1.9113 - val_accuracy: 0.6402
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7742 - accuracy: 0.6889 - val_loss: 1.8749 - val_accuracy: 0.6168
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7728 - accuracy: 0.6889 - val_loss: 1.8467 - val_accuracy: 0.6262
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4836 - accuracy: 0.6710 - val_loss: 1.8246 - val_accuracy: 0.6262
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5378 - accuracy: 0.6889 - val_loss: 1.7714 - val_accuracy: 0.6262
Epoch 15/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4796 - accuracy: 0.6761 - val_loss: 1.7438 - val_accuracy: 0.6262
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4178 - accuracy: 0.6812 - val_loss: 1.7160 - val_accuracy: 0.6121
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3072 - accuracy: 0.6735 - val_loss: 1.6884 - val_accuracy: 0.5981
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1818 - accuracy: 0.6684 - val_loss: 1.6496 - val_accuracy: 0.6075
Epoch 19/1000
4/4 [=====] - 0s 16ms/step - loss: 2.1144 - accuracy: 0.6658 - val_loss: 1.6302 - val_accuracy: 0.6028
Epoch 20/1000
4/4 [=====] - 0s 17ms/step - loss: 2.0016 - accuracy: 0.6710 - val_loss: 1.6596 - val_accuracy: 0.5888
Epoch 21/1000
4/4 [=====] - 0s 15ms/step - loss: 1.8054 - accuracy: 0.6607 - val_loss: 1.6489 - val_accuracy: 0.5748
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6837 - accuracy: 0.6118 - val_loss: 1.6574 - val_accuracy: 0.5748
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7133 - accuracy: 0.6555 - val_loss: 1.5748 - val_accuracy: 0.5607
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6272 - accuracy: 0.6144 - val_loss: 1.5816 - val_accuracy: 0.5514
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4847 - accuracy: 0.6298 - val_loss: 1.5589 - val_accuracy: 0.5467
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5343 - accuracy: 0.6144 - val_loss: 1.5610 - val_accuracy: 0.5561
Epoch 27/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4805 - accuracy: 0.6350 - val_loss: 1.5286 - val_accuracy: 0.5514
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4478 - accuracy: 0.6272 - val_loss: 1.4868 - val_accuracy: 0.5514
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4599 - accuracy: 0.6144 - val_loss: 1.5078 - val_accuracy: 0.5467
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4427 - accuracy: 0.5913 - val_loss: 1.4768 - val_accuracy: 0.5234
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3384 - accuracy: 0.6272 - val_loss: 1.4766 - val_accuracy: 0.5514

Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2573 - accuracy: 0.6041 - val_loss: 1.4688 - val_accuracy: 0.5421
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3088 - accuracy: 0.6195 - val_loss: 1.4564 - val_accuracy: 0.5327
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2893 - accuracy: 0.5733 - val_loss: 1.4470 - val_accuracy: 0.5280
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3099 - accuracy: 0.5784 - val_loss: 1.4142 - val_accuracy: 0.5374
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3179 - accuracy: 0.5758 - val_loss: 1.3769 - val_accuracy: 0.5327
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2650 - accuracy: 0.6298 - val_loss: 1.3499 - val_accuracy: 0.5187
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3226 - accuracy: 0.5938 - val_loss: 1.3403 - val_accuracy: 0.5187
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2747 - accuracy: 0.5887 - val_loss: 1.3677 - val_accuracy: 0.5093
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2278 - accuracy: 0.5784 - val_loss: 1.3575 - val_accuracy: 0.5187
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1748 - accuracy: 0.5733 - val_loss: 1.3695 - val_accuracy: 0.5234
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1409 - accuracy: 0.5527 - val_loss: 1.3291 - val_accuracy: 0.5140
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1633 - accuracy: 0.5707 - val_loss: 1.3102 - val_accuracy: 0.5280
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2187 - accuracy: 0.5964 - val_loss: 1.2667 - val_accuracy: 0.5327
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1525 - accuracy: 0.6015 - val_loss: 1.2800 - val_accuracy: 0.5234
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0908 - accuracy: 0.5758 - val_loss: 1.2505 - val_accuracy: 0.5234
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0600 - accuracy: 0.5810 - val_loss: 1.2665 - val_accuracy: 0.5234
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1072 - accuracy: 0.5758 - val_loss: 1.2586 - val_accuracy: 0.5234
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1017 - accuracy: 0.5810 - val_loss: 1.2227 - val_accuracy: 0.5187
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0946 - accuracy: 0.5553 - val_loss: 1.2107 - val_accuracy: 0.5234
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0411 - accuracy: 0.5707 - val_loss: 1.2343 - val_accuracy: 0.5187
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0334 - accuracy: 0.5887 - val_loss: 1.2201 - val_accuracy: 0.5187
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9806 - accuracy: 0.5707 - val_loss: 1.1803 - val_accuracy: 0.5234
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9350 - accuracy: 0.5707 - val_loss: 1.1733 - val_accuracy: 0.5093
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9083 - accuracy: 0.5810 - val_loss: 1.1975 - val_accuracy: 0.5140
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9461 - accuracy: 0.5424 - val_loss: 1.1494 - val_accuracy: 0.5000
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8639 - accuracy: 0.5630 - val_loss: 1.1053 - val_accuracy: 0.5000
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8668 - accuracy: 0.5424 - val_loss: 1.0995 - val_accuracy: 0.5047
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8598 - accuracy: 0.5578 - val_loss: 1.1200 - val_accuracy: 0.5140
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8100 - accuracy: 0.5578 - val_loss: 1.1375 - val_accuracy: 0.5234
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8218 - accuracy: 0.5553 - val_loss: 1.1197 - val_accuracy: 0.5234

```
accuracy: 0.5234
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8250 - accuracy: 0.5553 - val_loss: 1.0993 - val_accuracy: 0.5280
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7649 - accuracy: 0.5090 - val_loss: 1.0897 - val_accuracy: 0.5280
Epoch 64/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8258 - accuracy: 0.5656 - val_loss: 1.0564 - val_accuracy: 0.5327
Epoch 65/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8229 - accuracy: 0.5296 - val_loss: 1.0989 - val_accuracy: 0.5140
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7718 - accuracy: 0.5373 - val_loss: 1.0808 - val_accuracy: 0.4953
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7726 - accuracy: 0.5527 - val_loss: 1.0851 - val_accuracy: 0.5093
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7108 - accuracy: 0.5424 - val_loss: 1.0092 - val_accuracy: 0.5047
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7817 - accuracy: 0.5373 - val_loss: 0.9979 - val_accuracy: 0.5093
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6982 - accuracy: 0.5476 - val_loss: 0.9626 - val_accuracy: 0.4953
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6950 - accuracy: 0.5321 - val_loss: 0.9751 - val_accuracy: 0.5093
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6548 - accuracy: 0.5244 - val_loss: 0.9540 - val_accuracy: 0.4673
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7155 - accuracy: 0.5270 - val_loss: 1.0026 - val_accuracy: 0.4626
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7623 - accuracy: 0.5167 - val_loss: 0.9895 - val_accuracy: 0.4626
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6846 - accuracy: 0.5064 - val_loss: 0.9835 - val_accuracy: 0.4720
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6727 - accuracy: 0.4859 - val_loss: 0.9682 - val_accuracy: 0.4813
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6035 - accuracy: 0.5141 - val_loss: 0.9013 - val_accuracy: 0.4953
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6946 - accuracy: 0.5064 - val_loss: 0.8936 - val_accuracy: 0.4813
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6604 - accuracy: 0.5090 - val_loss: 0.8884 - val_accuracy: 0.4860
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6138 - accuracy: 0.4987 - val_loss: 0.8810 - val_accuracy: 0.4860
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6099 - accuracy: 0.5064 - val_loss: 0.8685 - val_accuracy: 0.4953
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6174 - accuracy: 0.5141 - val_loss: 0.8624 - val_accuracy: 0.5000
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6273 - accuracy: 0.5090 - val_loss: 0.8549 - val_accuracy: 0.5047
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6326 - accuracy: 0.5116 - val_loss: 0.8548 - val_accuracy: 0.4860
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6006 - accuracy: 0.4833 - val_loss: 0.8468 - val_accuracy: 0.4766
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6136 - accuracy: 0.4756 - val_loss: 0.8386 - val_accuracy: 0.4813
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6147 - accuracy: 0.4936 - val_loss: 0.8116 - val_accuracy: 0.4813
Epoch 88/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6310 - accuracy: 0.5167 - val_loss: 0.8307 - val_accuracy: 0.4860
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6275 - accuracy: 0.5116 - val_loss: 0.8278 - val_accuracy: 0.4766
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5924 - accuracy: 0.4961 - val_loss: 0.8284 - val_accuracy: 0.4720
Epoch 91/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.5760 - accuracy: 0.4961 - val_loss: 0.8194 - val_accuracy: 0.4673
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5963 - accuracy: 0.5193 - val_loss: 0.8104 - val_accuracy: 0.4720
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5615 - accuracy: 0.5039 - val_loss: 0.8141 - val_accuracy: 0.4626
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6713 - accuracy: 0.4987 - val_loss: 0.8571 - val_accuracy: 0.4766
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5854 - accuracy: 0.5116 - val_loss: 0.8152 - val_accuracy: 0.4766
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6260 - accuracy: 0.4910 - val_loss: 0.8069 - val_accuracy: 0.4766
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5421 - accuracy: 0.4910 - val_loss: 0.7950 - val_accuracy: 0.4486
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5550 - accuracy: 0.5013 - val_loss: 0.7959 - val_accuracy: 0.4673
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5511 - accuracy: 0.4730 - val_loss: 0.7893 - val_accuracy: 0.4673
Epoch 100/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5094 - accuracy: 0.4859 - val_loss: 0.7852 - val_accuracy: 0.4720
Epoch 101/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5081 - accuracy: 0.5141 - val_loss: 0.7777 - val_accuracy: 0.4720
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5220 - accuracy: 0.4936 - val_loss: 0.7670 - val_accuracy: 0.4346
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5271 - accuracy: 0.4936 - val_loss: 0.7637 - val_accuracy: 0.4299
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5275 - accuracy: 0.4961 - val_loss: 0.7645 - val_accuracy: 0.4439
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4844 - accuracy: 0.5090 - val_loss: 0.7655 - val_accuracy: 0.4579
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4824 - accuracy: 0.4936 - val_loss: 0.7591 - val_accuracy: 0.4626
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4816 - accuracy: 0.4859 - val_loss: 0.7554 - val_accuracy: 0.4533
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5407 - accuracy: 0.4987 - val_loss: 0.7501 - val_accuracy: 0.4673
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4839 - accuracy: 0.5013 - val_loss: 0.6861 - val_accuracy: 0.4766
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5084 - accuracy: 0.4679 - val_loss: 0.6445 - val_accuracy: 0.4720
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5065 - accuracy: 0.4730 - val_loss: 0.6390 - val_accuracy: 0.4720
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4998 - accuracy: 0.4987 - val_loss: 0.6344 - val_accuracy: 0.4766
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5196 - accuracy: 0.4833 - val_loss: 0.6253 - val_accuracy: 0.4673
Epoch 114/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4860 - accuracy: 0.5013 - val_loss: 0.6243 - val_accuracy: 0.4673
Epoch 115/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5316 - accuracy: 0.4781 - val_loss: 0.6190 - val_accuracy: 0.4720
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4772 - accuracy: 0.4627 - val_loss: 0.6201 - val_accuracy: 0.4626
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4861 - accuracy: 0.4679 - val_loss: 0.6196 - val_accuracy: 0.4579
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5222 - accuracy: 0.4859 - val_loss: 0.6197 - val_accuracy: 0.4626
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4792 - accuracy: 0.5064 - val_loss: 0.6126 - val_accuracy: 0.4626
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4770 - accuracy: 0.4961 - val_loss: 0.5980 - val_accuracy: 0.4533
```

Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4657 - accuracy: 0.5013 - val_loss: 0.5932 - val_accuracy: 0.4579
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4845 - accuracy: 0.5398 - val_loss: 0.5822 - val_accuracy: 0.4533
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5084 - accuracy: 0.5193 - val_loss: 0.5804 - val_accuracy: 0.4720
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4819 - accuracy: 0.5501 - val_loss: 0.5802 - val_accuracy: 0.4673
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5174 - accuracy: 0.5141 - val_loss: 0.5786 - val_accuracy: 0.4579
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4899 - accuracy: 0.5090 - val_loss: 0.5758 - val_accuracy: 0.4393
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5119 - accuracy: 0.4756 - val_loss: 0.5889 - val_accuracy: 0.4206
Epoch 128/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4788 - accuracy: 0.4936 - val_loss: 0.5831 - val_accuracy: 0.4159
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4754 - accuracy: 0.4781 - val_loss: 0.5446 - val_accuracy: 0.4206
Epoch 130/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4838 - accuracy: 0.4859 - val_loss: 0.5219 - val_accuracy: 0.4299
Epoch 131/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4675 - accuracy: 0.4833 - val_loss: 0.5121 - val_accuracy: 0.4252
Epoch 132/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4756 - accuracy: 0.4704 - val_loss: 0.5130 - val_accuracy: 0.4206
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4429 - accuracy: 0.4987 - val_loss: 0.5130 - val_accuracy: 0.4159
Epoch 134/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5081 - accuracy: 0.4653 - val_loss: 0.5117 - val_accuracy: 0.4159
Epoch 135/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4436 - accuracy: 0.4910 - val_loss: 0.5155 - val_accuracy: 0.4252
Epoch 136/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4530 - accuracy: 0.4781 - val_loss: 0.5146 - val_accuracy: 0.4206
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4604 - accuracy: 0.4730 - val_loss: 0.5121 - val_accuracy: 0.4252
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4780 - accuracy: 0.4884 - val_loss: 0.5104 - val_accuracy: 0.4299
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5625 - accuracy: 0.4704 - val_loss: 0.5335 - val_accuracy: 0.4299
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5223 - accuracy: 0.4653 - val_loss: 0.5193 - val_accuracy: 0.4065
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4247 - accuracy: 0.4627 - val_loss: 0.5143 - val_accuracy: 0.3972
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4899 - accuracy: 0.4756 - val_loss: 0.5394 - val_accuracy: 0.4252
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4237 - accuracy: 0.5141 - val_loss: 0.5651 - val_accuracy: 0.4299
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4065 - accuracy: 0.4833 - val_loss: 0.5719 - val_accuracy: 0.4252
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4775 - accuracy: 0.4602 - val_loss: 0.5991 - val_accuracy: 0.4439
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4431 - accuracy: 0.4602 - val_loss: 0.5996 - val_accuracy: 0.4393
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5363 - accuracy: 0.4781 - val_loss: 0.6244 - val_accuracy: 0.4533
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4413 - accuracy: 0.4704 - val_loss: 0.6242 - val_accuracy: 0.4346
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4001 - accuracy: 0.4704 - val_loss: 0.5979 - val_accuracy: 0.4393
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4655 - accuracy: 0.4627 - val_loss: 0.5925 - val_accuracy: 0.4533

```

accuracy: 0.4346
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4490 - accuracy: 0.4602 - val_loss: 0.6202 - val_
accuracy: 0.4346
Epoch 152/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4614 - accuracy: 0.4987 - val_loss: 0.5946 - val_
accuracy: 0.4299
Epoch 153/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5052 - accuracy: 0.4704 - val_loss: 0.6144 - val_
accuracy: 0.4393
Epoch 154/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4557 - accuracy: 0.4961 - val_loss: 0.6177 - val_
accuracy: 0.4439
Epoch 155/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4200 - accuracy: 0.4602 - val_loss: 0.6427 - val_
accuracy: 0.4299
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5289 - accuracy: 0.4936 - val_loss: 0.6466 - val_
accuracy: 0.4299
Epoch 157/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4821 - accuracy: 0.5116 - val_loss: 0.6766 - val_
accuracy: 0.4486
Epoch 158/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4550 - accuracy: 0.4499 - val_loss: 0.7174 - val_
accuracy: 0.4626
Epoch 159/1000
1/4 [====>.....] - ETA: 0s - loss: 0.4363 - accuracy: 0.4844Restoring model weights from th
e end of the best epoch: 9.
4/4 [=====] - 0s 14ms/step - loss: 0.4439 - accuracy: 0.4833 - val_loss: 0.7141 - val_
accuracy: 0.4673
Epoch 159: early stopping
2/2 [=====] - 0s 3ms/step - loss: 1.9968 - accuracy: 0.6279
[CV] END .....Dense1=25, Dense2=25; total time= 9.0s
Model: "sequential_28"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_112 (Dense)	(None, 25)	175
batch_normalization_84 (BatchNormalization)	(None, 25)	100
activation_84 (Activation)	(None, 25)	0
dense_113 (Dense)	(None, 25)	650
batch_normalization_85 (BatchNormalization)	(None, 25)	100
activation_85 (Activation)	(None, 25)	0
dense_114 (Dense)	(None, 10)	260
batch_normalization_86 (BatchNormalization)	(None, 10)	40
activation_86 (Activation)	(None, 10)	0
dense_115 (Dense)	(None, 2)	22
<hr/>		

Total params: 1,347
Trainable params: 1,227
Non-trainable params: 120

```

Epoch 1/1000
4/4 [=====] - 1s 55ms/step - loss: 5.2199 - accuracy: 0.5347 - val_loss: 5.0227 - val_
accuracy: 0.6589
Epoch 2/1000
4/4 [=====] - 0s 12ms/step - loss: 3.9943 - accuracy: 0.6170 - val_loss: 4.3125 - val_
accuracy: 0.6589
Epoch 3/1000
4/4 [=====] - 0s 12ms/step - loss: 3.6912 - accuracy: 0.6015 - val_loss: 4.0102 - val_
accuracy: 0.6542
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2299 - accuracy: 0.5913 - val_loss: 3.7405 - val_
accuracy: 0.6308
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3302 - accuracy: 0.6067 - val_loss: 3.5271 - val_
accuracy: 0.6449
Epoch 6/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9249 - accuracy: 0.6067 - val_loss: 3.1092 - val_
accuracy: 0.6308
Epoch 7/1000
4/4 [=====] - 0s 12ms/step - loss: 3.0978 - accuracy: 0.6093 - val_loss: 2.7955 - val_
accuracy: 0.6028
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8863 - accuracy: 0.6093 - val_loss: 2.6274 - val_
accuracy: 0.5888

```

Epoch 9/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9240 - accuracy: 0.5964 - val_loss: 2.3686 - val_accuracy: 0.6075
Epoch 10/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7034 - accuracy: 0.6067 - val_loss: 2.2368 - val_accuracy: 0.6121
Epoch 11/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5147 - accuracy: 0.6093 - val_loss: 2.0681 - val_accuracy: 0.6215
Epoch 12/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5693 - accuracy: 0.6195 - val_loss: 2.0335 - val_accuracy: 0.6168
Epoch 13/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3952 - accuracy: 0.6452 - val_loss: 1.8653 - val_accuracy: 0.6215
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4471 - accuracy: 0.6195 - val_loss: 1.7781 - val_accuracy: 0.6355
Epoch 15/1000
4/4 [=====] - 0s 11ms/step - loss: 2.5417 - accuracy: 0.6067 - val_loss: 1.7373 - val_accuracy: 0.6028
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1485 - accuracy: 0.6195 - val_loss: 1.7160 - val_accuracy: 0.5981
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0699 - accuracy: 0.6067 - val_loss: 1.7244 - val_accuracy: 0.6075
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1007 - accuracy: 0.6324 - val_loss: 1.7394 - val_accuracy: 0.6121
Epoch 19/1000
4/4 [=====] - 0s 11ms/step - loss: 2.1934 - accuracy: 0.6324 - val_loss: 1.7209 - val_accuracy: 0.6121
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9723 - accuracy: 0.6401 - val_loss: 1.6496 - val_accuracy: 0.6168
Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8877 - accuracy: 0.6144 - val_loss: 1.6176 - val_accuracy: 0.6215
Epoch 22/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8693 - accuracy: 0.6452 - val_loss: 1.5591 - val_accuracy: 0.6168
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8659 - accuracy: 0.6350 - val_loss: 1.5342 - val_accuracy: 0.6215
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7744 - accuracy: 0.6452 - val_loss: 1.5035 - val_accuracy: 0.6215
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6952 - accuracy: 0.6478 - val_loss: 1.4581 - val_accuracy: 0.6121
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8793 - accuracy: 0.6427 - val_loss: 1.4350 - val_accuracy: 0.6215
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7287 - accuracy: 0.6555 - val_loss: 1.4155 - val_accuracy: 0.6215
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6618 - accuracy: 0.6324 - val_loss: 1.3467 - val_accuracy: 0.6215
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7365 - accuracy: 0.6427 - val_loss: 1.3266 - val_accuracy: 0.6168
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5824 - accuracy: 0.6530 - val_loss: 1.3180 - val_accuracy: 0.6121
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7261 - accuracy: 0.6350 - val_loss: 1.3518 - val_accuracy: 0.6168
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3960 - accuracy: 0.6632 - val_loss: 1.3047 - val_accuracy: 0.6168
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5055 - accuracy: 0.6581 - val_loss: 1.3022 - val_accuracy: 0.6262
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4593 - accuracy: 0.6632 - val_loss: 1.2667 - val_accuracy: 0.6168
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4967 - accuracy: 0.6607 - val_loss: 1.2398 - val_accuracy: 0.6121
Epoch 36/1000
4/4 [=====] - 0s 11ms/step - loss: 1.4833 - accuracy: 0.6684 - val_loss: 1.2594 - val_accuracy: 0.6262
Epoch 37/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2433 - accuracy: 0.6555 - val_loss: 1.2478 - val_accuracy: 0.6121
Epoch 38/1000
4/4 [=====] - 0s 11ms/step - loss: 1.3479 - accuracy: 0.6530 - val_loss: 1.2301 - val_accuracy: 0.6121

```
accuracy: 0.6168
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3699 - accuracy: 0.6735 - val_loss: 1.2227 - val_accuracy: 0.6262
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4637 - accuracy: 0.6504 - val_loss: 1.2456 - val_accuracy: 0.6355
Epoch 41/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1888 - accuracy: 0.6761 - val_loss: 1.2276 - val_accuracy: 0.6355
Epoch 42/1000
4/4 [=====] - 0s 17ms/step - loss: 1.1536 - accuracy: 0.6889 - val_loss: 1.2016 - val_accuracy: 0.6355
Epoch 43/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1691 - accuracy: 0.6324 - val_loss: 1.1887 - val_accuracy: 0.6262
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2815 - accuracy: 0.6555 - val_loss: 1.1809 - val_accuracy: 0.6308
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3049 - accuracy: 0.6401 - val_loss: 1.1758 - val_accuracy: 0.6262
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3156 - accuracy: 0.6427 - val_loss: 1.1727 - val_accuracy: 0.6308
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1269 - accuracy: 0.6684 - val_loss: 1.1534 - val_accuracy: 0.6121
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2929 - accuracy: 0.6401 - val_loss: 1.1563 - val_accuracy: 0.6215
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4154 - accuracy: 0.6504 - val_loss: 1.1529 - val_accuracy: 0.6215
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1322 - accuracy: 0.6324 - val_loss: 1.1411 - val_accuracy: 0.6075
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1343 - accuracy: 0.6427 - val_loss: 1.1330 - val_accuracy: 0.6168
Epoch 52/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2177 - accuracy: 0.6427 - val_loss: 1.1280 - val_accuracy: 0.6121
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0465 - accuracy: 0.6530 - val_loss: 1.1176 - val_accuracy: 0.6075
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1019 - accuracy: 0.6761 - val_loss: 1.1093 - val_accuracy: 0.6121
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1772 - accuracy: 0.6247 - val_loss: 1.0916 - val_accuracy: 0.6168
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1087 - accuracy: 0.6427 - val_loss: 1.0810 - val_accuracy: 0.6262
Epoch 57/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0294 - accuracy: 0.6401 - val_loss: 1.0947 - val_accuracy: 0.6168
Epoch 58/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1470 - accuracy: 0.6375 - val_loss: 1.0906 - val_accuracy: 0.6168
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0527 - accuracy: 0.6787 - val_loss: 1.0833 - val_accuracy: 0.6168
Epoch 60/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8971 - accuracy: 0.6607 - val_loss: 1.0732 - val_accuracy: 0.6215
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2165 - accuracy: 0.6632 - val_loss: 1.0609 - val_accuracy: 0.6168
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0640 - accuracy: 0.6658 - val_loss: 1.0556 - val_accuracy: 0.6308
Epoch 63/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0292 - accuracy: 0.6632 - val_loss: 1.0439 - val_accuracy: 0.6355
Epoch 64/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0799 - accuracy: 0.6530 - val_loss: 1.0270 - val_accuracy: 0.6355
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9576 - accuracy: 0.6710 - val_loss: 1.0203 - val_accuracy: 0.6355
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0028 - accuracy: 0.6658 - val_loss: 1.0102 - val_accuracy: 0.6355
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8980 - accuracy: 0.6607 - val_loss: 1.0002 - val_accuracy: 0.6308
Epoch 68/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 1.0042 - accuracy: 0.6787 - val_loss: 0.9855 - val_accuracy: 0.6355
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9708 - accuracy: 0.6658 - val_loss: 0.9897 - val_accuracy: 0.6355
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9805 - accuracy: 0.6632 - val_loss: 0.9783 - val_accuracy: 0.6355
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9888 - accuracy: 0.6710 - val_loss: 0.9413 - val_accuracy: 0.6308
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0094 - accuracy: 0.6581 - val_loss: 0.9284 - val_accuracy: 0.6355
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9796 - accuracy: 0.6632 - val_loss: 0.9888 - val_accuracy: 0.6308
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0097 - accuracy: 0.6632 - val_loss: 0.9866 - val_accuracy: 0.6262
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0305 - accuracy: 0.6452 - val_loss: 0.9507 - val_accuracy: 0.6262
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9747 - accuracy: 0.6632 - val_loss: 0.9483 - val_accuracy: 0.6308
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8161 - accuracy: 0.6350 - val_loss: 0.9353 - val_accuracy: 0.6262
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9583 - accuracy: 0.6607 - val_loss: 0.9314 - val_accuracy: 0.6262
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8518 - accuracy: 0.6710 - val_loss: 0.9271 - val_accuracy: 0.6262
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9030 - accuracy: 0.6555 - val_loss: 0.9250 - val_accuracy: 0.6262
Epoch 81/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9960 - accuracy: 0.6658 - val_loss: 0.9163 - val_accuracy: 0.6308
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8223 - accuracy: 0.6735 - val_loss: 0.9228 - val_accuracy: 0.6355
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1716 - accuracy: 0.6530 - val_loss: 0.9169 - val_accuracy: 0.6355
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1043 - accuracy: 0.6710 - val_loss: 0.9168 - val_accuracy: 0.6355
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8605 - accuracy: 0.6684 - val_loss: 0.8776 - val_accuracy: 0.6355
Epoch 86/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1868 - accuracy: 0.6555 - val_loss: 0.8708 - val_accuracy: 0.6402
Epoch 87/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9503 - accuracy: 0.6658 - val_loss: 0.8588 - val_accuracy: 0.6402
Epoch 88/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9790 - accuracy: 0.6581 - val_loss: 0.8553 - val_accuracy: 0.6402
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9632 - accuracy: 0.6427 - val_loss: 0.8466 - val_accuracy: 0.6402
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8539 - accuracy: 0.6787 - val_loss: 0.8434 - val_accuracy: 0.6308
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7979 - accuracy: 0.6607 - val_loss: 0.8504 - val_accuracy: 0.6308
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8374 - accuracy: 0.6787 - val_loss: 0.8421 - val_accuracy: 0.6355
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8240 - accuracy: 0.6504 - val_loss: 0.8318 - val_accuracy: 0.6402
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7706 - accuracy: 0.6632 - val_loss: 0.8290 - val_accuracy: 0.6449
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9151 - accuracy: 0.6247 - val_loss: 0.8281 - val_accuracy: 0.6402
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0241 - accuracy: 0.6452 - val_loss: 0.8211 - val_accuracy: 0.6589
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9723 - accuracy: 0.6761 - val_loss: 0.8333 - val_accuracy: 0.6542
```

Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6897 - accuracy: 0.6555 - val_loss: 0.8310 - val_accuracy: 0.6542
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7922 - accuracy: 0.6504 - val_loss: 0.8139 - val_accuracy: 0.6495
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7385 - accuracy: 0.6632 - val_loss: 0.8074 - val_accuracy: 0.6542
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8352 - accuracy: 0.6581 - val_loss: 0.8029 - val_accuracy: 0.6542
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8633 - accuracy: 0.6658 - val_loss: 0.7995 - val_accuracy: 0.6682
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7916 - accuracy: 0.6504 - val_loss: 0.8221 - val_accuracy: 0.6963
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8850 - accuracy: 0.6427 - val_loss: 0.8420 - val_accuracy: 0.7009
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7834 - accuracy: 0.6864 - val_loss: 0.8035 - val_accuracy: 0.7056
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8655 - accuracy: 0.6864 - val_loss: 0.8030 - val_accuracy: 0.7056
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7900 - accuracy: 0.6761 - val_loss: 0.7751 - val_accuracy: 0.6729
Epoch 108/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7210 - accuracy: 0.6581 - val_loss: 0.7701 - val_accuracy: 0.6682
Epoch 109/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6737 - accuracy: 0.6761 - val_loss: 0.7708 - val_accuracy: 0.6636
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7281 - accuracy: 0.6915 - val_loss: 0.7688 - val_accuracy: 0.6916
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6987 - accuracy: 0.7198 - val_loss: 0.7629 - val_accuracy: 0.6963
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6873 - accuracy: 0.7121 - val_loss: 0.7714 - val_accuracy: 0.6776
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7725 - accuracy: 0.7069 - val_loss: 0.7599 - val_accuracy: 0.6916
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7447 - accuracy: 0.7069 - val_loss: 0.7871 - val_accuracy: 0.6916
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6896 - accuracy: 0.7172 - val_loss: 0.7593 - val_accuracy: 0.6869
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6780 - accuracy: 0.6915 - val_loss: 0.7851 - val_accuracy: 0.6869
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7026 - accuracy: 0.6889 - val_loss: 0.7803 - val_accuracy: 0.6776
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7184 - accuracy: 0.6812 - val_loss: 0.7656 - val_accuracy: 0.7009
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6196 - accuracy: 0.7095 - val_loss: 0.7615 - val_accuracy: 0.6963
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7035 - accuracy: 0.7095 - val_loss: 0.7605 - val_accuracy: 0.7009
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8077 - accuracy: 0.6838 - val_loss: 0.8310 - val_accuracy: 0.7103
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7509 - accuracy: 0.6967 - val_loss: 0.8482 - val_accuracy: 0.7103
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7199 - accuracy: 0.7172 - val_loss: 0.7666 - val_accuracy: 0.7150
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6932 - accuracy: 0.7044 - val_loss: 0.8120 - val_accuracy: 0.7196
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6116 - accuracy: 0.7147 - val_loss: 0.7575 - val_accuracy: 0.7243
Epoch 126/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6995 - accuracy: 0.7172 - val_loss: 0.7619 - val_accuracy: 0.7243
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8322 - accuracy: 0.6992 - val_loss: 0.7874 - val_accuracy: 0.7243

```
accuracy: 0.7290
Epoch 128/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6802 - accuracy: 0.7249 - val_loss: 0.7558 - val_accuracy: 0.7336
Epoch 129/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5798 - accuracy: 0.7429 - val_loss: 0.7692 - val_accuracy: 0.7290
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5840 - accuracy: 0.7224 - val_loss: 0.8134 - val_accuracy: 0.7243
Epoch 131/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6699 - accuracy: 0.7069 - val_loss: 0.8088 - val_accuracy: 0.7290
Epoch 132/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5996 - accuracy: 0.7172 - val_loss: 0.8081 - val_accuracy: 0.7336
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5459 - accuracy: 0.7147 - val_loss: 0.8430 - val_accuracy: 0.7056
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4883 - accuracy: 0.7249 - val_loss: 0.8381 - val_accuracy: 0.7103
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4922 - accuracy: 0.7172 - val_loss: 0.8463 - val_accuracy: 0.7150
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5274 - accuracy: 0.6889 - val_loss: 0.8621 - val_accuracy: 0.7150
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5958 - accuracy: 0.7121 - val_loss: 0.8560 - val_accuracy: 0.7290
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5626 - accuracy: 0.7069 - val_loss: 0.8260 - val_accuracy: 0.7243
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5771 - accuracy: 0.7301 - val_loss: 0.8329 - val_accuracy: 0.7243
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5021 - accuracy: 0.7198 - val_loss: 0.8313 - val_accuracy: 0.7150
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5794 - accuracy: 0.7198 - val_loss: 0.8352 - val_accuracy: 0.7196
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5684 - accuracy: 0.7378 - val_loss: 0.8319 - val_accuracy: 0.7290
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5613 - accuracy: 0.7147 - val_loss: 0.8315 - val_accuracy: 0.7103
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6510 - accuracy: 0.7147 - val_loss: 0.8295 - val_accuracy: 0.7103
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4980 - accuracy: 0.7018 - val_loss: 0.8321 - val_accuracy: 0.7290
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6654 - accuracy: 0.7147 - val_loss: 0.8922 - val_accuracy: 0.7243
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5247 - accuracy: 0.7352 - val_loss: 0.8694 - val_accuracy: 0.7196
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5434 - accuracy: 0.7506 - val_loss: 0.8793 - val_accuracy: 0.6402
Epoch 149/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5748 - accuracy: 0.7378 - val_loss: 0.8933 - val_accuracy: 0.7056
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4783 - accuracy: 0.7275 - val_loss: 0.9023 - val_accuracy: 0.6495
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5270 - accuracy: 0.7198 - val_loss: 0.9318 - val_accuracy: 0.6449
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5409 - accuracy: 0.6684 - val_loss: 0.9282 - val_accuracy: 0.6355
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5521 - accuracy: 0.6992 - val_loss: 0.8677 - val_accuracy: 0.6308
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6880 - accuracy: 0.6735 - val_loss: 0.8814 - val_accuracy: 0.6215
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4911 - accuracy: 0.6401 - val_loss: 0.9262 - val_accuracy: 0.6028
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4889 - accuracy: 0.6555 - val_loss: 0.9203 - val_accuracy: 0.6028
Epoch 157/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.4497 - accuracy: 0.6504 - val_loss: 0.8908 - val_accuracy: 0.5935
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5658 - accuracy: 0.6401 - val_loss: 0.9030 - val_accuracy: 0.6355
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5496 - accuracy: 0.6530 - val_loss: 0.8792 - val_accuracy: 0.6636
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4983 - accuracy: 0.6761 - val_loss: 0.8727 - val_accuracy: 0.6636
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5367 - accuracy: 0.6658 - val_loss: 0.8495 - val_accuracy: 0.6636
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4264 - accuracy: 0.6787 - val_loss: 0.8923 - val_accuracy: 0.6589
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5646 - accuracy: 0.6889 - val_loss: 0.8636 - val_accuracy: 0.6449
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4898 - accuracy: 0.7044 - val_loss: 0.8385 - val_accuracy: 0.6215
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5238 - accuracy: 0.7095 - val_loss: 0.8205 - val_accuracy: 0.6215
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5529 - accuracy: 0.6375 - val_loss: 0.8673 - val_accuracy: 0.6168
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4481 - accuracy: 0.6658 - val_loss: 0.8686 - val_accuracy: 0.5935
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4760 - accuracy: 0.6632 - val_loss: 0.8388 - val_accuracy: 0.5841
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5466 - accuracy: 0.6247 - val_loss: 0.8626 - val_accuracy: 0.6121
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5349 - accuracy: 0.6298 - val_loss: 0.8554 - val_accuracy: 0.6262
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4442 - accuracy: 0.6812 - val_loss: 0.8563 - val_accuracy: 0.6215
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4939 - accuracy: 0.6710 - val_loss: 0.8520 - val_accuracy: 0.6121
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4862 - accuracy: 0.6915 - val_loss: 0.8509 - val_accuracy: 0.6262
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5064 - accuracy: 0.6530 - val_loss: 0.8494 - val_accuracy: 0.6215
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4875 - accuracy: 0.6324 - val_loss: 0.8021 - val_accuracy: 0.6355
Epoch 176/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4711 - accuracy: 0.6607 - val_loss: 0.7745 - val_accuracy: 0.6355
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5087 - accuracy: 0.6812 - val_loss: 0.7998 - val_accuracy: 0.6355
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6060 - accuracy: 0.6658 - val_loss: 0.7773 - val_accuracy: 0.6402
Epoch 179/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4359 - accuracy: 0.6581 - val_loss: 0.7720 - val_accuracy: 0.6215
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5119 - accuracy: 0.6504 - val_loss: 0.7483 - val_accuracy: 0.6262
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4851 - accuracy: 0.6350 - val_loss: 0.7831 - val_accuracy: 0.5654
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4452 - accuracy: 0.6170 - val_loss: 0.7781 - val_accuracy: 0.5561
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4615 - accuracy: 0.6041 - val_loss: 0.7796 - val_accuracy: 0.5467
Epoch 184/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5355 - accuracy: 0.6170 - val_loss: 0.7825 - val_accuracy: 0.5421
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3978 - accuracy: 0.5938 - val_loss: 0.7800 - val_accuracy: 0.5561
Epoch 186/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4631 - accuracy: 0.6093 - val_loss: 0.7805 - val_accuracy: 0.5467
```

Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4665 - accuracy: 0.6015 - val_loss: 0.7753 - val_accuracy: 0.4860
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4874 - accuracy: 0.5913 - val_loss: 0.7769 - val_accuracy: 0.5187
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4196 - accuracy: 0.5938 - val_loss: 0.7889 - val_accuracy: 0.4720
Epoch 190/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4187 - accuracy: 0.5630 - val_loss: 0.7847 - val_accuracy: 0.4813
Epoch 191/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4251 - accuracy: 0.5681 - val_loss: 0.7830 - val_accuracy: 0.4720
Epoch 192/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4362 - accuracy: 0.5630 - val_loss: 0.7830 - val_accuracy: 0.4813
Epoch 193/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4796 - accuracy: 0.5630 - val_loss: 0.7391 - val_accuracy: 0.4860
Epoch 194/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6660 - accuracy: 0.5296 - val_loss: 0.7918 - val_accuracy: 0.4813
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5451 - accuracy: 0.5630 - val_loss: 0.7976 - val_accuracy: 0.4626
Epoch 196/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5266 - accuracy: 0.5321 - val_loss: 0.7426 - val_accuracy: 0.4720
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4591 - accuracy: 0.5347 - val_loss: 0.7340 - val_accuracy: 0.4579
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4181 - accuracy: 0.5553 - val_loss: 0.7987 - val_accuracy: 0.4533
Epoch 199/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4537 - accuracy: 0.5656 - val_loss: 0.7920 - val_accuracy: 0.4579
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5856 - accuracy: 0.5578 - val_loss: 0.7909 - val_accuracy: 0.4439
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4889 - accuracy: 0.5424 - val_loss: 0.8493 - val_accuracy: 0.4533
Epoch 202/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5086 - accuracy: 0.5527 - val_loss: 0.8745 - val_accuracy: 0.4533
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5567 - accuracy: 0.5141 - val_loss: 0.8821 - val_accuracy: 0.4579
Epoch 204/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4224 - accuracy: 0.5167 - val_loss: 0.8552 - val_accuracy: 0.4393
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4668 - accuracy: 0.5373 - val_loss: 0.8462 - val_accuracy: 0.4159
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4545 - accuracy: 0.5013 - val_loss: 0.8429 - val_accuracy: 0.4346
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3725 - accuracy: 0.5398 - val_loss: 0.8387 - val_accuracy: 0.4299
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5622 - accuracy: 0.5296 - val_loss: 0.8320 - val_accuracy: 0.4439
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4192 - accuracy: 0.5296 - val_loss: 0.7784 - val_accuracy: 0.4439
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4165 - accuracy: 0.5347 - val_loss: 0.8425 - val_accuracy: 0.4112
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4865 - accuracy: 0.5090 - val_loss: 0.8203 - val_accuracy: 0.4112
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3639 - accuracy: 0.5167 - val_loss: 0.8170 - val_accuracy: 0.4065
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5375 - accuracy: 0.5039 - val_loss: 0.8094 - val_accuracy: 0.4112
Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3931 - accuracy: 0.5090 - val_loss: 0.8086 - val_accuracy: 0.4112
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4117 - accuracy: 0.5219 - val_loss: 0.8322 - val_accuracy: 0.4065
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4164 - accuracy: 0.5141 - val_loss: 0.8094 - val_accuracy: 0.4112

```
accuracy: 0.4019
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4490 - accuracy: 0.5090 - val_loss: 0.7904 - val_
accuracy: 0.4112
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3924 - accuracy: 0.5013 - val_loss: 0.7937 - val_
accuracy: 0.4159
Epoch 219/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3962 - accuracy: 0.4781 - val_loss: 0.8045 - val_
accuracy: 0.4019
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4362 - accuracy: 0.5116 - val_loss: 0.7689 - val_
accuracy: 0.4019
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4839 - accuracy: 0.5167 - val_loss: 0.7301 - val_
accuracy: 0.4019
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3738 - accuracy: 0.4936 - val_loss: 0.7251 - val_
accuracy: 0.4206
Epoch 223/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3527 - accuracy: 0.5064 - val_loss: 0.7173 - val_
accuracy: 0.4159
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4116 - accuracy: 0.4987 - val_loss: 0.7116 - val_
accuracy: 0.4346
Epoch 225/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5421 - accuracy: 0.5167 - val_loss: 0.7073 - val_
accuracy: 0.4393
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3707 - accuracy: 0.5193 - val_loss: 0.7299 - val_
accuracy: 0.4486
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4087 - accuracy: 0.5296 - val_loss: 0.7291 - val_
accuracy: 0.4346
Epoch 228/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3896 - accuracy: 0.5116 - val_loss: 0.7584 - val_
accuracy: 0.4299
Epoch 229/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3788 - accuracy: 0.5296 - val_loss: 0.7253 - val_
accuracy: 0.4393
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4815 - accuracy: 0.5090 - val_loss: 0.7578 - val_
accuracy: 0.4299
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5023 - accuracy: 0.4987 - val_loss: 0.7755 - val_
accuracy: 0.4393
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3767 - accuracy: 0.5321 - val_loss: 0.7703 - val_
accuracy: 0.4393
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4108 - accuracy: 0.5244 - val_loss: 0.7372 - val_
accuracy: 0.4393
Epoch 234/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4021 - accuracy: 0.5321 - val_loss: 0.7382 - val_
accuracy: 0.4439
Epoch 235/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4226 - accuracy: 0.5244 - val_loss: 0.7726 - val_
accuracy: 0.4439
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4403 - accuracy: 0.5219 - val_loss: 0.7465 - val_
accuracy: 0.4533
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3867 - accuracy: 0.5296 - val_loss: 0.7723 - val_
accuracy: 0.4486
Epoch 238/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4222 - accuracy: 0.5296 - val_loss: 0.7708 - val_
accuracy: 0.4439
Epoch 239/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4930 - accuracy: 0.5296 - val_loss: 0.7623 - val_
accuracy: 0.4579
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4141 - accuracy: 0.5270 - val_loss: 0.7598 - val_
accuracy: 0.4486
Epoch 241/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3640 - accuracy: 0.5167 - val_loss: 0.7672 - val_
accuracy: 0.4486
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4324 - accuracy: 0.5476 - val_loss: 0.7642 - val_
accuracy: 0.4626
Epoch 243/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3856 - accuracy: 0.5347 - val_loss: 0.7634 - val_
accuracy: 0.4579
Epoch 244/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4219 - accuracy: 0.5398 - val_loss: 0.7545 - val_
accuracy: 0.4393
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3874 - accuracy: 0.5039 - val_loss: 0.8374 - val_
accuracy: 0.4626
Epoch 246/1000
```

```
4/4 [=====] - 0s 11ms/step - loss: 0.3832 - accuracy: 0.5398 - val_loss: 0.8904 - val_accuracy: 0.4579
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4060 - accuracy: 0.5219 - val_loss: 0.8922 - val_accuracy: 0.4626
Epoch 248/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4758 - accuracy: 0.5321 - val_loss: 0.9017 - val_accuracy: 0.4579
Epoch 249/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3493 - accuracy: 0.5373 - val_loss: 0.8967 - val_accuracy: 0.4626
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3471 - accuracy: 0.5527 - val_loss: 0.8921 - val_accuracy: 0.4579
Epoch 251/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3559 - accuracy: 0.5553 - val_loss: 0.8653 - val_accuracy: 0.4486
Epoch 252/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4673 - accuracy: 0.5141 - val_loss: 0.8805 - val_accuracy: 0.4486
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3589 - accuracy: 0.5398 - val_loss: 0.8576 - val_accuracy: 0.4579
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4572 - accuracy: 0.5527 - val_loss: 0.8274 - val_accuracy: 0.4533
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3339 - accuracy: 0.5373 - val_loss: 0.8303 - val_accuracy: 0.4486
Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4615 - accuracy: 0.5373 - val_loss: 0.9532 - val_accuracy: 0.4439
Epoch 257/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4092 - accuracy: 0.5450 - val_loss: 1.1092 - val_accuracy: 0.4206
Epoch 258/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4993 - accuracy: 0.5270 - val_loss: 1.1081 - val_accuracy: 0.4346
Epoch 259/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4530 - accuracy: 0.5501 - val_loss: 1.0392 - val_accuracy: 0.4439
Epoch 260/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3931 - accuracy: 0.5270 - val_loss: 0.9105 - val_accuracy: 0.4626
Epoch 261/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4171 - accuracy: 0.5553 - val_loss: 0.8943 - val_accuracy: 0.4626
Epoch 262/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4013 - accuracy: 0.5450 - val_loss: 0.8882 - val_accuracy: 0.4673
Epoch 263/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4044 - accuracy: 0.5681 - val_loss: 0.8903 - val_accuracy: 0.4626
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5649 - accuracy: 0.5707 - val_loss: 0.8899 - val_accuracy: 0.4673
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3788 - accuracy: 0.5630 - val_loss: 0.8796 - val_accuracy: 0.4533
Epoch 266/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4220 - accuracy: 0.5578 - val_loss: 0.8842 - val_accuracy: 0.4860
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3755 - accuracy: 0.5578 - val_loss: 0.9420 - val_accuracy: 0.4673
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3928 - accuracy: 0.5707 - val_loss: 0.8819 - val_accuracy: 0.4720
Epoch 269/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4346 - accuracy: 0.5578 - val_loss: 0.8879 - val_accuracy: 0.4533
Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3576 - accuracy: 0.5630 - val_loss: 0.8887 - val_accuracy: 0.4533
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4632 - accuracy: 0.5630 - val_loss: 0.8919 - val_accuracy: 0.4579
Epoch 272/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3283 - accuracy: 0.5553 - val_loss: 0.8989 - val_accuracy: 0.4673
Epoch 273/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3934 - accuracy: 0.5887 - val_loss: 0.9011 - val_accuracy: 0.4626
Epoch 274/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3907 - accuracy: 0.5681 - val_loss: 0.8937 - val_accuracy: 0.4486
Epoch 275/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4446 - accuracy: 0.5604 - val_loss: 0.8982 - val_accuracy: 0.4486
```

```

Epoch 276/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3450 - accuracy: 0.5784 - val_loss: 0.8906 - val_accuracy: 0.4813
Epoch 277/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3421 - accuracy: 0.5578 - val_loss: 0.8920 - val_accuracy: 0.4766
Epoch 278/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3140 - accuracy: 0.5938Restoring model weights from th
e end of the best epoch: 128.
4/4 [=====] - 0s 16ms/step - loss: 0.3714 - accuracy: 0.5887 - val_loss: 0.8853 - val_accuracy: 0.4766
Epoch 278: early stopping
2/2 [=====] - 0s 5ms/step - loss: 0.8107 - accuracy: 0.7442
[CV] END .....Dense1=25, Dense2=25; total time= 13.8s
Model: "sequential_29"

```

Layer (type)	Output Shape	Param #
dense_116 (Dense)	(None, 25)	175
batch_normalization_87 (Batch Normalization)	(None, 25)	100
activation_87 (Activation)	(None, 25)	0
dense_117 (Dense)	(None, 50)	1300
batch_normalization_88 (Batch Normalization)	(None, 50)	200
activation_88 (Activation)	(None, 50)	0
dense_118 (Dense)	(None, 10)	510
batch_normalization_89 (Batch Normalization)	(None, 10)	40
activation_89 (Activation)	(None, 10)	0
dense_119 (Dense)	(None, 2)	22

```

Total params: 2,347
Trainable params: 2,177
Non-trainable params: 170

```

```

Epoch 1/1000
4/4 [=====] - 1s 58ms/step - loss: 5.8265 - accuracy: 0.5129 - val_loss: 4.2769 - val_accuracy: 0.4579
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 4.8792 - accuracy: 0.4820 - val_loss: 3.9254 - val_accuracy: 0.4393
Epoch 3/1000
4/4 [=====] - 0s 12ms/step - loss: 4.7770 - accuracy: 0.4613 - val_loss: 3.7489 - val_accuracy: 0.4206
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 4.5953 - accuracy: 0.4639 - val_loss: 3.2445 - val_accuracy: 0.4252
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 4.5292 - accuracy: 0.4588 - val_loss: 2.7626 - val_accuracy: 0.4673
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 4.4332 - accuracy: 0.4639 - val_loss: 2.6313 - val_accuracy: 0.4953
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 4.0333 - accuracy: 0.5180 - val_loss: 2.3464 - val_accuracy: 0.5654
Epoch 8/1000
4/4 [=====] - 0s 18ms/step - loss: 3.8591 - accuracy: 0.5438 - val_loss: 2.2828 - val_accuracy: 0.5467
Epoch 9/1000
4/4 [=====] - 0s 15ms/step - loss: 3.7621 - accuracy: 0.5541 - val_loss: 2.1254 - val_accuracy: 0.5701
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 3.6020 - accuracy: 0.5593 - val_loss: 2.0478 - val_accuracy: 0.5981
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 3.6206 - accuracy: 0.5799 - val_loss: 2.0521 - val_accuracy: 0.5888
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4155 - accuracy: 0.5567 - val_loss: 2.0871 - val_accuracy: 0.5981
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2316 - accuracy: 0.5567 - val_loss: 2.0664 - val_accuracy: 0.5841
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3234 - accuracy: 0.5876 - val_loss: 2.0441 - val_accuracy: 0.5701
Epoch 15/1000

```

```
4/4 [=====] - 0s 13ms/step - loss: 3.1533 - accuracy: 0.5747 - val_loss: 1.9570 - val_accuracy: 0.5701
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 2.9021 - accuracy: 0.6082 - val_loss: 1.8520 - val_accuracy: 0.5514
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8573 - accuracy: 0.5876 - val_loss: 1.7730 - val_accuracy: 0.5607
Epoch 18/1000
4/4 [=====] - 0s 15ms/step - loss: 2.6707 - accuracy: 0.5773 - val_loss: 1.7515 - val_accuracy: 0.5514
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5762 - accuracy: 0.5876 - val_loss: 1.6958 - val_accuracy: 0.5514
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5388 - accuracy: 0.5876 - val_loss: 1.6736 - val_accuracy: 0.5467
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4808 - accuracy: 0.5979 - val_loss: 1.6820 - val_accuracy: 0.5748
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3594 - accuracy: 0.5799 - val_loss: 1.6258 - val_accuracy: 0.5794
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2552 - accuracy: 0.5902 - val_loss: 1.6301 - val_accuracy: 0.5701
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2148 - accuracy: 0.6108 - val_loss: 1.6380 - val_accuracy: 0.5607
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2477 - accuracy: 0.5722 - val_loss: 1.6519 - val_accuracy: 0.5607
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2411 - accuracy: 0.5876 - val_loss: 1.6443 - val_accuracy: 0.5607
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0223 - accuracy: 0.5954 - val_loss: 1.7055 - val_accuracy: 0.5654
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0251 - accuracy: 0.6005 - val_loss: 1.6750 - val_accuracy: 0.5654
Epoch 29/1000
4/4 [=====] - 0s 11ms/step - loss: 2.0396 - accuracy: 0.5928 - val_loss: 1.6698 - val_accuracy: 0.5654
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0547 - accuracy: 0.5696 - val_loss: 1.6955 - val_accuracy: 0.5654
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0467 - accuracy: 0.5747 - val_loss: 1.7683 - val_accuracy: 0.5654
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8266 - accuracy: 0.5799 - val_loss: 1.5552 - val_accuracy: 0.5654
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7829 - accuracy: 0.5696 - val_loss: 1.5381 - val_accuracy: 0.5654
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8334 - accuracy: 0.5825 - val_loss: 1.5243 - val_accuracy: 0.5654
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7990 - accuracy: 0.5593 - val_loss: 1.5206 - val_accuracy: 0.5654
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7055 - accuracy: 0.5825 - val_loss: 1.4962 - val_accuracy: 0.5701
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6557 - accuracy: 0.5490 - val_loss: 1.5013 - val_accuracy: 0.5701
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5757 - accuracy: 0.5851 - val_loss: 1.5501 - val_accuracy: 0.5701
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6044 - accuracy: 0.5619 - val_loss: 1.5886 - val_accuracy: 0.5701
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6793 - accuracy: 0.5541 - val_loss: 1.5852 - val_accuracy: 0.5748
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6013 - accuracy: 0.5670 - val_loss: 1.5536 - val_accuracy: 0.5701
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5434 - accuracy: 0.5747 - val_loss: 1.5752 - val_accuracy: 0.5701
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5473 - accuracy: 0.5670 - val_loss: 1.5703 - val_accuracy: 0.5701
Epoch 44/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4916 - accuracy: 0.5361 - val_loss: 1.5607 - val_accuracy: 0.5654
```

Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4335 - accuracy: 0.5619 - val_loss: 1.5604 - val_accuracy: 0.5654
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4453 - accuracy: 0.5335 - val_loss: 1.6421 - val_accuracy: 0.5701
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3846 - accuracy: 0.5258 - val_loss: 1.5957 - val_accuracy: 0.5748
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4249 - accuracy: 0.5206 - val_loss: 1.5645 - val_accuracy: 0.5748
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3698 - accuracy: 0.5309 - val_loss: 1.6265 - val_accuracy: 0.5701
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3573 - accuracy: 0.5567 - val_loss: 1.6629 - val_accuracy: 0.5701
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3973 - accuracy: 0.5232 - val_loss: 1.6694 - val_accuracy: 0.5701
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3781 - accuracy: 0.4871 - val_loss: 1.6515 - val_accuracy: 0.5701
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3467 - accuracy: 0.5129 - val_loss: 1.6610 - val_accuracy: 0.5654
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2090 - accuracy: 0.4871 - val_loss: 1.6286 - val_accuracy: 0.5607
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1494 - accuracy: 0.4923 - val_loss: 1.5309 - val_accuracy: 0.5561
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2521 - accuracy: 0.5103 - val_loss: 1.4095 - val_accuracy: 0.5467
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1055 - accuracy: 0.5180 - val_loss: 1.4400 - val_accuracy: 0.5514
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1850 - accuracy: 0.5180 - val_loss: 1.4510 - val_accuracy: 0.5514
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1376 - accuracy: 0.4923 - val_loss: 1.4531 - val_accuracy: 0.5561
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0519 - accuracy: 0.5180 - val_loss: 1.4137 - val_accuracy: 0.5467
Epoch 61/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0133 - accuracy: 0.5412 - val_loss: 1.4155 - val_accuracy: 0.5467
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0813 - accuracy: 0.5361 - val_loss: 1.3739 - val_accuracy: 0.5374
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0318 - accuracy: 0.4948 - val_loss: 1.3913 - val_accuracy: 0.5561
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0188 - accuracy: 0.4613 - val_loss: 1.3947 - val_accuracy: 0.5514
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9742 - accuracy: 0.5026 - val_loss: 1.3793 - val_accuracy: 0.5561
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0406 - accuracy: 0.4820 - val_loss: 1.3354 - val_accuracy: 0.5421
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0325 - accuracy: 0.5026 - val_loss: 1.2363 - val_accuracy: 0.5234
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0554 - accuracy: 0.4820 - val_loss: 1.1842 - val_accuracy: 0.5187
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8250 - accuracy: 0.4897 - val_loss: 1.1582 - val_accuracy: 0.5093
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9695 - accuracy: 0.4691 - val_loss: 1.1008 - val_accuracy: 0.5047
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9610 - accuracy: 0.4485 - val_loss: 1.0717 - val_accuracy: 0.5047
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9288 - accuracy: 0.4562 - val_loss: 1.0514 - val_accuracy: 0.4907
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9492 - accuracy: 0.4562 - val_loss: 1.0608 - val_accuracy: 0.4813
Epoch 74/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8778 - accuracy: 0.4459 - val_loss: 1.0904 - val_accuracy: 0.4813

```
accuracy: 0.4626
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8878 - accuracy: 0.4485 - val_loss: 1.0248 - val_accuracy: 0.4626
Epoch 76/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9043 - accuracy: 0.4588 - val_loss: 1.0030 - val_accuracy: 0.4673
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8582 - accuracy: 0.4562 - val_loss: 1.0131 - val_accuracy: 0.4299
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8342 - accuracy: 0.4691 - val_loss: 1.0266 - val_accuracy: 0.4252
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9471 - accuracy: 0.4768 - val_loss: 1.0102 - val_accuracy: 0.4112
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9436 - accuracy: 0.4639 - val_loss: 0.9687 - val_accuracy: 0.4065
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8848 - accuracy: 0.4742 - val_loss: 1.0050 - val_accuracy: 0.4206
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9083 - accuracy: 0.4562 - val_loss: 0.9815 - val_accuracy: 0.4112
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8650 - accuracy: 0.4536 - val_loss: 0.9737 - val_accuracy: 0.4206
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8804 - accuracy: 0.4381 - val_loss: 0.9616 - val_accuracy: 0.4252
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8586 - accuracy: 0.4665 - val_loss: 0.9451 - val_accuracy: 0.3972
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8730 - accuracy: 0.4845 - val_loss: 0.8870 - val_accuracy: 0.4065
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8479 - accuracy: 0.4459 - val_loss: 0.8499 - val_accuracy: 0.3645
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7836 - accuracy: 0.4613 - val_loss: 0.8477 - val_accuracy: 0.3458
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9088 - accuracy: 0.4253 - val_loss: 0.8393 - val_accuracy: 0.3318
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8282 - accuracy: 0.4588 - val_loss: 0.8568 - val_accuracy: 0.3037
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7247 - accuracy: 0.4227 - val_loss: 0.7812 - val_accuracy: 0.3037
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7924 - accuracy: 0.4433 - val_loss: 0.7725 - val_accuracy: 0.2991
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7887 - accuracy: 0.4588 - val_loss: 0.7712 - val_accuracy: 0.3131
Epoch 94/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8372 - accuracy: 0.4227 - val_loss: 0.7610 - val_accuracy: 0.3084
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8670 - accuracy: 0.4433 - val_loss: 0.7562 - val_accuracy: 0.3458
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7163 - accuracy: 0.4407 - val_loss: 0.7628 - val_accuracy: 0.3692
Epoch 97/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7557 - accuracy: 0.4253 - val_loss: 0.7516 - val_accuracy: 0.3738
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8074 - accuracy: 0.4510 - val_loss: 0.7884 - val_accuracy: 0.3224
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7263 - accuracy: 0.4407 - val_loss: 0.7253 - val_accuracy: 0.3224
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8515 - accuracy: 0.4459 - val_loss: 0.7549 - val_accuracy: 0.3131
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7329 - accuracy: 0.4149 - val_loss: 0.7970 - val_accuracy: 0.3131
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7429 - accuracy: 0.4459 - val_loss: 0.7833 - val_accuracy: 0.3178
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7453 - accuracy: 0.4407 - val_loss: 0.7385 - val_accuracy: 0.3692
Epoch 104/1000
```

4/4 [=====] - 0s 12ms/step - loss: 0.7498 - accuracy: 0.4613 - val_loss: 0.7556 - val_accuracy: 0.3505
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6865 - accuracy: 0.4381 - val_loss: 0.7531 - val_accuracy: 0.3037
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6562 - accuracy: 0.4098 - val_loss: 0.7250 - val_accuracy: 0.3224
Epoch 107/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7078 - accuracy: 0.4330 - val_loss: 0.7260 - val_accuracy: 0.3364
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7712 - accuracy: 0.4124 - val_loss: 0.6997 - val_accuracy: 0.3832
Epoch 109/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7066 - accuracy: 0.4613 - val_loss: 0.7382 - val_accuracy: 0.3832
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7328 - accuracy: 0.4510 - val_loss: 0.7056 - val_accuracy: 0.3972
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7165 - accuracy: 0.4536 - val_loss: 0.7168 - val_accuracy: 0.3785
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6670 - accuracy: 0.4510 - val_loss: 0.7637 - val_accuracy: 0.4953
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5970 - accuracy: 0.4485 - val_loss: 0.7610 - val_accuracy: 0.4813
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7079 - accuracy: 0.4175 - val_loss: 0.8040 - val_accuracy: 0.4907
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6752 - accuracy: 0.4201 - val_loss: 0.7741 - val_accuracy: 0.4860
Epoch 116/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6759 - accuracy: 0.4201 - val_loss: 0.7625 - val_accuracy: 0.4486
Epoch 117/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5789 - accuracy: 0.4072 - val_loss: 0.7408 - val_accuracy: 0.4533
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6054 - accuracy: 0.4149 - val_loss: 0.7138 - val_accuracy: 0.4393
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5975 - accuracy: 0.4304 - val_loss: 0.6766 - val_accuracy: 0.3972
Epoch 120/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7004 - accuracy: 0.4021 - val_loss: 0.7020 - val_accuracy: 0.4486
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5433 - accuracy: 0.3943 - val_loss: 0.6966 - val_accuracy: 0.4393
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6215 - accuracy: 0.4149 - val_loss: 0.6888 - val_accuracy: 0.4579
Epoch 123/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6488 - accuracy: 0.4046 - val_loss: 0.6912 - val_accuracy: 0.4626
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6153 - accuracy: 0.4485 - val_loss: 0.6524 - val_accuracy: 0.4720
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5328 - accuracy: 0.4407 - val_loss: 0.6400 - val_accuracy: 0.4299
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5143 - accuracy: 0.4201 - val_loss: 0.6636 - val_accuracy: 0.3879
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4857 - accuracy: 0.4124 - val_loss: 0.6668 - val_accuracy: 0.3785
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4644 - accuracy: 0.4201 - val_loss: 0.7299 - val_accuracy: 0.3505
Epoch 129/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4545 - accuracy: 0.4175 - val_loss: 0.7916 - val_accuracy: 0.4065
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4728 - accuracy: 0.4098 - val_loss: 0.7072 - val_accuracy: 0.3925
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5003 - accuracy: 0.4072 - val_loss: 0.7849 - val_accuracy: 0.3925
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5268 - accuracy: 0.4356 - val_loss: 0.7989 - val_accuracy: 0.4019
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5327 - accuracy: 0.4356 - val_loss: 0.8852 - val_accuracy: 0.4112

Epoch 134/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.5170 - accuracy: 0.4175 - val_loss: 0.8274 - val_accuracy: 0.3738
 Epoch 135/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4831 - accuracy: 0.4124 - val_loss: 0.7704 - val_accuracy: 0.3692
 Epoch 136/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4889 - accuracy: 0.4278 - val_loss: 0.7900 - val_accuracy: 0.3925
 Epoch 137/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4299 - accuracy: 0.4278 - val_loss: 0.6961 - val_accuracy: 0.4112
 Epoch 138/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4372 - accuracy: 0.4175 - val_loss: 0.6957 - val_accuracy: 0.3505
 Epoch 139/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.5218 - accuracy: 0.4227 - val_loss: 0.6901 - val_accuracy: 0.3738
 Epoch 140/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4322 - accuracy: 0.3789 - val_loss: 0.6595 - val_accuracy: 0.3551
 Epoch 141/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4269 - accuracy: 0.4124 - val_loss: 0.6766 - val_accuracy: 0.3879
 Epoch 142/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.4696 - accuracy: 0.4046 - val_loss: 0.6907 - val_accuracy: 0.3785
 Epoch 143/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4227 - accuracy: 0.3840 - val_loss: 0.6574 - val_accuracy: 0.4486
 Epoch 144/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.4285 - accuracy: 0.4124 - val_loss: 0.6915 - val_accuracy: 0.4486
 Epoch 145/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4071 - accuracy: 0.4098 - val_loss: 0.7153 - val_accuracy: 0.4626
 Epoch 146/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.4926 - accuracy: 0.4175 - val_loss: 0.7102 - val_accuracy: 0.4673
 Epoch 147/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4601 - accuracy: 0.4124 - val_loss: 0.6832 - val_accuracy: 0.4673
 Epoch 148/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4214 - accuracy: 0.4330 - val_loss: 0.6516 - val_accuracy: 0.4720
 Epoch 149/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4520 - accuracy: 0.4227 - val_loss: 0.6478 - val_accuracy: 0.4533
 Epoch 150/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.5043 - accuracy: 0.4201 - val_loss: 0.6444 - val_accuracy: 0.4299
 Epoch 151/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.4213 - accuracy: 0.4098 - val_loss: 0.6395 - val_accuracy: 0.4252
 Epoch 152/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.5042 - accuracy: 0.3969 - val_loss: 0.6452 - val_accuracy: 0.4065
 Epoch 153/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3933 - accuracy: 0.3840 - val_loss: 0.6290 - val_accuracy: 0.3645
 Epoch 154/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3672 - accuracy: 0.3969 - val_loss: 0.6457 - val_accuracy: 0.3832
 Epoch 155/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3935 - accuracy: 0.4098 - val_loss: 0.6892 - val_accuracy: 0.3879
 Epoch 156/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4437 - accuracy: 0.4330 - val_loss: 0.6767 - val_accuracy: 0.3972
 Epoch 157/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.5139 - accuracy: 0.4021 - val_loss: 0.6622 - val_accuracy: 0.4019
 Epoch 158/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3894 - accuracy: 0.4072 - val_loss: 0.6544 - val_accuracy: 0.4065
 Epoch 159/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4195 - accuracy: 0.4381 - val_loss: 0.7134 - val_accuracy: 0.3738
 Epoch 160/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.3636 - accuracy: 0.4375Restoring model weights from the end of the best epoch: 10.
 4/4 [=====] - 0s 16ms/step - loss: 0.4034 - accuracy: 0.4149 - val_loss: 0.7412 - val_accuracy: 0.3925
 Epoch 160: early stopping
 2/2 [=====] - 0s 4ms/step - loss: 2.0494 - accuracy: 0.5909
 [CV] ENDDense1=25, Dense2=50; total time= 8.5s
 Model: "sequential_30"

Layer (type)	Output Shape	Param #
--------------	--------------	---------

```
=====
dense_120 (Dense)          (None, 25)           175
batch_normalization_90 (BatchNormalization)      100
activation_90 (Activation) (None, 25)           0
dense_121 (Dense)          (None, 50)            1300
batch_normalization_91 (BatchNormalization)      200
activation_91 (Activation) (None, 50)           0
dense_122 (Dense)          (None, 10)            510
batch_normalization_92 (BatchNormalization)      40
activation_92 (Activation) (None, 10)           0
dense_123 (Dense)          (None, 2)             22
=====

Total params: 2,347
Trainable params: 2,177
Non-trainable params: 170

Epoch 1/1000
4/4 [=====] - 1s 56ms/step - loss: 4.4485 - accuracy: 0.5155 - val_loss: 4.9141 - val_accuracy: 0.4299
Epoch 2/1000
4/4 [=====] - 0s 15ms/step - loss: 3.5342 - accuracy: 0.5309 - val_loss: 3.3462 - val_accuracy: 0.4159
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 3.3901 - accuracy: 0.5077 - val_loss: 2.5766 - val_accuracy: 0.4533
Epoch 4/1000
4/4 [=====] - 0s 15ms/step - loss: 3.0846 - accuracy: 0.4871 - val_loss: 2.5255 - val_accuracy: 0.4860
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0382 - accuracy: 0.5077 - val_loss: 2.4753 - val_accuracy: 0.4673
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8022 - accuracy: 0.5129 - val_loss: 2.5009 - val_accuracy: 0.4533
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7641 - accuracy: 0.5000 - val_loss: 2.4683 - val_accuracy: 0.4626
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8244 - accuracy: 0.5129 - val_loss: 2.4213 - val_accuracy: 0.4907
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4922 - accuracy: 0.5077 - val_loss: 2.4258 - val_accuracy: 0.5187
Epoch 10/1000
4/4 [=====] - 0s 15ms/step - loss: 2.5046 - accuracy: 0.5206 - val_loss: 2.3390 - val_accuracy: 0.5280
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5314 - accuracy: 0.4974 - val_loss: 2.3075 - val_accuracy: 0.5374
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4608 - accuracy: 0.5000 - val_loss: 2.2993 - val_accuracy: 0.5467
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4494 - accuracy: 0.5155 - val_loss: 2.2358 - val_accuracy: 0.5701
Epoch 14/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1843 - accuracy: 0.5232 - val_loss: 2.2402 - val_accuracy: 0.5607
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0969 - accuracy: 0.5129 - val_loss: 2.1732 - val_accuracy: 0.5467
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0095 - accuracy: 0.4974 - val_loss: 2.0824 - val_accuracy: 0.5467
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9863 - accuracy: 0.5052 - val_loss: 2.0218 - val_accuracy: 0.5467
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9072 - accuracy: 0.5077 - val_loss: 2.0370 - val_accuracy: 0.5514
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8616 - accuracy: 0.4974 - val_loss: 1.8931 - val_accuracy: 0.5561
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6420 - accuracy: 0.4613 - val_loss: 1.8509 - val_accuracy: 0.5561
```

Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6041 - accuracy: 0.4588 - val_loss: 1.8455 - val_accuracy: 0.5467
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6422 - accuracy: 0.5026 - val_loss: 1.7846 - val_accuracy: 0.5467
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5586 - accuracy: 0.4768 - val_loss: 1.7686 - val_accuracy: 0.5467
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6297 - accuracy: 0.4897 - val_loss: 1.7089 - val_accuracy: 0.5561
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5549 - accuracy: 0.4768 - val_loss: 1.6850 - val_accuracy: 0.5607
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5033 - accuracy: 0.4691 - val_loss: 1.6232 - val_accuracy: 0.5701
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4160 - accuracy: 0.4871 - val_loss: 1.5228 - val_accuracy: 0.5794
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4058 - accuracy: 0.4794 - val_loss: 1.5111 - val_accuracy: 0.5748
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2702 - accuracy: 0.4794 - val_loss: 1.4962 - val_accuracy: 0.5748
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2169 - accuracy: 0.5077 - val_loss: 1.5127 - val_accuracy: 0.5794
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4071 - accuracy: 0.4536 - val_loss: 1.4937 - val_accuracy: 0.5841
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1461 - accuracy: 0.4510 - val_loss: 1.4490 - val_accuracy: 0.5888
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0780 - accuracy: 0.4510 - val_loss: 1.4339 - val_accuracy: 0.5701
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1931 - accuracy: 0.4510 - val_loss: 1.4250 - val_accuracy: 0.5841
Epoch 35/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0708 - accuracy: 0.4613 - val_loss: 1.4116 - val_accuracy: 0.5748
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9940 - accuracy: 0.4485 - val_loss: 1.3745 - val_accuracy: 0.5748
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0387 - accuracy: 0.4381 - val_loss: 1.3567 - val_accuracy: 0.5794
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0173 - accuracy: 0.4485 - val_loss: 1.3559 - val_accuracy: 0.5701
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9057 - accuracy: 0.4175 - val_loss: 1.3306 - val_accuracy: 0.5841
Epoch 40/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9737 - accuracy: 0.4330 - val_loss: 1.3213 - val_accuracy: 0.5841
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0602 - accuracy: 0.4459 - val_loss: 1.3260 - val_accuracy: 0.5841
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9367 - accuracy: 0.4588 - val_loss: 1.3427 - val_accuracy: 0.5841
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8160 - accuracy: 0.4407 - val_loss: 1.3207 - val_accuracy: 0.5748
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7606 - accuracy: 0.4381 - val_loss: 1.3407 - val_accuracy: 0.5841
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7547 - accuracy: 0.4562 - val_loss: 1.3063 - val_accuracy: 0.5935
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7162 - accuracy: 0.4562 - val_loss: 1.2741 - val_accuracy: 0.5888
Epoch 47/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6920 - accuracy: 0.4433 - val_loss: 1.2723 - val_accuracy: 0.5888
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6836 - accuracy: 0.4536 - val_loss: 1.2889 - val_accuracy: 0.5888
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8357 - accuracy: 0.4742 - val_loss: 1.2870 - val_accuracy: 0.5935
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7487 - accuracy: 0.4356 - val_loss: 1.2541 - val_accuracy: 0.5888

accuracy: 0.5935
Epoch 51/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7451 - accuracy: 0.4691 - val_loss: 1.2438 - val_accuracy: 0.5935
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7069 - accuracy: 0.4897 - val_loss: 1.2307 - val_accuracy: 0.6028
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6255 - accuracy: 0.4613 - val_loss: 1.2208 - val_accuracy: 0.6028
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7315 - accuracy: 0.4794 - val_loss: 1.2110 - val_accuracy: 0.6075
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6601 - accuracy: 0.4820 - val_loss: 1.2017 - val_accuracy: 0.6028
Epoch 56/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7181 - accuracy: 0.4639 - val_loss: 1.1893 - val_accuracy: 0.6028
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6808 - accuracy: 0.4407 - val_loss: 1.1786 - val_accuracy: 0.6028
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6319 - accuracy: 0.4742 - val_loss: 1.1680 - val_accuracy: 0.5888
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6546 - accuracy: 0.4407 - val_loss: 1.1640 - val_accuracy: 0.5888
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6677 - accuracy: 0.4381 - val_loss: 1.1586 - val_accuracy: 0.5888
Epoch 61/1000
4/4 [=====] - 0s 17ms/step - loss: 0.6314 - accuracy: 0.4510 - val_loss: 1.1834 - val_accuracy: 0.5841
Epoch 62/1000
4/4 [=====] - 0s 16ms/step - loss: 0.6779 - accuracy: 0.4588 - val_loss: 1.1706 - val_accuracy: 0.5841
Epoch 63/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6698 - accuracy: 0.4536 - val_loss: 1.1645 - val_accuracy: 0.5841
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5889 - accuracy: 0.4613 - val_loss: 1.1490 - val_accuracy: 0.5794
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6335 - accuracy: 0.4562 - val_loss: 1.1428 - val_accuracy: 0.5654
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6504 - accuracy: 0.4510 - val_loss: 1.1306 - val_accuracy: 0.5514
Epoch 67/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6860 - accuracy: 0.4639 - val_loss: 1.1377 - val_accuracy: 0.5467
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6149 - accuracy: 0.4433 - val_loss: 1.0934 - val_accuracy: 0.5234
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6017 - accuracy: 0.4536 - val_loss: 1.0816 - val_accuracy: 0.5140
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7113 - accuracy: 0.4639 - val_loss: 1.0664 - val_accuracy: 0.5140
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4919 - accuracy: 0.4459 - val_loss: 1.0550 - val_accuracy: 0.5140
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6347 - accuracy: 0.4253 - val_loss: 1.0417 - val_accuracy: 0.5140
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6229 - accuracy: 0.4304 - val_loss: 1.0249 - val_accuracy: 0.5093
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6512 - accuracy: 0.4613 - val_loss: 1.0037 - val_accuracy: 0.5000
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5741 - accuracy: 0.4304 - val_loss: 0.9926 - val_accuracy: 0.5000
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5738 - accuracy: 0.4459 - val_loss: 0.9742 - val_accuracy: 0.4907
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5830 - accuracy: 0.4381 - val_loss: 0.9593 - val_accuracy: 0.4720
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5943 - accuracy: 0.4253 - val_loss: 0.9553 - val_accuracy: 0.4673
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5740 - accuracy: 0.4381 - val_loss: 0.9363 - val_accuracy: 0.4486
Epoch 80/1000

```
4/4 [=====] - 0s 12ms/step - loss: 0.6185 - accuracy: 0.4304 - val_loss: 0.9509 - val_accuracy: 0.4393
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5309 - accuracy: 0.4227 - val_loss: 0.8922 - val_accuracy: 0.4299
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5468 - accuracy: 0.4227 - val_loss: 0.8948 - val_accuracy: 0.4252
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5187 - accuracy: 0.4149 - val_loss: 0.9220 - val_accuracy: 0.4206
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5714 - accuracy: 0.4227 - val_loss: 0.9053 - val_accuracy: 0.4019
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5658 - accuracy: 0.4098 - val_loss: 0.9005 - val_accuracy: 0.3879
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4852 - accuracy: 0.4201 - val_loss: 0.8860 - val_accuracy: 0.3879
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5058 - accuracy: 0.4149 - val_loss: 0.8693 - val_accuracy: 0.3832
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4573 - accuracy: 0.4098 - val_loss: 0.8662 - val_accuracy: 0.3692
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4946 - accuracy: 0.4227 - val_loss: 0.9189 - val_accuracy: 0.3738
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6287 - accuracy: 0.4278 - val_loss: 0.8891 - val_accuracy: 0.3598
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4741 - accuracy: 0.4304 - val_loss: 0.8711 - val_accuracy: 0.3598
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5172 - accuracy: 0.4433 - val_loss: 0.9043 - val_accuracy: 0.3692
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5633 - accuracy: 0.4381 - val_loss: 0.9022 - val_accuracy: 0.3692
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5360 - accuracy: 0.4356 - val_loss: 0.8785 - val_accuracy: 0.3692
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4461 - accuracy: 0.4124 - val_loss: 0.8918 - val_accuracy: 0.3785
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5919 - accuracy: 0.4227 - val_loss: 0.8936 - val_accuracy: 0.3925
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5312 - accuracy: 0.4562 - val_loss: 0.9036 - val_accuracy: 0.3879
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4920 - accuracy: 0.4304 - val_loss: 0.9043 - val_accuracy: 0.3832
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4204 - accuracy: 0.4407 - val_loss: 0.8950 - val_accuracy: 0.3832
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5699 - accuracy: 0.4175 - val_loss: 0.8972 - val_accuracy: 0.3785
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4366 - accuracy: 0.4562 - val_loss: 0.9163 - val_accuracy: 0.3785
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4795 - accuracy: 0.4381 - val_loss: 0.9089 - val_accuracy: 0.3785
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5035 - accuracy: 0.4459 - val_loss: 0.9002 - val_accuracy: 0.3692
Epoch 104/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4626 - accuracy: 0.4665 - val_loss: 0.8812 - val_accuracy: 0.3692
Epoch 105/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4578 - accuracy: 0.4562 - val_loss: 0.8643 - val_accuracy: 0.3879
Epoch 106/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4594 - accuracy: 0.4485 - val_loss: 0.8390 - val_accuracy: 0.4065
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4161 - accuracy: 0.4588 - val_loss: 0.8422 - val_accuracy: 0.4112
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4137 - accuracy: 0.4897 - val_loss: 0.8380 - val_accuracy: 0.4159
Epoch 109/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4957 - accuracy: 0.4613 - val_loss: 0.8284 - val_accuracy: 0.4112
```

Epoch 110/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4496 - accuracy: 0.4536 - val_loss: 0.8352 - val_accuracy: 0.3879
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4043 - accuracy: 0.4923 - val_loss: 0.8409 - val_accuracy: 0.3879
Epoch 112/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4345 - accuracy: 0.4665 - val_loss: 0.8258 - val_accuracy: 0.3925
Epoch 113/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4442 - accuracy: 0.4794 - val_loss: 0.8413 - val_accuracy: 0.3972
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4184 - accuracy: 0.5284 - val_loss: 0.8308 - val_accuracy: 0.3925
Epoch 115/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3899 - accuracy: 0.5180 - val_loss: 0.8261 - val_accuracy: 0.3972
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4405 - accuracy: 0.4897 - val_loss: 0.8241 - val_accuracy: 0.4019
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3869 - accuracy: 0.5026 - val_loss: 0.8245 - val_accuracy: 0.4019
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4559 - accuracy: 0.4871 - val_loss: 0.8262 - val_accuracy: 0.3879
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4503 - accuracy: 0.5155 - val_loss: 0.8214 - val_accuracy: 0.3879
Epoch 120/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3720 - accuracy: 0.5077 - val_loss: 0.8208 - val_accuracy: 0.3832
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4524 - accuracy: 0.5052 - val_loss: 0.8196 - val_accuracy: 0.3879
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3964 - accuracy: 0.5000 - val_loss: 0.8402 - val_accuracy: 0.3738
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4623 - accuracy: 0.5129 - val_loss: 0.8375 - val_accuracy: 0.3785
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4390 - accuracy: 0.5180 - val_loss: 0.8398 - val_accuracy: 0.3692
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3937 - accuracy: 0.4820 - val_loss: 0.8387 - val_accuracy: 0.3738
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4343 - accuracy: 0.5052 - val_loss: 0.8608 - val_accuracy: 0.3692
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4776 - accuracy: 0.4562 - val_loss: 0.8548 - val_accuracy: 0.3645
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4341 - accuracy: 0.4613 - val_loss: 0.8560 - val_accuracy: 0.3645
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4811 - accuracy: 0.4691 - val_loss: 0.8616 - val_accuracy: 0.3645
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3506 - accuracy: 0.4845 - val_loss: 0.8302 - val_accuracy: 0.3645
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4873 - accuracy: 0.4871 - val_loss: 0.8126 - val_accuracy: 0.3832
Epoch 132/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3677 - accuracy: 0.4536 - val_loss: 0.8488 - val_accuracy: 0.3879
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4643 - accuracy: 0.4897 - val_loss: 0.8544 - val_accuracy: 0.3925
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4149 - accuracy: 0.4897 - val_loss: 0.8423 - val_accuracy: 0.3832
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4021 - accuracy: 0.4845 - val_loss: 0.8189 - val_accuracy: 0.3879
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3928 - accuracy: 0.5000 - val_loss: 0.7878 - val_accuracy: 0.3692
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3498 - accuracy: 0.5026 - val_loss: 0.8144 - val_accuracy: 0.3785
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4110 - accuracy: 0.5309 - val_loss: 0.8429 - val_accuracy: 0.3738
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3218 - accuracy: 0.5103 - val_loss: 0.8421 - val_accuracy: 0.3879

```
accuracy: 0.3832
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4068 - accuracy: 0.4897 - val_loss: 0.8923 - val_accuracy: 0.3879
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3960 - accuracy: 0.4742 - val_loss: 0.9412 - val_accuracy: 0.3972
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4784 - accuracy: 0.5129 - val_loss: 0.8827 - val_accuracy: 0.3925
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3679 - accuracy: 0.4897 - val_loss: 0.8806 - val_accuracy: 0.4019
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4329 - accuracy: 0.5232 - val_loss: 0.9760 - val_accuracy: 0.3972
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4059 - accuracy: 0.5180 - val_loss: 0.8666 - val_accuracy: 0.4019
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3889 - accuracy: 0.5000 - val_loss: 0.7956 - val_accuracy: 0.3972
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3123 - accuracy: 0.5180 - val_loss: 0.8192 - val_accuracy: 0.3972
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4057 - accuracy: 0.4794 - val_loss: 0.8149 - val_accuracy: 0.4206
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4779 - accuracy: 0.5206 - val_loss: 0.8184 - val_accuracy: 0.4393
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4081 - accuracy: 0.4923 - val_loss: 0.8427 - val_accuracy: 0.4252
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3528 - accuracy: 0.5129 - val_loss: 0.8913 - val_accuracy: 0.4486
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3269 - accuracy: 0.4871 - val_loss: 0.8907 - val_accuracy: 0.4159
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3625 - accuracy: 0.4948 - val_loss: 0.9279 - val_accuracy: 0.3925
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3711 - accuracy: 0.4742 - val_loss: 0.8967 - val_accuracy: 0.3785
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4343 - accuracy: 0.4639 - val_loss: 0.8966 - val_accuracy: 0.3692
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3198 - accuracy: 0.4820 - val_loss: 0.8986 - val_accuracy: 0.3738
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3391 - accuracy: 0.5026 - val_loss: 0.8979 - val_accuracy: 0.3785
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4498 - accuracy: 0.4923 - val_loss: 0.8993 - val_accuracy: 0.4019
Epoch 159/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3786 - accuracy: 0.4768 - val_loss: 0.9040 - val_accuracy: 0.4112
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2971 - accuracy: 0.4742 - val_loss: 0.9590 - val_accuracy: 0.3832
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3487 - accuracy: 0.4871 - val_loss: 0.9944 - val_accuracy: 0.4019
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3905 - accuracy: 0.4948 - val_loss: 0.9877 - val_accuracy: 0.4159
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4318 - accuracy: 0.4897 - val_loss: 1.0498 - val_accuracy: 0.4112
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4225 - accuracy: 0.5077 - val_loss: 1.0287 - val_accuracy: 0.4112
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4543 - accuracy: 0.4794 - val_loss: 1.0791 - val_accuracy: 0.4019
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3165 - accuracy: 0.4974 - val_loss: 1.0504 - val_accuracy: 0.3972
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3611 - accuracy: 0.5155 - val_loss: 1.0269 - val_accuracy: 0.3972
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3096 - accuracy: 0.4948 - val_loss: 1.1035 - val_accuracy: 0.3972
Epoch 169/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.3162 - accuracy: 0.5206 - val_loss: 1.0573 - val_accuracy: 0.4159
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3608 - accuracy: 0.5206 - val_loss: 1.0535 - val_accuracy: 0.4112
Epoch 171/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3522 - accuracy: 0.5180 - val_loss: 1.0806 - val_accuracy: 0.4112
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3876 - accuracy: 0.5000 - val_loss: 1.0800 - val_accuracy: 0.3879
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3811 - accuracy: 0.4897 - val_loss: 0.8861 - val_accuracy: 0.4019
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3543 - accuracy: 0.4742 - val_loss: 0.9146 - val_accuracy: 0.4159
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3450 - accuracy: 0.4948 - val_loss: 0.8825 - val_accuracy: 0.4252
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3367 - accuracy: 0.4768 - val_loss: 0.8840 - val_accuracy: 0.4299
Epoch 177/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3970 - accuracy: 0.4845 - val_loss: 0.8871 - val_accuracy: 0.4299
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3425 - accuracy: 0.5129 - val_loss: 0.9111 - val_accuracy: 0.4346
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3480 - accuracy: 0.4923 - val_loss: 0.8692 - val_accuracy: 0.4299
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4213 - accuracy: 0.5026 - val_loss: 0.8706 - val_accuracy: 0.4206
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3433 - accuracy: 0.4665 - val_loss: 0.8632 - val_accuracy: 0.3925
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3603 - accuracy: 0.5155 - val_loss: 0.8627 - val_accuracy: 0.3972
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3592 - accuracy: 0.4716 - val_loss: 0.8626 - val_accuracy: 0.3972
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3598 - accuracy: 0.4742 - val_loss: 0.8638 - val_accuracy: 0.4159
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3252 - accuracy: 0.4768 - val_loss: 0.9001 - val_accuracy: 0.4252
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3910 - accuracy: 0.4820 - val_loss: 0.8762 - val_accuracy: 0.4112
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4709 - accuracy: 0.4948 - val_loss: 0.9562 - val_accuracy: 0.4393
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3597 - accuracy: 0.4948 - val_loss: 0.9812 - val_accuracy: 0.4393
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3527 - accuracy: 0.4897 - val_loss: 1.0255 - val_accuracy: 0.4439
Epoch 190/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3421 - accuracy: 0.4742 - val_loss: 1.0549 - val_accuracy: 0.4439
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2996 - accuracy: 0.4871 - val_loss: 1.0013 - val_accuracy: 0.4486
Epoch 192/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4529 - accuracy: 0.4794 - val_loss: 0.9808 - val_accuracy: 0.4533
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3430 - accuracy: 0.4948 - val_loss: 1.0088 - val_accuracy: 0.4720
Epoch 194/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3142 - accuracy: 0.5026 - val_loss: 1.0159 - val_accuracy: 0.4579
Epoch 195/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3591 - accuracy: 0.5000 - val_loss: 1.0286 - val_accuracy: 0.4533
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3071 - accuracy: 0.4845 - val_loss: 1.0348 - val_accuracy: 0.4579
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2943 - accuracy: 0.4820 - val_loss: 1.0380 - val_accuracy: 0.4393
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3180 - accuracy: 0.4845 - val_loss: 1.0413 - val_accuracy: 0.4346
```

```

Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3557 - accuracy: 0.4897 - val_loss: 1.0953 - val_accuracy: 0.4159
Epoch 200/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3926 - accuracy: 0.5129 - val_loss: 1.0949 - val_accuracy: 0.4252
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3364 - accuracy: 0.5155 - val_loss: 1.0397 - val_accuracy: 0.4252
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3564 - accuracy: 0.4974 - val_loss: 1.1014 - val_accuracy: 0.4206
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3459 - accuracy: 0.4613 - val_loss: 1.0735 - val_accuracy: 0.4299
Epoch 204/1000
1/4 [====>.....] - ETA: 0s - loss: 0.4036 - accuracy: 0.5547Restoring model weights from the end of the best epoch: 54.
4/4 [=====] - 0s 14ms/step - loss: 0.4185 - accuracy: 0.4845 - val_loss: 1.1084 - val_accuracy: 0.4159
Epoch 204: early stopping
2/2 [=====] - 0s 3ms/step - loss: 1.1869 - accuracy: 0.6364
[CV] END .....Dense1=25, Dense2=50; total time= 11.4s
Model: "sequential_31"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_124 (Dense)	(None, 25)	175
batch_normalization_93 (BatchNormalization)	(None, 25)	100
activation_93 (Activation)	(None, 25)	0
dense_125 (Dense)	(None, 50)	1300
batch_normalization_94 (BatchNormalization)	(None, 50)	200
activation_94 (Activation)	(None, 50)	0
dense_126 (Dense)	(None, 10)	510
batch_normalization_95 (BatchNormalization)	(None, 10)	40
activation_95 (Activation)	(None, 10)	0
dense_127 (Dense)	(None, 2)	22
<hr/>		
Total params: 2,347		
Trainable params: 2,177		
Non-trainable params: 170		

```

Epoch 1/1000
4/4 [=====] - 1s 53ms/step - loss: 5.1224 - accuracy: 0.4884 - val_loss: 2.4251 - val_accuracy: 0.5888
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 4.5324 - accuracy: 0.5039 - val_loss: 2.1863 - val_accuracy: 0.5981
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 4.2396 - accuracy: 0.5347 - val_loss: 2.1965 - val_accuracy: 0.6121
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 4.0653 - accuracy: 0.5116 - val_loss: 2.2078 - val_accuracy: 0.6075
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 4.0817 - accuracy: 0.5219 - val_loss: 2.2209 - val_accuracy: 0.6262
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 3.8928 - accuracy: 0.5116 - val_loss: 2.1764 - val_accuracy: 0.6121
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 3.8910 - accuracy: 0.5039 - val_loss: 2.1023 - val_accuracy: 0.6168
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9313 - accuracy: 0.5193 - val_loss: 2.1418 - val_accuracy: 0.6121
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9270 - accuracy: 0.5116 - val_loss: 2.1543 - val_accuracy: 0.5888
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9187 - accuracy: 0.5219 - val_loss: 2.1248 - val_accuracy: 0.5467
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8860 - accuracy: 0.5167 - val_loss: 2.1420 - val_accuracy: 0.5374
Epoch 12/1000

```

```
4/4 [=====] - 0s 13ms/step - loss: 3.8699 - accuracy: 0.5090 - val_loss: 2.1280 - val_accuracy: 0.5140
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7489 - accuracy: 0.5116 - val_loss: 2.0763 - val_accuracy: 0.5093
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7984 - accuracy: 0.4987 - val_loss: 2.0667 - val_accuracy: 0.5093
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5114 - accuracy: 0.4987 - val_loss: 2.0033 - val_accuracy: 0.4860
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4755 - accuracy: 0.5039 - val_loss: 2.0252 - val_accuracy: 0.5981
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7759 - accuracy: 0.5270 - val_loss: 1.9609 - val_accuracy: 0.5935
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5177 - accuracy: 0.4807 - val_loss: 1.9194 - val_accuracy: 0.6028
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5342 - accuracy: 0.5116 - val_loss: 1.8783 - val_accuracy: 0.5841
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 3.4691 - accuracy: 0.4859 - val_loss: 1.8710 - val_accuracy: 0.5794
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 3.2650 - accuracy: 0.4987 - val_loss: 1.8603 - val_accuracy: 0.5888
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3523 - accuracy: 0.4833 - val_loss: 1.8445 - val_accuracy: 0.5841
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 3.2659 - accuracy: 0.4884 - val_loss: 1.8271 - val_accuracy: 0.5841
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5087 - accuracy: 0.4679 - val_loss: 1.8282 - val_accuracy: 0.5794
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9928 - accuracy: 0.4833 - val_loss: 1.8026 - val_accuracy: 0.5748
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2510 - accuracy: 0.4859 - val_loss: 1.7917 - val_accuracy: 0.5748
Epoch 27/1000
4/4 [=====] - 0s 14ms/step - loss: 2.9913 - accuracy: 0.4679 - val_loss: 1.7794 - val_accuracy: 0.5794
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1546 - accuracy: 0.5141 - val_loss: 1.7535 - val_accuracy: 0.5654
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9182 - accuracy: 0.4781 - val_loss: 1.7781 - val_accuracy: 0.5701
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0137 - accuracy: 0.4730 - val_loss: 1.8096 - val_accuracy: 0.5701
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9384 - accuracy: 0.5090 - val_loss: 1.8515 - val_accuracy: 0.5701
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8111 - accuracy: 0.5090 - val_loss: 1.8002 - val_accuracy: 0.5748
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7941 - accuracy: 0.4961 - val_loss: 1.7967 - val_accuracy: 0.5701
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7811 - accuracy: 0.4833 - val_loss: 1.8270 - val_accuracy: 0.4393
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7043 - accuracy: 0.5064 - val_loss: 1.7871 - val_accuracy: 0.4252
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7725 - accuracy: 0.5013 - val_loss: 1.8119 - val_accuracy: 0.4206
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5854 - accuracy: 0.5296 - val_loss: 1.8237 - val_accuracy: 0.4159
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6823 - accuracy: 0.4961 - val_loss: 1.8028 - val_accuracy: 0.4112
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7620 - accuracy: 0.4961 - val_loss: 1.8458 - val_accuracy: 0.4159
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5482 - accuracy: 0.5244 - val_loss: 1.8549 - val_accuracy: 0.4766
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6352 - accuracy: 0.4961 - val_loss: 1.8955 - val_accuracy: 0.4720
```

Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4652 - accuracy: 0.5347 - val_loss: 1.9147 - val_accuracy: 0.4766
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3726 - accuracy: 0.5553 - val_loss: 1.8757 - val_accuracy: 0.4813
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2398 - accuracy: 0.4910 - val_loss: 1.7989 - val_accuracy: 0.4626
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3578 - accuracy: 0.4807 - val_loss: 1.8171 - val_accuracy: 0.4626
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4030 - accuracy: 0.4987 - val_loss: 1.8046 - val_accuracy: 0.4813
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1275 - accuracy: 0.5064 - val_loss: 1.7948 - val_accuracy: 0.4907
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1849 - accuracy: 0.5141 - val_loss: 1.7834 - val_accuracy: 0.4907
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2562 - accuracy: 0.4576 - val_loss: 1.7956 - val_accuracy: 0.4766
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1455 - accuracy: 0.4987 - val_loss: 1.7367 - val_accuracy: 0.4720
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3779 - accuracy: 0.4884 - val_loss: 1.7384 - val_accuracy: 0.4766
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2080 - accuracy: 0.4987 - val_loss: 1.7222 - val_accuracy: 0.4766
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1372 - accuracy: 0.4961 - val_loss: 1.7070 - val_accuracy: 0.4860
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0088 - accuracy: 0.5064 - val_loss: 1.7103 - val_accuracy: 0.4907
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0101 - accuracy: 0.4679 - val_loss: 1.6793 - val_accuracy: 0.5140
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8728 - accuracy: 0.4704 - val_loss: 1.6275 - val_accuracy: 0.5140
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9998 - accuracy: 0.4859 - val_loss: 1.6168 - val_accuracy: 0.5187
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9078 - accuracy: 0.4936 - val_loss: 1.6238 - val_accuracy: 0.5140
Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8222 - accuracy: 0.4756 - val_loss: 1.5695 - val_accuracy: 0.4720
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8063 - accuracy: 0.4730 - val_loss: 1.5181 - val_accuracy: 0.4673
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8807 - accuracy: 0.4602 - val_loss: 1.5116 - val_accuracy: 0.4766
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7175 - accuracy: 0.4576 - val_loss: 1.5001 - val_accuracy: 0.4860
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7357 - accuracy: 0.4859 - val_loss: 1.4259 - val_accuracy: 0.4860
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6638 - accuracy: 0.4961 - val_loss: 1.3726 - val_accuracy: 0.4860
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5652 - accuracy: 0.4781 - val_loss: 1.3495 - val_accuracy: 0.4860
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5177 - accuracy: 0.4730 - val_loss: 1.3490 - val_accuracy: 0.4766
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5209 - accuracy: 0.4781 - val_loss: 1.3912 - val_accuracy: 0.4720
Epoch 68/1000
4/4 [=====] - 0s 11ms/step - loss: 1.4158 - accuracy: 0.5116 - val_loss: 1.3273 - val_accuracy: 0.4720
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3863 - accuracy: 0.4833 - val_loss: 1.2876 - val_accuracy: 0.4533
Epoch 70/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5575 - accuracy: 0.4627 - val_loss: 1.3035 - val_accuracy: 0.4486
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4377 - accuracy: 0.4704 - val_loss: 1.2531 - val_accuracy: 0.4533

```
accuracy: 0.4393
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4124 - accuracy: 0.4756 - val_loss: 1.2376 - val_
accuracy: 0.4393
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4069 - accuracy: 0.4576 - val_loss: 1.2418 - val_
accuracy: 0.4346
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3003 - accuracy: 0.4447 - val_loss: 1.2317 - val_
accuracy: 0.4206
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3317 - accuracy: 0.4704 - val_loss: 1.2749 - val_
accuracy: 0.4206
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4138 - accuracy: 0.4524 - val_loss: 1.2795 - val_
accuracy: 0.4206
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4645 - accuracy: 0.5013 - val_loss: 1.2750 - val_
accuracy: 0.4252
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2741 - accuracy: 0.4653 - val_loss: 1.2623 - val_
accuracy: 0.4346
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2255 - accuracy: 0.4653 - val_loss: 1.2463 - val_
accuracy: 0.4252
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2507 - accuracy: 0.4653 - val_loss: 1.1882 - val_
accuracy: 0.4299
Epoch 81/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2361 - accuracy: 0.4884 - val_loss: 1.1783 - val_
accuracy: 0.4393
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1903 - accuracy: 0.4884 - val_loss: 1.1555 - val_
accuracy: 0.4439
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1944 - accuracy: 0.4910 - val_loss: 1.1634 - val_
accuracy: 0.4486
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2458 - accuracy: 0.5013 - val_loss: 1.1282 - val_
accuracy: 0.4486
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2565 - accuracy: 0.4730 - val_loss: 1.1215 - val_
accuracy: 0.4393
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2934 - accuracy: 0.4961 - val_loss: 1.1127 - val_
accuracy: 0.4533
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2294 - accuracy: 0.4936 - val_loss: 1.1020 - val_
accuracy: 0.4439
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2263 - accuracy: 0.5116 - val_loss: 1.1274 - val_
accuracy: 0.4907
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2656 - accuracy: 0.5424 - val_loss: 1.0633 - val_
accuracy: 0.4860
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2397 - accuracy: 0.5219 - val_loss: 1.0822 - val_
accuracy: 0.4907
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1465 - accuracy: 0.5141 - val_loss: 1.0447 - val_
accuracy: 0.5000
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2546 - accuracy: 0.5090 - val_loss: 1.0620 - val_
accuracy: 0.5047
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2055 - accuracy: 0.5219 - val_loss: 1.0705 - val_
accuracy: 0.4860
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1525 - accuracy: 0.5398 - val_loss: 1.0651 - val_
accuracy: 0.4907
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0454 - accuracy: 0.5476 - val_loss: 1.0596 - val_
accuracy: 0.4907
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1190 - accuracy: 0.5244 - val_loss: 1.0112 - val_
accuracy: 0.5187
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1573 - accuracy: 0.5373 - val_loss: 0.9960 - val_
accuracy: 0.5140
Epoch 98/1000
4/4 [=====] - 0s 18ms/step - loss: 1.1778 - accuracy: 0.5578 - val_loss: 0.9793 - val_
accuracy: 0.5327
Epoch 99/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0678 - accuracy: 0.5321 - val_loss: 0.9051 - val_
accuracy: 0.5421
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0862 - accuracy: 0.5656 - val_loss: 0.9301 - val_
accuracy: 0.5514
Epoch 101/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 1.0424 - accuracy: 0.5784 - val_loss: 0.9248 - val_accuracy: 0.5467
Epoch 102/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1134 - accuracy: 0.5578 - val_loss: 0.9324 - val_accuracy: 0.5748
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1048 - accuracy: 0.5681 - val_loss: 0.9166 - val_accuracy: 0.5654
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0172 - accuracy: 0.5450 - val_loss: 0.9362 - val_accuracy: 0.5794
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0341 - accuracy: 0.5578 - val_loss: 0.9271 - val_accuracy: 0.5514
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0589 - accuracy: 0.5553 - val_loss: 0.9174 - val_accuracy: 0.5561
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9480 - accuracy: 0.5810 - val_loss: 0.9109 - val_accuracy: 0.5514
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0217 - accuracy: 0.5861 - val_loss: 0.8904 - val_accuracy: 0.5514
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1104 - accuracy: 0.5784 - val_loss: 0.8476 - val_accuracy: 0.5701
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9389 - accuracy: 0.5784 - val_loss: 0.8266 - val_accuracy: 0.5701
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8732 - accuracy: 0.5578 - val_loss: 0.8056 - val_accuracy: 0.5654
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9006 - accuracy: 0.5604 - val_loss: 0.7509 - val_accuracy: 0.5467
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9177 - accuracy: 0.5707 - val_loss: 0.7223 - val_accuracy: 0.5654
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9375 - accuracy: 0.5527 - val_loss: 0.6892 - val_accuracy: 0.5794
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8967 - accuracy: 0.6093 - val_loss: 0.7131 - val_accuracy: 0.5841
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8369 - accuracy: 0.5758 - val_loss: 0.7628 - val_accuracy: 0.5748
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8169 - accuracy: 0.5476 - val_loss: 0.7639 - val_accuracy: 0.5701
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7928 - accuracy: 0.5604 - val_loss: 0.8009 - val_accuracy: 0.5607
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8787 - accuracy: 0.5321 - val_loss: 0.8556 - val_accuracy: 0.5794
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7531 - accuracy: 0.5527 - val_loss: 0.7947 - val_accuracy: 0.5794
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8023 - accuracy: 0.5476 - val_loss: 0.7105 - val_accuracy: 0.5794
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8114 - accuracy: 0.5758 - val_loss: 0.7107 - val_accuracy: 0.5841
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7828 - accuracy: 0.5450 - val_loss: 0.7341 - val_accuracy: 0.5841
Epoch 124/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7628 - accuracy: 0.5964 - val_loss: 0.7114 - val_accuracy: 0.6168
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7328 - accuracy: 0.6221 - val_loss: 0.7058 - val_accuracy: 0.6168
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7124 - accuracy: 0.6041 - val_loss: 0.7323 - val_accuracy: 0.6121
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5315 - accuracy: 0.6324 - val_loss: 0.6999 - val_accuracy: 0.6168
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6020 - accuracy: 0.6144 - val_loss: 0.6940 - val_accuracy: 0.6308
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6947 - accuracy: 0.6144 - val_loss: 0.6960 - val_accuracy: 0.5794
Epoch 130/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6693 - accuracy: 0.5193 - val_loss: 0.6879 - val_accuracy: 0.6028
```

Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6214 - accuracy: 0.5938 - val_loss: 0.6828 - val_accuracy: 0.6121
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5922 - accuracy: 0.6015 - val_loss: 0.7004 - val_accuracy: 0.5935
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5561 - accuracy: 0.5424 - val_loss: 0.6895 - val_accuracy: 0.5935
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5278 - accuracy: 0.6170 - val_loss: 0.6911 - val_accuracy: 0.5981
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5908 - accuracy: 0.6324 - val_loss: 0.6871 - val_accuracy: 0.5467
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6272 - accuracy: 0.5604 - val_loss: 0.7193 - val_accuracy: 0.6215
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5058 - accuracy: 0.5630 - val_loss: 0.7174 - val_accuracy: 0.6075
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5179 - accuracy: 0.5990 - val_loss: 0.6854 - val_accuracy: 0.6028
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5103 - accuracy: 0.6144 - val_loss: 0.6942 - val_accuracy: 0.6121
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5548 - accuracy: 0.6144 - val_loss: 0.6430 - val_accuracy: 0.6075
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4841 - accuracy: 0.6221 - val_loss: 0.6709 - val_accuracy: 0.6075
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5096 - accuracy: 0.6375 - val_loss: 0.6675 - val_accuracy: 0.5748
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4343 - accuracy: 0.5810 - val_loss: 0.6434 - val_accuracy: 0.5794
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5075 - accuracy: 0.6067 - val_loss: 0.6430 - val_accuracy: 0.6308
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5117 - accuracy: 0.6504 - val_loss: 0.6435 - val_accuracy: 0.6262
Epoch 146/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4849 - accuracy: 0.6478 - val_loss: 0.6194 - val_accuracy: 0.6402
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5059 - accuracy: 0.6787 - val_loss: 0.6744 - val_accuracy: 0.6262
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4772 - accuracy: 0.6272 - val_loss: 0.7073 - val_accuracy: 0.6028
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4494 - accuracy: 0.6684 - val_loss: 0.7366 - val_accuracy: 0.5935
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5936 - accuracy: 0.6350 - val_loss: 0.6806 - val_accuracy: 0.6262
Epoch 151/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5093 - accuracy: 0.6375 - val_loss: 0.7105 - val_accuracy: 0.6168
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5231 - accuracy: 0.6272 - val_loss: 0.7385 - val_accuracy: 0.6262
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6119 - accuracy: 0.6350 - val_loss: 0.7104 - val_accuracy: 0.6262
Epoch 154/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4235 - accuracy: 0.6401 - val_loss: 0.7328 - val_accuracy: 0.6168
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4381 - accuracy: 0.6247 - val_loss: 0.7652 - val_accuracy: 0.6028
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4476 - accuracy: 0.6478 - val_loss: 0.7607 - val_accuracy: 0.6075
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5596 - accuracy: 0.6298 - val_loss: 0.7580 - val_accuracy: 0.6168
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4451 - accuracy: 0.6607 - val_loss: 0.7598 - val_accuracy: 0.6495
Epoch 159/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4843 - accuracy: 0.6658 - val_loss: 0.7334 - val_accuracy: 0.6495
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4800 - accuracy: 0.6375 - val_loss: 0.7827 - val_accuracy: 0.6375

```
accuracy: 0.6449
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4749 - accuracy: 0.6452 - val_loss: 0.7813 - val_accuracy: 0.6449
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5015 - accuracy: 0.6324 - val_loss: 0.7773 - val_accuracy: 0.6495
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4333 - accuracy: 0.6478 - val_loss: 0.7811 - val_accuracy: 0.6449
Epoch 164/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5341 - accuracy: 0.6530 - val_loss: 0.7832 - val_accuracy: 0.6542
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5007 - accuracy: 0.6452 - val_loss: 0.7659 - val_accuracy: 0.6402
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3908 - accuracy: 0.6581 - val_loss: 0.7328 - val_accuracy: 0.6262
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4735 - accuracy: 0.6530 - val_loss: 0.6959 - val_accuracy: 0.6308
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4895 - accuracy: 0.6478 - val_loss: 0.7075 - val_accuracy: 0.6262
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4346 - accuracy: 0.6555 - val_loss: 0.6986 - val_accuracy: 0.6308
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4568 - accuracy: 0.6350 - val_loss: 0.6760 - val_accuracy: 0.6168
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4282 - accuracy: 0.6581 - val_loss: 0.6476 - val_accuracy: 0.5935
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4229 - accuracy: 0.6658 - val_loss: 0.7057 - val_accuracy: 0.6028
Epoch 173/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5079 - accuracy: 0.6581 - val_loss: 0.7310 - val_accuracy: 0.5888
Epoch 174/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4754 - accuracy: 0.6427 - val_loss: 0.7274 - val_accuracy: 0.5888
Epoch 175/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4224 - accuracy: 0.6452 - val_loss: 0.7040 - val_accuracy: 0.5981
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4966 - accuracy: 0.6375 - val_loss: 0.7309 - val_accuracy: 0.5981
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3879 - accuracy: 0.6427 - val_loss: 0.7291 - val_accuracy: 0.5888
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4339 - accuracy: 0.6478 - val_loss: 0.7532 - val_accuracy: 0.6028
Epoch 179/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4453 - accuracy: 0.6684 - val_loss: 0.7646 - val_accuracy: 0.6075
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4260 - accuracy: 0.6247 - val_loss: 0.7650 - val_accuracy: 0.6168
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3764 - accuracy: 0.6761 - val_loss: 0.7556 - val_accuracy: 0.6075
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4465 - accuracy: 0.6504 - val_loss: 0.7379 - val_accuracy: 0.5935
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4000 - accuracy: 0.6298 - val_loss: 0.7268 - val_accuracy: 0.5981
Epoch 184/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3950 - accuracy: 0.6555 - val_loss: 0.7281 - val_accuracy: 0.5935
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3726 - accuracy: 0.6247 - val_loss: 0.7348 - val_accuracy: 0.5794
Epoch 186/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4132 - accuracy: 0.6170 - val_loss: 0.7310 - val_accuracy: 0.5935
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3973 - accuracy: 0.6581 - val_loss: 0.7294 - val_accuracy: 0.5888
Epoch 188/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4200 - accuracy: 0.6324 - val_loss: 0.7285 - val_accuracy: 0.5748
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3846 - accuracy: 0.6607 - val_loss: 0.7899 - val_accuracy: 0.5794
Epoch 190/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.4867 - accuracy: 0.6247 - val_loss: 0.8168 - val_accuracy: 0.5748
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4581 - accuracy: 0.6504 - val_loss: 0.7940 - val_accuracy: 0.6121
Epoch 192/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4195 - accuracy: 0.6812 - val_loss: 0.7944 - val_accuracy: 0.5981
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4298 - accuracy: 0.6530 - val_loss: 0.8832 - val_accuracy: 0.5888
Epoch 194/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4803 - accuracy: 0.6684 - val_loss: 0.8957 - val_accuracy: 0.6028
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3240 - accuracy: 0.6581 - val_loss: 0.9303 - val_accuracy: 0.6075
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4778 - accuracy: 0.6761 - val_loss: 0.9543 - val_accuracy: 0.5935
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4468 - accuracy: 0.6812 - val_loss: 0.8629 - val_accuracy: 0.6168
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4555 - accuracy: 0.6452 - val_loss: 0.9569 - val_accuracy: 0.6215
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4667 - accuracy: 0.6195 - val_loss: 0.9558 - val_accuracy: 0.6168
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4221 - accuracy: 0.6350 - val_loss: 0.9568 - val_accuracy: 0.6215
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4238 - accuracy: 0.6581 - val_loss: 0.9252 - val_accuracy: 0.6028
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4649 - accuracy: 0.6658 - val_loss: 0.9183 - val_accuracy: 0.5888
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4926 - accuracy: 0.6530 - val_loss: 0.9180 - val_accuracy: 0.5794
Epoch 204/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4460 - accuracy: 0.6555 - val_loss: 0.9211 - val_accuracy: 0.5794
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4848 - accuracy: 0.6375 - val_loss: 0.9259 - val_accuracy: 0.5701
Epoch 206/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4519 - accuracy: 0.6427 - val_loss: 0.9547 - val_accuracy: 0.5514
Epoch 207/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4371 - accuracy: 0.6427 - val_loss: 0.9515 - val_accuracy: 0.5654
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4427 - accuracy: 0.6093 - val_loss: 0.9201 - val_accuracy: 0.5748
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4308 - accuracy: 0.6298 - val_loss: 0.9198 - val_accuracy: 0.5607
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4784 - accuracy: 0.6350 - val_loss: 0.9180 - val_accuracy: 0.5514
Epoch 211/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4252 - accuracy: 0.6221 - val_loss: 0.8951 - val_accuracy: 0.5607
Epoch 212/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4474 - accuracy: 0.6427 - val_loss: 0.8903 - val_accuracy: 0.5607
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4190 - accuracy: 0.6504 - val_loss: 0.8655 - val_accuracy: 0.5654
Epoch 214/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5438 - accuracy: 0.6684 - val_loss: 0.9221 - val_accuracy: 0.5748
Epoch 215/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4565 - accuracy: 0.6504 - val_loss: 0.8917 - val_accuracy: 0.5794
Epoch 216/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3783 - accuracy: 0.6812 - val_loss: 0.9178 - val_accuracy: 0.5748
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4585 - accuracy: 0.6298 - val_loss: 0.9139 - val_accuracy: 0.5935
Epoch 218/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4447 - accuracy: 0.6607 - val_loss: 0.9440 - val_accuracy: 0.5888
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4119 - accuracy: 0.6761 - val_loss: 0.9452 - val_accuracy: 0.5841
```

Epoch 220/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5237 - accuracy: 0.6658 - val_loss: 0.9747 - val_accuracy: 0.5607
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4037 - accuracy: 0.6581 - val_loss: 0.8966 - val_accuracy: 0.5561
Epoch 222/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4198 - accuracy: 0.6735 - val_loss: 0.8889 - val_accuracy: 0.5514
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4027 - accuracy: 0.6478 - val_loss: 0.8862 - val_accuracy: 0.5467
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4572 - accuracy: 0.6581 - val_loss: 0.8889 - val_accuracy: 0.5421
Epoch 225/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3855 - accuracy: 0.6504 - val_loss: 0.9489 - val_accuracy: 0.5561
Epoch 226/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3963 - accuracy: 0.6658 - val_loss: 0.9538 - val_accuracy: 0.5467
Epoch 227/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4259 - accuracy: 0.6504 - val_loss: 0.9253 - val_accuracy: 0.5748
Epoch 228/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3970 - accuracy: 0.6504 - val_loss: 0.9004 - val_accuracy: 0.5794
Epoch 229/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5850 - accuracy: 0.6684 - val_loss: 0.8569 - val_accuracy: 0.5888
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3758 - accuracy: 0.6658 - val_loss: 0.8400 - val_accuracy: 0.5888
Epoch 231/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3490 - accuracy: 0.6864 - val_loss: 0.7309 - val_accuracy: 0.5935
Epoch 232/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3607 - accuracy: 0.6787 - val_loss: 0.7296 - val_accuracy: 0.5981
Epoch 233/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4402 - accuracy: 0.6401 - val_loss: 0.7102 - val_accuracy: 0.5841
Epoch 234/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4417 - accuracy: 0.6504 - val_loss: 0.7133 - val_accuracy: 0.5841
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5275 - accuracy: 0.6710 - val_loss: 0.7404 - val_accuracy: 0.5748
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3244 - accuracy: 0.6581 - val_loss: 0.7684 - val_accuracy: 0.5888
Epoch 237/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4255 - accuracy: 0.6530 - val_loss: 0.7120 - val_accuracy: 0.5841
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4120 - accuracy: 0.6915 - val_loss: 0.7341 - val_accuracy: 0.5981
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3416 - accuracy: 0.6812 - val_loss: 0.7855 - val_accuracy: 0.5794
Epoch 240/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4226 - accuracy: 0.6581 - val_loss: 0.7132 - val_accuracy: 0.5935
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4696 - accuracy: 0.6787 - val_loss: 0.7436 - val_accuracy: 0.5888
Epoch 242/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3425 - accuracy: 0.6581 - val_loss: 0.7652 - val_accuracy: 0.6121
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3488 - accuracy: 0.6684 - val_loss: 0.7348 - val_accuracy: 0.5794
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3962 - accuracy: 0.6530 - val_loss: 0.7679 - val_accuracy: 0.5981
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4440 - accuracy: 0.6350 - val_loss: 0.8139 - val_accuracy: 0.6121
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3595 - accuracy: 0.6684 - val_loss: 0.7874 - val_accuracy: 0.5794
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3849 - accuracy: 0.6504 - val_loss: 0.7833 - val_accuracy: 0.5841
Epoch 248/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3302 - accuracy: 0.6530 - val_loss: 0.7822 - val_accuracy: 0.5841
Epoch 249/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3270 - accuracy: 0.6504 - val_loss: 0.8075 - val_accuracy: 0.5841

```
accuracy: 0.5794
Epoch 250/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3549 - accuracy: 0.6684 - val_loss: 0.7841 - val_
accuracy: 0.5888
Epoch 251/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3665 - accuracy: 0.6427 - val_loss: 0.7335 - val_
accuracy: 0.5888
Epoch 252/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3662 - accuracy: 0.6658 - val_loss: 0.7954 - val_
accuracy: 0.5794
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4569 - accuracy: 0.6452 - val_loss: 0.7913 - val_
accuracy: 0.5794
Epoch 254/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3306 - accuracy: 0.6350 - val_loss: 0.8745 - val_
accuracy: 0.5701
Epoch 255/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4569 - accuracy: 0.6298 - val_loss: 0.8122 - val_
accuracy: 0.5794
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4271 - accuracy: 0.6452 - val_loss: 0.8111 - val_
accuracy: 0.5514
Epoch 257/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2991 - accuracy: 0.6170 - val_loss: 0.6973 - val_
accuracy: 0.5561
Epoch 258/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3648 - accuracy: 0.6298 - val_loss: 0.8153 - val_
accuracy: 0.5654
Epoch 259/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3896 - accuracy: 0.6118 - val_loss: 0.8098 - val_
accuracy: 0.5654
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4039 - accuracy: 0.6375 - val_loss: 0.8661 - val_
accuracy: 0.5561
Epoch 261/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3478 - accuracy: 0.6530 - val_loss: 0.7564 - val_
accuracy: 0.5748
Epoch 262/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3172 - accuracy: 0.6324 - val_loss: 0.6953 - val_
accuracy: 0.5794
Epoch 263/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3761 - accuracy: 0.6375 - val_loss: 0.7336 - val_
accuracy: 0.5794
Epoch 264/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4861 - accuracy: 0.6247 - val_loss: 0.7195 - val_
accuracy: 0.5935
Epoch 265/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3547 - accuracy: 0.6247 - val_loss: 0.7118 - val_
accuracy: 0.5935
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4256 - accuracy: 0.6272 - val_loss: 0.7435 - val_
accuracy: 0.6028
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3817 - accuracy: 0.6221 - val_loss: 0.7959 - val_
accuracy: 0.6075
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3610 - accuracy: 0.6452 - val_loss: 0.7439 - val_
accuracy: 0.6075
Epoch 269/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3815 - accuracy: 0.6632 - val_loss: 0.7463 - val_
accuracy: 0.6028
Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4259 - accuracy: 0.6555 - val_loss: 0.7197 - val_
accuracy: 0.6028
Epoch 271/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3532 - accuracy: 0.6504 - val_loss: 0.7309 - val_
accuracy: 0.5935
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3237 - accuracy: 0.6581 - val_loss: 0.6896 - val_
accuracy: 0.5888
Epoch 273/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3955 - accuracy: 0.6530 - val_loss: 0.6955 - val_
accuracy: 0.6028
Epoch 274/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4171 - accuracy: 0.6452 - val_loss: 0.7302 - val_
accuracy: 0.6028
Epoch 275/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3551 - accuracy: 0.6427 - val_loss: 0.7673 - val_
accuracy: 0.5748
Epoch 276/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4224 - accuracy: 0.6504 - val_loss: 0.6964 - val_
accuracy: 0.5888
Epoch 277/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3531 - accuracy: 0.6735 - val_loss: 0.6728 - val_
accuracy: 0.6121
Epoch 278/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3038 - accuracy: 0.6632 - val_loss: 0.6821 - val_
accuracy: 0.6121
Epoch 279/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3643 - accuracy: 0.6735 - val_loss: 0.6684 - val_accuracy: 0.6028
Epoch 280/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3159 - accuracy: 0.6735 - val_loss: 0.6287 - val_accuracy: 0.6168
Epoch 281/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3231 - accuracy: 0.6761 - val_loss: 0.6598 - val_accuracy: 0.6168
Epoch 282/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3303 - accuracy: 0.6530 - val_loss: 0.7082 - val_accuracy: 0.6121
Epoch 283/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4271 - accuracy: 0.6658 - val_loss: 0.6364 - val_accuracy: 0.5794
Epoch 284/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3491 - accuracy: 0.6658 - val_loss: 0.6562 - val_accuracy: 0.5794
Epoch 285/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3358 - accuracy: 0.6555 - val_loss: 0.6446 - val_accuracy: 0.5654
Epoch 286/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3556 - accuracy: 0.6504 - val_loss: 0.6425 - val_accuracy: 0.5654
Epoch 287/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4174 - accuracy: 0.6812 - val_loss: 0.6506 - val_accuracy: 0.5561
Epoch 288/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3579 - accuracy: 0.6375 - val_loss: 0.6434 - val_accuracy: 0.5701
Epoch 289/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3799 - accuracy: 0.6401 - val_loss: 0.6650 - val_accuracy: 0.5654
Epoch 290/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4589 - accuracy: 0.6555 - val_loss: 0.6722 - val_accuracy: 0.5561
Epoch 291/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3493 - accuracy: 0.6427 - val_loss: 0.7246 - val_accuracy: 0.5607
Epoch 292/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3064 - accuracy: 0.6581 - val_loss: 0.6826 - val_accuracy: 0.5421
Epoch 293/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3531 - accuracy: 0.6710 - val_loss: 0.7134 - val_accuracy: 0.5748
Epoch 294/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3514 - accuracy: 0.6658 - val_loss: 0.7840 - val_accuracy: 0.5654
Epoch 295/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3705 - accuracy: 0.6427 - val_loss: 0.7239 - val_accuracy: 0.5701
Epoch 296/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4173 - accuracy: 0.6684 - val_loss: 0.7268 - val_accuracy: 0.5748
Epoch 297/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3137 - accuracy: 0.6812 - val_loss: 0.7300 - val_accuracy: 0.5701
Epoch 298/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3848 - accuracy: 0.6658 - val_loss: 0.7624 - val_accuracy: 0.5888
Epoch 299/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2719 - accuracy: 0.6967 - val_loss: 0.8798 - val_accuracy: 0.5841
Epoch 300/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4211 - accuracy: 0.6555 - val_loss: 0.8984 - val_accuracy: 0.5841
Epoch 301/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3224 - accuracy: 0.6658 - val_loss: 0.9195 - val_accuracy: 0.5888
Epoch 302/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3554 - accuracy: 0.6761 - val_loss: 0.9249 - val_accuracy: 0.5701
Epoch 303/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3539 - accuracy: 0.6812 - val_loss: 0.8875 - val_accuracy: 0.5888
Epoch 304/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3544 - accuracy: 0.6710 - val_loss: 0.7768 - val_accuracy: 0.6075
Epoch 305/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3128 - accuracy: 0.6581 - val_loss: 0.7389 - val_accuracy: 0.6262
Epoch 306/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3397 - accuracy: 0.6787 - val_loss: 0.7547 - val_accuracy: 0.6215
Epoch 307/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4078 - accuracy: 0.6581 - val_loss: 0.8522 - val_accuracy: 0.5981
Epoch 308/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3782 - accuracy: 0.6812 - val_loss: 0.9015 - val_accuracy: 0.6028
```

```

Epoch 309/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2907 - accuracy: 0.6838 - val_loss: 0.8980 - val_accuracy: 0.5888
Epoch 310/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4375 - accuracy: 0.6607 - val_loss: 0.7903 - val_accuracy: 0.5607
Epoch 311/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3350 - accuracy: 0.6298 - val_loss: 0.7438 - val_accuracy: 0.5794
Epoch 312/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3044 - accuracy: 0.6735 - val_loss: 0.7777 - val_accuracy: 0.5794
Epoch 313/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3138 - accuracy: 0.6838 - val_loss: 0.8151 - val_accuracy: 0.5421
Epoch 314/1000
1/4 [====>.....] - ETA: 0s - loss: 0.2158 - accuracy: 0.6719Restoring model weights from the end of the best epoch: 164.
4/4 [=====] - 0s 15ms/step - loss: 0.2994 - accuracy: 0.6581 - val_loss: 0.7184 - val_accuracy: 0.5561
Epoch 314: early stopping
2/2 [=====] - 0s 3ms/step - loss: 1.1546 - accuracy: 0.6047
[CV] END .....Dense1=25, Dense2=50; total time= 16.0s
Model: "sequential_32"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_128 (Dense)	(None, 25)	175
batch_normalization_96 (BatchNormalization)	(None, 25)	100
activation_96 (Activation)	(None, 25)	0
dense_129 (Dense)	(None, 50)	1300
batch_normalization_97 (BatchNormalization)	(None, 50)	200
activation_97 (Activation)	(None, 50)	0
dense_130 (Dense)	(None, 10)	510
batch_normalization_98 (BatchNormalization)	(None, 10)	40
activation_98 (Activation)	(None, 10)	0
dense_131 (Dense)	(None, 2)	22
<hr/>		
Total params: 2,347		
Trainable params: 2,177		
Non-trainable params: 170		

```

Epoch 1/1000
4/4 [=====] - 1s 57ms/step - loss: 5.6252 - accuracy: 0.4910 - val_loss: 2.2084 - val_accuracy: 0.5327
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 4.5340 - accuracy: 0.5630 - val_loss: 2.5986 - val_accuracy: 0.4439
Epoch 3/1000
4/4 [=====] - 0s 12ms/step - loss: 4.2818 - accuracy: 0.4730 - val_loss: 2.7620 - val_accuracy: 0.4439
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 4.1451 - accuracy: 0.5039 - val_loss: 2.8637 - val_accuracy: 0.4252
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 3.9694 - accuracy: 0.5733 - val_loss: 2.5506 - val_accuracy: 0.5234
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9091 - accuracy: 0.5835 - val_loss: 2.4368 - val_accuracy: 0.5607
Epoch 7/1000
4/4 [=====] - 0s 15ms/step - loss: 3.8669 - accuracy: 0.5938 - val_loss: 2.4391 - val_accuracy: 0.4299
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 3.6678 - accuracy: 0.4884 - val_loss: 2.3562 - val_accuracy: 0.5888
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5382 - accuracy: 0.5398 - val_loss: 2.2603 - val_accuracy: 0.6168
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5248 - accuracy: 0.5630 - val_loss: 2.1270 - val_accuracy: 0.6262
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 3.2144 - accuracy: 0.5604 - val_loss: 2.0285 - val_accuracy: 0.6542
Epoch 12/1000

```

```
4/4 [=====] - 0s 13ms/step - loss: 3.2423 - accuracy: 0.5501 - val_loss: 1.9981 - val_accuracy: 0.6449
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3187 - accuracy: 0.5630 - val_loss: 1.9408 - val_accuracy: 0.6308
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9196 - accuracy: 0.5656 - val_loss: 1.8905 - val_accuracy: 0.6402
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 2.9657 - accuracy: 0.5270 - val_loss: 1.8780 - val_accuracy: 0.6682
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9313 - accuracy: 0.5270 - val_loss: 1.8672 - val_accuracy: 0.6355
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9278 - accuracy: 0.5270 - val_loss: 1.8641 - val_accuracy: 0.6495
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0047 - accuracy: 0.5424 - val_loss: 1.8577 - val_accuracy: 0.6542
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7881 - accuracy: 0.5141 - val_loss: 1.8459 - val_accuracy: 0.6636
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8255 - accuracy: 0.5476 - val_loss: 1.8296 - val_accuracy: 0.6636
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7594 - accuracy: 0.5270 - val_loss: 1.7999 - val_accuracy: 0.6355
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6835 - accuracy: 0.5373 - val_loss: 1.7806 - val_accuracy: 0.6355
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5263 - accuracy: 0.5039 - val_loss: 1.7388 - val_accuracy: 0.6355
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4513 - accuracy: 0.5733 - val_loss: 1.7263 - val_accuracy: 0.6308
Epoch 25/1000
4/4 [=====] - 0s 16ms/step - loss: 2.3390 - accuracy: 0.5347 - val_loss: 1.7124 - val_accuracy: 0.6262
Epoch 26/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2825 - accuracy: 0.5141 - val_loss: 1.7026 - val_accuracy: 0.6355
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1277 - accuracy: 0.5424 - val_loss: 1.7031 - val_accuracy: 0.6402
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3107 - accuracy: 0.4936 - val_loss: 1.6853 - val_accuracy: 0.6308
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2006 - accuracy: 0.5013 - val_loss: 1.6762 - val_accuracy: 0.6402
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1906 - accuracy: 0.4961 - val_loss: 1.6609 - val_accuracy: 0.6355
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0430 - accuracy: 0.5219 - val_loss: 1.6393 - val_accuracy: 0.6402
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9796 - accuracy: 0.5141 - val_loss: 1.6440 - val_accuracy: 0.6355
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2939 - accuracy: 0.4936 - val_loss: 1.6347 - val_accuracy: 0.6262
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9171 - accuracy: 0.5219 - val_loss: 1.6170 - val_accuracy: 0.6262
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8185 - accuracy: 0.5013 - val_loss: 1.6036 - val_accuracy: 0.6262
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8549 - accuracy: 0.5424 - val_loss: 1.5631 - val_accuracy: 0.6262
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8583 - accuracy: 0.5424 - val_loss: 1.5378 - val_accuracy: 0.6262
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7675 - accuracy: 0.5116 - val_loss: 1.5636 - val_accuracy: 0.6402
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7023 - accuracy: 0.5321 - val_loss: 1.5521 - val_accuracy: 0.6542
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6145 - accuracy: 0.5193 - val_loss: 1.5353 - val_accuracy: 0.6449
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5740 - accuracy: 0.5476 - val_loss: 1.5092 - val_accuracy: 0.6402
```

Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5703 - accuracy: 0.5347 - val_loss: 1.4881 - val_accuracy: 0.6402
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5617 - accuracy: 0.4833 - val_loss: 1.4729 - val_accuracy: 0.6449
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5243 - accuracy: 0.5167 - val_loss: 1.4579 - val_accuracy: 0.6402
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3637 - accuracy: 0.5090 - val_loss: 1.4507 - val_accuracy: 0.6262
Epoch 46/1000
4/4 [=====] - 0s 15ms/step - loss: 1.3827 - accuracy: 0.4961 - val_loss: 1.4356 - val_accuracy: 0.6308
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1458 - accuracy: 0.4987 - val_loss: 1.4259 - val_accuracy: 0.6262
Epoch 48/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0628 - accuracy: 0.5193 - val_loss: 1.4649 - val_accuracy: 0.6262
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0038 - accuracy: 0.4961 - val_loss: 1.4404 - val_accuracy: 0.6495
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0327 - accuracy: 0.4756 - val_loss: 1.4164 - val_accuracy: 0.6308
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9200 - accuracy: 0.4910 - val_loss: 1.4173 - val_accuracy: 0.6449
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0650 - accuracy: 0.4704 - val_loss: 1.3987 - val_accuracy: 0.6308
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9593 - accuracy: 0.4807 - val_loss: 1.4074 - val_accuracy: 0.6262
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9377 - accuracy: 0.5090 - val_loss: 1.3895 - val_accuracy: 0.6355
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9394 - accuracy: 0.4653 - val_loss: 1.2948 - val_accuracy: 0.6542
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8123 - accuracy: 0.5219 - val_loss: 1.2792 - val_accuracy: 0.6402
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8567 - accuracy: 0.4987 - val_loss: 1.2098 - val_accuracy: 0.6355
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9187 - accuracy: 0.5013 - val_loss: 1.2379 - val_accuracy: 0.6355
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8658 - accuracy: 0.5039 - val_loss: 1.2264 - val_accuracy: 0.6308
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7959 - accuracy: 0.4833 - val_loss: 1.2759 - val_accuracy: 0.6168
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7978 - accuracy: 0.5270 - val_loss: 1.2780 - val_accuracy: 0.6121
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8144 - accuracy: 0.5064 - val_loss: 1.2953 - val_accuracy: 0.6121
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7975 - accuracy: 0.5116 - val_loss: 1.2902 - val_accuracy: 0.6121
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7933 - accuracy: 0.4807 - val_loss: 1.2874 - val_accuracy: 0.6121
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8658 - accuracy: 0.4910 - val_loss: 1.2779 - val_accuracy: 0.6121
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7797 - accuracy: 0.5039 - val_loss: 1.2728 - val_accuracy: 0.6121
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9497 - accuracy: 0.5064 - val_loss: 1.2662 - val_accuracy: 0.6121
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8312 - accuracy: 0.4987 - val_loss: 1.2651 - val_accuracy: 0.6028
Epoch 69/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8423 - accuracy: 0.4653 - val_loss: 1.2432 - val_accuracy: 0.6168
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7814 - accuracy: 0.5219 - val_loss: 1.2259 - val_accuracy: 0.6215
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8085 - accuracy: 0.5296 - val_loss: 1.2155 - val_accuracy: 0.6121

accuracy: 0.6121
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7430 - accuracy: 0.4833 - val_loss: 1.2254 - val_accuracy: 0.6168
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6700 - accuracy: 0.5476 - val_loss: 1.2443 - val_accuracy: 0.6121
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7467 - accuracy: 0.5167 - val_loss: 1.2285 - val_accuracy: 0.6121
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9992 - accuracy: 0.5347 - val_loss: 1.1928 - val_accuracy: 0.6121
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7406 - accuracy: 0.5244 - val_loss: 1.1780 - val_accuracy: 0.6121
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0427 - accuracy: 0.5373 - val_loss: 1.0957 - val_accuracy: 0.6121
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7640 - accuracy: 0.4884 - val_loss: 1.1466 - val_accuracy: 0.6075
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7764 - accuracy: 0.5039 - val_loss: 1.1873 - val_accuracy: 0.6168
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6655 - accuracy: 0.5013 - val_loss: 1.1533 - val_accuracy: 0.5841
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7654 - accuracy: 0.5193 - val_loss: 1.1401 - val_accuracy: 0.5888
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7139 - accuracy: 0.5219 - val_loss: 1.0477 - val_accuracy: 0.5935
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6712 - accuracy: 0.5373 - val_loss: 1.0407 - val_accuracy: 0.5935
Epoch 84/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5917 - accuracy: 0.5398 - val_loss: 0.9845 - val_accuracy: 0.6121
Epoch 85/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5824 - accuracy: 0.5141 - val_loss: 0.9928 - val_accuracy: 0.6075
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7170 - accuracy: 0.5116 - val_loss: 0.9937 - val_accuracy: 0.6121
Epoch 87/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5475 - accuracy: 0.5321 - val_loss: 0.9975 - val_accuracy: 0.6075
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7949 - accuracy: 0.5553 - val_loss: 0.8648 - val_accuracy: 0.5981
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4988 - accuracy: 0.5321 - val_loss: 0.8380 - val_accuracy: 0.6168
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6888 - accuracy: 0.5013 - val_loss: 0.8005 - val_accuracy: 0.6215
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6208 - accuracy: 0.4936 - val_loss: 0.8093 - val_accuracy: 0.6308
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6731 - accuracy: 0.5013 - val_loss: 0.7956 - val_accuracy: 0.6215
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5824 - accuracy: 0.4936 - val_loss: 0.8385 - val_accuracy: 0.5888
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5918 - accuracy: 0.4910 - val_loss: 0.7891 - val_accuracy: 0.5981
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7175 - accuracy: 0.5296 - val_loss: 0.8274 - val_accuracy: 0.6028
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5338 - accuracy: 0.4781 - val_loss: 0.8228 - val_accuracy: 0.5981
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5533 - accuracy: 0.4781 - val_loss: 0.8157 - val_accuracy: 0.6028
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6056 - accuracy: 0.5064 - val_loss: 0.8427 - val_accuracy: 0.6215
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5695 - accuracy: 0.5064 - val_loss: 0.8900 - val_accuracy: 0.6168
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5011 - accuracy: 0.5013 - val_loss: 0.8619 - val_accuracy: 0.6121
Epoch 101/1000

```
4/4 [=====] - 0s 12ms/step - loss: 0.7102 - accuracy: 0.4910 - val_loss: 0.8807 - val_accuracy: 0.6075
Epoch 102/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5395 - accuracy: 0.5167 - val_loss: 0.8806 - val_accuracy: 0.5935
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5583 - accuracy: 0.4807 - val_loss: 0.8424 - val_accuracy: 0.5935
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6055 - accuracy: 0.4550 - val_loss: 0.9150 - val_accuracy: 0.5981
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5219 - accuracy: 0.5116 - val_loss: 0.9034 - val_accuracy: 0.5888
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6667 - accuracy: 0.5064 - val_loss: 0.8978 - val_accuracy: 0.5935
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5924 - accuracy: 0.5116 - val_loss: 0.8954 - val_accuracy: 0.6121
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5891 - accuracy: 0.4833 - val_loss: 0.8784 - val_accuracy: 0.5981
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5168 - accuracy: 0.4961 - val_loss: 0.8433 - val_accuracy: 0.6028
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5076 - accuracy: 0.5167 - val_loss: 0.8225 - val_accuracy: 0.5935
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5993 - accuracy: 0.4987 - val_loss: 0.8443 - val_accuracy: 0.5794
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5169 - accuracy: 0.4679 - val_loss: 0.8434 - val_accuracy: 0.5841
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4152 - accuracy: 0.5090 - val_loss: 0.8199 - val_accuracy: 0.5654
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5577 - accuracy: 0.4859 - val_loss: 0.8221 - val_accuracy: 0.5421
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4937 - accuracy: 0.4910 - val_loss: 0.8462 - val_accuracy: 0.5514
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4827 - accuracy: 0.5321 - val_loss: 0.8618 - val_accuracy: 0.5467
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6016 - accuracy: 0.4730 - val_loss: 0.8492 - val_accuracy: 0.5561
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5189 - accuracy: 0.4807 - val_loss: 0.8240 - val_accuracy: 0.5794
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5027 - accuracy: 0.4859 - val_loss: 0.8143 - val_accuracy: 0.5701
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4608 - accuracy: 0.4936 - val_loss: 0.8314 - val_accuracy: 0.5701
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5693 - accuracy: 0.4704 - val_loss: 0.8293 - val_accuracy: 0.5748
Epoch 122/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5625 - accuracy: 0.4884 - val_loss: 0.8401 - val_accuracy: 0.5748
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6165 - accuracy: 0.4987 - val_loss: 0.8569 - val_accuracy: 0.5701
Epoch 124/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5370 - accuracy: 0.5090 - val_loss: 0.8873 - val_accuracy: 0.5561
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4876 - accuracy: 0.4884 - val_loss: 0.8623 - val_accuracy: 0.5748
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5226 - accuracy: 0.4987 - val_loss: 0.8098 - val_accuracy: 0.5654
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5849 - accuracy: 0.5167 - val_loss: 0.8319 - val_accuracy: 0.5748
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4702 - accuracy: 0.5321 - val_loss: 0.8348 - val_accuracy: 0.5701
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5435 - accuracy: 0.4961 - val_loss: 0.7856 - val_accuracy: 0.5667
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5398 - accuracy: 0.5090 - val_loss: 0.7981 - val_accuracy: 0.5701
```

Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5191 - accuracy: 0.5450 - val_loss: 0.8095 - val_accuracy: 0.5701
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3520 - accuracy: 0.5090 - val_loss: 0.7910 - val_accuracy: 0.5748
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4118 - accuracy: 0.5167 - val_loss: 0.8005 - val_accuracy: 0.5561
Epoch 134/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5177 - accuracy: 0.5039 - val_loss: 0.8431 - val_accuracy: 0.5374
Epoch 135/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5025 - accuracy: 0.5013 - val_loss: 0.8413 - val_accuracy: 0.5421
Epoch 136/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4744 - accuracy: 0.5141 - val_loss: 0.8279 - val_accuracy: 0.5327
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4077 - accuracy: 0.4807 - val_loss: 0.8834 - val_accuracy: 0.5234
Epoch 138/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5969 - accuracy: 0.5064 - val_loss: 0.8816 - val_accuracy: 0.5187
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4384 - accuracy: 0.4987 - val_loss: 0.9432 - val_accuracy: 0.5280
Epoch 140/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3597 - accuracy: 0.5116 - val_loss: 0.9504 - val_accuracy: 0.5234
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4325 - accuracy: 0.5270 - val_loss: 0.9697 - val_accuracy: 0.5421
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4656 - accuracy: 0.5398 - val_loss: 0.9259 - val_accuracy: 0.5187
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4575 - accuracy: 0.4859 - val_loss: 0.9904 - val_accuracy: 0.5187
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4193 - accuracy: 0.4884 - val_loss: 0.9561 - val_accuracy: 0.5234
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3971 - accuracy: 0.4781 - val_loss: 0.9412 - val_accuracy: 0.5000
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4156 - accuracy: 0.4807 - val_loss: 1.0227 - val_accuracy: 0.5140
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3859 - accuracy: 0.4987 - val_loss: 1.0092 - val_accuracy: 0.5234
Epoch 148/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4431 - accuracy: 0.5141 - val_loss: 1.0134 - val_accuracy: 0.5093
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3758 - accuracy: 0.5039 - val_loss: 1.0571 - val_accuracy: 0.5093
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3883 - accuracy: 0.5090 - val_loss: 1.0921 - val_accuracy: 0.5047
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4145 - accuracy: 0.5013 - val_loss: 1.0864 - val_accuracy: 0.5280
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4090 - accuracy: 0.5219 - val_loss: 1.0774 - val_accuracy: 0.5140
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4245 - accuracy: 0.5141 - val_loss: 1.2652 - val_accuracy: 0.5374
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4021 - accuracy: 0.5450 - val_loss: 1.2529 - val_accuracy: 0.5280
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4661 - accuracy: 0.5090 - val_loss: 1.1872 - val_accuracy: 0.5327
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4342 - accuracy: 0.4987 - val_loss: 1.1481 - val_accuracy: 0.5421
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3773 - accuracy: 0.5476 - val_loss: 1.1278 - val_accuracy: 0.5234
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5015 - accuracy: 0.5373 - val_loss: 1.1223 - val_accuracy: 0.5234
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4407 - accuracy: 0.5476 - val_loss: 1.1489 - val_accuracy: 0.5234
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4414 - accuracy: 0.5501 - val_loss: 1.1413 - val_accuracy: 0.5234

```

accuracy: 0.5093
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3946 - accuracy: 0.5861 - val_loss: 1.2221 - val_accuracy: 0.5187
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3963 - accuracy: 0.5938 - val_loss: 1.2686 - val_accuracy: 0.5187
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4094 - accuracy: 0.5656 - val_loss: 1.2438 - val_accuracy: 0.5093
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4260 - accuracy: 0.5244 - val_loss: 1.2378 - val_accuracy: 0.5047
Epoch 165/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3359 - accuracy: 0.5547Restoring model weights from the end of the best epoch: 15.
4/4 [=====] - 0s 13ms/step - loss: 0.3649 - accuracy: 0.5244 - val_loss: 1.2332 - val_accuracy: 0.5047
Epoch 165: early stopping
2/2 [=====] - 0s 4ms/step - loss: 1.4419 - accuracy: 0.6047
[CV] END .....Dense1=25, Dense2=50; total time= 8.9s
Model: "sequential_33"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_132 (Dense)	(None, 25)	175
batch_normalization_99 (BatchNormalization)	(None, 25)	100
activation_99 (Activation)	(None, 25)	0
dense_133 (Dense)	(None, 50)	1300
batch_normalization_100 (BatchNormalization)	(None, 50)	200
activation_100 (Activation)	(None, 50)	0
dense_134 (Dense)	(None, 10)	510
batch_normalization_101 (BatchNormalization)	(None, 10)	40
activation_101 (Activation)	(None, 10)	0
dense_135 (Dense)	(None, 2)	22
<hr/>		
Total params:	2,347	
Trainable params:	2,177	
Non-trainable params:	170	

```

Epoch 1/1000
4/4 [=====] - 2s 59ms/step - loss: 3.7979 - accuracy: 0.5553 - val_loss: 1.6408 - val_accuracy: 0.6355
Epoch 2/1000
4/4 [=====] - 0s 16ms/step - loss: 3.0269 - accuracy: 0.6118 - val_loss: 1.7582 - val_accuracy: 0.6402
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6896 - accuracy: 0.6118 - val_loss: 1.9230 - val_accuracy: 0.6308
Epoch 4/1000
4/4 [=====] - 0s 16ms/step - loss: 2.6130 - accuracy: 0.6350 - val_loss: 2.0343 - val_accuracy: 0.6542
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 2.4003 - accuracy: 0.6632 - val_loss: 2.1489 - val_accuracy: 0.6589
Epoch 6/1000
4/4 [=====] - 0s 16ms/step - loss: 2.3680 - accuracy: 0.6632 - val_loss: 2.1803 - val_accuracy: 0.6636
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3660 - accuracy: 0.6710 - val_loss: 2.1017 - val_accuracy: 0.6869
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1966 - accuracy: 0.6915 - val_loss: 2.0286 - val_accuracy: 0.6729
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1316 - accuracy: 0.6967 - val_loss: 2.0033 - val_accuracy: 0.6729
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2753 - accuracy: 0.6787 - val_loss: 1.9421 - val_accuracy: 0.6729
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1959 - accuracy: 0.6787 - val_loss: 1.8908 - val_accuracy: 0.6916
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2029 - accuracy: 0.6710 - val_loss: 1.8058 - val_accuracy: 0.7056

```

Epoch 13/1000
4/4 [=====] - 0s 15ms/step - loss: 1.9783 - accuracy: 0.6941 - val_loss: 1.7943 - val_accuracy: 0.7243
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0290 - accuracy: 0.6889 - val_loss: 1.7720 - val_accuracy: 0.7243
Epoch 15/1000
4/4 [=====] - 0s 15ms/step - loss: 1.9514 - accuracy: 0.6761 - val_loss: 1.7438 - val_accuracy: 0.7336
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7465 - accuracy: 0.7044 - val_loss: 1.7173 - val_accuracy: 0.7290
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6857 - accuracy: 0.6838 - val_loss: 1.7291 - val_accuracy: 0.7290
Epoch 18/1000
4/4 [=====] - 0s 15ms/step - loss: 1.7440 - accuracy: 0.7121 - val_loss: 1.7436 - val_accuracy: 0.7243
Epoch 19/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7430 - accuracy: 0.7069 - val_loss: 1.7471 - val_accuracy: 0.7243
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6389 - accuracy: 0.7172 - val_loss: 1.6910 - val_accuracy: 0.7103
Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5180 - accuracy: 0.7172 - val_loss: 1.6537 - val_accuracy: 0.7150
Epoch 22/1000
4/4 [=====] - 0s 15ms/step - loss: 1.5399 - accuracy: 0.7301 - val_loss: 1.6310 - val_accuracy: 0.7336
Epoch 23/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5933 - accuracy: 0.7249 - val_loss: 1.6076 - val_accuracy: 0.7243
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3814 - accuracy: 0.7069 - val_loss: 1.5765 - val_accuracy: 0.7290
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2769 - accuracy: 0.7584 - val_loss: 1.5749 - val_accuracy: 0.7243
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2885 - accuracy: 0.7481 - val_loss: 1.5504 - val_accuracy: 0.7336
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1245 - accuracy: 0.7558 - val_loss: 1.5359 - val_accuracy: 0.7150
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1638 - accuracy: 0.7301 - val_loss: 1.5191 - val_accuracy: 0.7150
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2582 - accuracy: 0.7249 - val_loss: 1.5052 - val_accuracy: 0.7150
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0905 - accuracy: 0.7326 - val_loss: 1.5008 - val_accuracy: 0.7150
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0781 - accuracy: 0.7275 - val_loss: 1.4500 - val_accuracy: 0.7150
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0593 - accuracy: 0.7249 - val_loss: 1.4423 - val_accuracy: 0.7103
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1603 - accuracy: 0.7378 - val_loss: 1.4296 - val_accuracy: 0.7150
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9643 - accuracy: 0.7352 - val_loss: 1.4105 - val_accuracy: 0.7150
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1432 - accuracy: 0.7404 - val_loss: 1.4186 - val_accuracy: 0.7009
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0836 - accuracy: 0.7301 - val_loss: 1.4096 - val_accuracy: 0.7009
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0132 - accuracy: 0.7224 - val_loss: 1.3798 - val_accuracy: 0.7009
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0218 - accuracy: 0.7404 - val_loss: 1.3471 - val_accuracy: 0.7009
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9273 - accuracy: 0.7198 - val_loss: 1.3363 - val_accuracy: 0.7009
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9774 - accuracy: 0.7352 - val_loss: 1.3129 - val_accuracy: 0.6963
Epoch 41/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9915 - accuracy: 0.7326 - val_loss: 1.3036 - val_accuracy: 0.6916
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0356 - accuracy: 0.7121 - val_loss: 1.2920 - val_accuracy: 0.6916

```
accuracy: 0.6869
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9715 - accuracy: 0.7532 - val_loss: 1.2719 - val_
accuracy: 0.6916
Epoch 44/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0468 - accuracy: 0.7326 - val_loss: 1.2560 - val_
accuracy: 0.6963
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9394 - accuracy: 0.7198 - val_loss: 1.2576 - val_
accuracy: 0.6916
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8566 - accuracy: 0.7352 - val_loss: 1.2791 - val_
accuracy: 0.6916
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9176 - accuracy: 0.7326 - val_loss: 1.2653 - val_
accuracy: 0.6963
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9472 - accuracy: 0.7429 - val_loss: 1.3087 - val_
accuracy: 0.6963
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8068 - accuracy: 0.7455 - val_loss: 1.2832 - val_
accuracy: 0.6963
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8347 - accuracy: 0.7378 - val_loss: 1.2593 - val_
accuracy: 0.7009
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7493 - accuracy: 0.7404 - val_loss: 1.2222 - val_
accuracy: 0.7103
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7753 - accuracy: 0.7429 - val_loss: 1.2213 - val_
accuracy: 0.7103
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7425 - accuracy: 0.7455 - val_loss: 1.2420 - val_
accuracy: 0.7103
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7679 - accuracy: 0.7301 - val_loss: 1.2661 - val_
accuracy: 0.7150
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7250 - accuracy: 0.7224 - val_loss: 1.2809 - val_
accuracy: 0.7009
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6082 - accuracy: 0.7147 - val_loss: 1.2334 - val_
accuracy: 0.7009
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8632 - accuracy: 0.7095 - val_loss: 1.2259 - val_
accuracy: 0.7009
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7883 - accuracy: 0.7095 - val_loss: 1.2175 - val_
accuracy: 0.7009
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7056 - accuracy: 0.7224 - val_loss: 1.1927 - val_
accuracy: 0.7009
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6473 - accuracy: 0.7147 - val_loss: 1.2135 - val_
accuracy: 0.6963
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6884 - accuracy: 0.7378 - val_loss: 1.2237 - val_
accuracy: 0.6963
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7003 - accuracy: 0.7198 - val_loss: 1.1281 - val_
accuracy: 0.7009
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6681 - accuracy: 0.7121 - val_loss: 1.1230 - val_
accuracy: 0.6963
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7085 - accuracy: 0.7326 - val_loss: 1.1212 - val_
accuracy: 0.7056
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6744 - accuracy: 0.7301 - val_loss: 1.1051 - val_
accuracy: 0.7056
Epoch 66/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6052 - accuracy: 0.7301 - val_loss: 1.0792 - val_
accuracy: 0.7009
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6736 - accuracy: 0.7249 - val_loss: 1.0776 - val_
accuracy: 0.7056
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7048 - accuracy: 0.7275 - val_loss: 1.0695 - val_
accuracy: 0.6963
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6380 - accuracy: 0.7121 - val_loss: 1.0364 - val_
accuracy: 0.6916
Epoch 70/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6696 - accuracy: 0.7455 - val_loss: 1.0400 - val_
accuracy: 0.6822
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6652 - accuracy: 0.7301 - val_loss: 1.1100 - val_
accuracy: 0.6869
Epoch 72/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.5449 - accuracy: 0.7352 - val_loss: 1.0162 - val_accuracy: 0.6776
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6840 - accuracy: 0.7044 - val_loss: 0.9742 - val_accuracy: 0.6776
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6344 - accuracy: 0.6864 - val_loss: 0.9870 - val_accuracy: 0.6822
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5722 - accuracy: 0.7224 - val_loss: 0.9631 - val_accuracy: 0.6682
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6255 - accuracy: 0.7249 - val_loss: 0.9356 - val_accuracy: 0.6729
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5800 - accuracy: 0.6992 - val_loss: 0.8976 - val_accuracy: 0.6776
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5564 - accuracy: 0.7172 - val_loss: 0.8746 - val_accuracy: 0.6729
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4681 - accuracy: 0.7147 - val_loss: 0.8677 - val_accuracy: 0.6729
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4945 - accuracy: 0.7172 - val_loss: 0.8561 - val_accuracy: 0.6729
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5231 - accuracy: 0.7224 - val_loss: 0.8742 - val_accuracy: 0.6729
Epoch 82/1000
4/4 [=====] - 0s 23ms/step - loss: 0.4760 - accuracy: 0.7249 - val_loss: 0.8729 - val_accuracy: 0.6822
Epoch 83/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4912 - accuracy: 0.6992 - val_loss: 0.8312 - val_accuracy: 0.6729
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5984 - accuracy: 0.7018 - val_loss: 0.8770 - val_accuracy: 0.6776
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5418 - accuracy: 0.7121 - val_loss: 0.8700 - val_accuracy: 0.6776
Epoch 86/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5482 - accuracy: 0.7301 - val_loss: 0.8767 - val_accuracy: 0.6729
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5920 - accuracy: 0.7224 - val_loss: 0.9125 - val_accuracy: 0.6776
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5431 - accuracy: 0.7121 - val_loss: 0.8915 - val_accuracy: 0.6729
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5011 - accuracy: 0.7224 - val_loss: 0.8749 - val_accuracy: 0.7009
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5847 - accuracy: 0.7069 - val_loss: 0.8955 - val_accuracy: 0.6916
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5401 - accuracy: 0.7172 - val_loss: 0.9260 - val_accuracy: 0.6916
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5564 - accuracy: 0.6967 - val_loss: 0.9209 - val_accuracy: 0.6916
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4952 - accuracy: 0.7095 - val_loss: 0.9314 - val_accuracy: 0.6963
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4421 - accuracy: 0.7172 - val_loss: 0.9331 - val_accuracy: 0.7056
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4556 - accuracy: 0.7224 - val_loss: 0.9198 - val_accuracy: 0.7103
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5748 - accuracy: 0.7069 - val_loss: 0.8927 - val_accuracy: 0.6963
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4386 - accuracy: 0.7172 - val_loss: 0.9398 - val_accuracy: 0.7103
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4333 - accuracy: 0.7224 - val_loss: 0.9205 - val_accuracy: 0.7150
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5500 - accuracy: 0.7069 - val_loss: 0.8920 - val_accuracy: 0.7056
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4551 - accuracy: 0.7172 - val_loss: 0.9350 - val_accuracy: 0.7056
Epoch 101/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4604 - accuracy: 0.7147 - val_loss: 0.8469 - val_accuracy: 0.7196
```

```
Epoch 102/1000
4/4 [=====] - 0s 19ms/step - loss: 0.5012 - accuracy: 0.7455 - val_loss: 0.9081 - val_accuracy: 0.6869
Epoch 103/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4457 - accuracy: 0.7326 - val_loss: 0.9270 - val_accuracy: 0.6916
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4317 - accuracy: 0.7172 - val_loss: 0.9449 - val_accuracy: 0.6869
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5179 - accuracy: 0.7121 - val_loss: 0.9466 - val_accuracy: 0.6869
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5197 - accuracy: 0.7198 - val_loss: 0.9660 - val_accuracy: 0.6869
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4315 - accuracy: 0.7147 - val_loss: 0.9631 - val_accuracy: 0.6916
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4772 - accuracy: 0.6967 - val_loss: 0.9527 - val_accuracy: 0.6869
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4956 - accuracy: 0.7198 - val_loss: 0.9618 - val_accuracy: 0.6869
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4126 - accuracy: 0.7352 - val_loss: 0.9648 - val_accuracy: 0.6822
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5331 - accuracy: 0.7044 - val_loss: 0.9861 - val_accuracy: 0.6869
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4877 - accuracy: 0.6992 - val_loss: 0.9558 - val_accuracy: 0.6729
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3976 - accuracy: 0.6967 - val_loss: 1.0143 - val_accuracy: 0.6682
Epoch 114/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3621 - accuracy: 0.7326 - val_loss: 1.0093 - val_accuracy: 0.6589
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4965 - accuracy: 0.7172 - val_loss: 1.0387 - val_accuracy: 0.6542
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3862 - accuracy: 0.7198 - val_loss: 1.0087 - val_accuracy: 0.6542
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4131 - accuracy: 0.7224 - val_loss: 1.0430 - val_accuracy: 0.6589
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3735 - accuracy: 0.7147 - val_loss: 1.0405 - val_accuracy: 0.6729
Epoch 119/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4540 - accuracy: 0.7172 - val_loss: 1.0251 - val_accuracy: 0.6682
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3812 - accuracy: 0.7275 - val_loss: 1.0606 - val_accuracy: 0.6916
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3956 - accuracy: 0.7275 - val_loss: 1.0380 - val_accuracy: 0.6963
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3385 - accuracy: 0.7172 - val_loss: 1.0741 - val_accuracy: 0.7150
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4849 - accuracy: 0.7301 - val_loss: 1.0454 - val_accuracy: 0.6822
Epoch 124/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5278 - accuracy: 0.6967 - val_loss: 1.0448 - val_accuracy: 0.6963
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4157 - accuracy: 0.7095 - val_loss: 1.0128 - val_accuracy: 0.6963
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4515 - accuracy: 0.7147 - val_loss: 1.2046 - val_accuracy: 0.6963
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3763 - accuracy: 0.6992 - val_loss: 1.1809 - val_accuracy: 0.6963
Epoch 128/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3626 - accuracy: 0.7224 - val_loss: 1.2109 - val_accuracy: 0.6916
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3371 - accuracy: 0.7172 - val_loss: 1.1996 - val_accuracy: 0.7103
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5210 - accuracy: 0.7121 - val_loss: 1.2100 - val_accuracy: 0.7103
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3662 - accuracy: 0.7224 - val_loss: 1.1988 - val_accuracy: 0.7103
```

```
accuracy: 0.7103
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4509 - accuracy: 0.7249 - val_loss: 1.1769 - val_accuracy: 0.6869
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3324 - accuracy: 0.7121 - val_loss: 1.1840 - val_accuracy: 0.6776
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5976 - accuracy: 0.7044 - val_loss: 1.2931 - val_accuracy: 0.6822
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3539 - accuracy: 0.7147 - val_loss: 1.2642 - val_accuracy: 0.6822
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3569 - accuracy: 0.7249 - val_loss: 1.2900 - val_accuracy: 0.6822
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3583 - accuracy: 0.6889 - val_loss: 1.2902 - val_accuracy: 0.6869
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4025 - accuracy: 0.7275 - val_loss: 1.2986 - val_accuracy: 0.6916
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3674 - accuracy: 0.7275 - val_loss: 1.3015 - val_accuracy: 0.6869
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4341 - accuracy: 0.7095 - val_loss: 1.2922 - val_accuracy: 0.6916
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4030 - accuracy: 0.6992 - val_loss: 1.2975 - val_accuracy: 0.6869
Epoch 142/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3244 - accuracy: 0.7044 - val_loss: 1.2314 - val_accuracy: 0.6869
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3526 - accuracy: 0.7069 - val_loss: 1.2521 - val_accuracy: 0.6869
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4185 - accuracy: 0.6941 - val_loss: 1.2996 - val_accuracy: 0.6869
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3363 - accuracy: 0.7018 - val_loss: 1.3208 - val_accuracy: 0.6916
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4140 - accuracy: 0.7069 - val_loss: 1.3455 - val_accuracy: 0.6916
Epoch 147/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3828 - accuracy: 0.7198 - val_loss: 1.3234 - val_accuracy: 0.6963
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4724 - accuracy: 0.6992 - val_loss: 1.3714 - val_accuracy: 0.7009
Epoch 149/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3399 - accuracy: 0.7069 - val_loss: 1.3697 - val_accuracy: 0.7056
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3812 - accuracy: 0.6864 - val_loss: 1.3659 - val_accuracy: 0.7150
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3842 - accuracy: 0.7095 - val_loss: 1.3680 - val_accuracy: 0.7150
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3482 - accuracy: 0.7044 - val_loss: 1.3667 - val_accuracy: 0.7196
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3846 - accuracy: 0.7044 - val_loss: 1.3713 - val_accuracy: 0.7196
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3445 - accuracy: 0.6992 - val_loss: 1.3710 - val_accuracy: 0.7290
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3612 - accuracy: 0.7198 - val_loss: 1.3738 - val_accuracy: 0.7290
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3538 - accuracy: 0.7018 - val_loss: 1.3750 - val_accuracy: 0.7383
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3643 - accuracy: 0.6941 - val_loss: 1.3710 - val_accuracy: 0.7383
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4889 - accuracy: 0.6838 - val_loss: 1.3972 - val_accuracy: 0.7290
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3657 - accuracy: 0.7172 - val_loss: 1.3689 - val_accuracy: 0.6963
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4385 - accuracy: 0.7018 - val_loss: 1.3728 - val_accuracy: 0.7009
Epoch 161/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.3200 - accuracy: 0.7095 - val_loss: 1.4294 - val_accuracy: 0.6916
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4335 - accuracy: 0.6992 - val_loss: 1.4135 - val_accuracy: 0.7056
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3519 - accuracy: 0.6967 - val_loss: 1.3680 - val_accuracy: 0.7009
Epoch 164/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3094 - accuracy: 0.6915 - val_loss: 1.4485 - val_accuracy: 0.7009
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3550 - accuracy: 0.7095 - val_loss: 1.5145 - val_accuracy: 0.7009
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3504 - accuracy: 0.6555 - val_loss: 1.4158 - val_accuracy: 0.7056
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3369 - accuracy: 0.6864 - val_loss: 1.3495 - val_accuracy: 0.7056
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3513 - accuracy: 0.6735 - val_loss: 1.4305 - val_accuracy: 0.7103
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3544 - accuracy: 0.7147 - val_loss: 1.4100 - val_accuracy: 0.7056
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3491 - accuracy: 0.7121 - val_loss: 1.4608 - val_accuracy: 0.7009
Epoch 171/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3682 - accuracy: 0.6967 - val_loss: 1.4367 - val_accuracy: 0.6916
Epoch 172/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3899 - accuracy: 0.7018 - val_loss: 1.3703 - val_accuracy: 0.7196
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3502 - accuracy: 0.7198 - val_loss: 1.3822 - val_accuracy: 0.7243
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4180 - accuracy: 0.7069 - val_loss: 1.4146 - val_accuracy: 0.7150
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3679 - accuracy: 0.7326 - val_loss: 1.4394 - val_accuracy: 0.7056
Epoch 176/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4567 - accuracy: 0.7172 - val_loss: 1.4371 - val_accuracy: 0.7103
Epoch 177/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4039 - accuracy: 0.7069 - val_loss: 1.5084 - val_accuracy: 0.7056
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2839 - accuracy: 0.7121 - val_loss: 1.4622 - val_accuracy: 0.7103
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3805 - accuracy: 0.7069 - val_loss: 1.4548 - val_accuracy: 0.6869
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3593 - accuracy: 0.7172 - val_loss: 1.4518 - val_accuracy: 0.6916
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3094 - accuracy: 0.6941 - val_loss: 1.4804 - val_accuracy: 0.6916
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4110 - accuracy: 0.6992 - val_loss: 1.5779 - val_accuracy: 0.6916
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3773 - accuracy: 0.7301 - val_loss: 1.5180 - val_accuracy: 0.6916
Epoch 184/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4181 - accuracy: 0.7481 - val_loss: 1.5636 - val_accuracy: 0.6869
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4621 - accuracy: 0.7275 - val_loss: 1.5783 - val_accuracy: 0.7009
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3087 - accuracy: 0.6812 - val_loss: 1.5494 - val_accuracy: 0.7009
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3921 - accuracy: 0.6941 - val_loss: 1.5211 - val_accuracy: 0.7009
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2948 - accuracy: 0.7095 - val_loss: 1.5424 - val_accuracy: 0.6869
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3897 - accuracy: 0.7018 - val_loss: 1.5079 - val_accuracy: 0.7009
Epoch 190/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3374 - accuracy: 0.7044 - val_loss: 1.4818 - val_accuracy: 0.6869
```

Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3417 - accuracy: 0.7147 - val_loss: 1.4794 - val_accuracy: 0.6963
Epoch 192/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3194 - accuracy: 0.7455 - val_loss: 1.5123 - val_accuracy: 0.6822
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4105 - accuracy: 0.6838 - val_loss: 1.5878 - val_accuracy: 0.6869
Epoch 194/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3322 - accuracy: 0.7095 - val_loss: 1.5783 - val_accuracy: 0.6822
Epoch 195/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3714 - accuracy: 0.7069 - val_loss: 1.6278 - val_accuracy: 0.6776
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3198 - accuracy: 0.6967 - val_loss: 1.5934 - val_accuracy: 0.6963
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2476 - accuracy: 0.7018 - val_loss: 1.6246 - val_accuracy: 0.7009
Epoch 198/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3144 - accuracy: 0.7095 - val_loss: 1.4985 - val_accuracy: 0.7103
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2956 - accuracy: 0.7018 - val_loss: 1.5842 - val_accuracy: 0.7009
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2937 - accuracy: 0.6915 - val_loss: 1.5613 - val_accuracy: 0.6963
Epoch 201/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4923 - accuracy: 0.6941 - val_loss: 1.5931 - val_accuracy: 0.6776
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2872 - accuracy: 0.6812 - val_loss: 1.6548 - val_accuracy: 0.6776
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3119 - accuracy: 0.6864 - val_loss: 1.5913 - val_accuracy: 0.6822
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4422 - accuracy: 0.6710 - val_loss: 1.5875 - val_accuracy: 0.6682
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3731 - accuracy: 0.6812 - val_loss: 1.6460 - val_accuracy: 0.6729
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3535 - accuracy: 0.6838 - val_loss: 1.5688 - val_accuracy: 0.6822
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4491 - accuracy: 0.6889 - val_loss: 1.6108 - val_accuracy: 0.6729
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3672 - accuracy: 0.6889 - val_loss: 1.4962 - val_accuracy: 0.6869
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4081 - accuracy: 0.6864 - val_loss: 1.5756 - val_accuracy: 0.6776
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3337 - accuracy: 0.6889 - val_loss: 1.5772 - val_accuracy: 0.6776
Epoch 211/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2571 - accuracy: 0.7069 - val_loss: 1.5759 - val_accuracy: 0.6729
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3372 - accuracy: 0.6607 - val_loss: 1.5456 - val_accuracy: 0.6776
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2982 - accuracy: 0.7147 - val_loss: 1.5483 - val_accuracy: 0.6636
Epoch 214/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2910 - accuracy: 0.6941 - val_loss: 1.5249 - val_accuracy: 0.6682
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3077 - accuracy: 0.6710 - val_loss: 1.5283 - val_accuracy: 0.6682
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3154 - accuracy: 0.6735 - val_loss: 1.5938 - val_accuracy: 0.6729
Epoch 217/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3010 - accuracy: 0.6735 - val_loss: 1.5403 - val_accuracy: 0.6729
Epoch 218/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3192 - accuracy: 0.6607 - val_loss: 1.5337 - val_accuracy: 0.6776
Epoch 219/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3199 - accuracy: 0.6812 - val_loss: 1.5337 - val_accuracy: 0.6869
Epoch 220/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2897 - accuracy: 0.6607 - val_loss: 1.5590 - val_accuracy: 0.6869

accuracy: 0.6776
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3505 - accuracy: 0.6607 - val_loss: 1.5528 - val_accuracy: 0.6589
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3345 - accuracy: 0.6812 - val_loss: 1.5809 - val_accuracy: 0.6542
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3484 - accuracy: 0.6504 - val_loss: 1.5536 - val_accuracy: 0.6636
Epoch 224/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3286 - accuracy: 0.6812 - val_loss: 1.5491 - val_accuracy: 0.6729
Epoch 225/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2700 - accuracy: 0.6607 - val_loss: 1.5568 - val_accuracy: 0.6729
Epoch 226/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3651 - accuracy: 0.6658 - val_loss: 1.4974 - val_accuracy: 0.6729
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2364 - accuracy: 0.6658 - val_loss: 1.5359 - val_accuracy: 0.6729
Epoch 228/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4315 - accuracy: 0.6710 - val_loss: 1.5572 - val_accuracy: 0.6729
Epoch 229/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3224 - accuracy: 0.7069 - val_loss: 1.5525 - val_accuracy: 0.6636
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2674 - accuracy: 0.7172 - val_loss: 1.5232 - val_accuracy: 0.6729
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3158 - accuracy: 0.7198 - val_loss: 1.5440 - val_accuracy: 0.6682
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3794 - accuracy: 0.6864 - val_loss: 1.5092 - val_accuracy: 0.6729
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3374 - accuracy: 0.6889 - val_loss: 1.5058 - val_accuracy: 0.6542
Epoch 234/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3010 - accuracy: 0.7018 - val_loss: 1.5059 - val_accuracy: 0.6636
Epoch 235/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2832 - accuracy: 0.7044 - val_loss: 1.5291 - val_accuracy: 0.6636
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2740 - accuracy: 0.7429 - val_loss: 1.5645 - val_accuracy: 0.6589
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2841 - accuracy: 0.7249 - val_loss: 1.6067 - val_accuracy: 0.6449
Epoch 238/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3036 - accuracy: 0.7275 - val_loss: 1.6052 - val_accuracy: 0.6636
Epoch 239/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3289 - accuracy: 0.7121 - val_loss: 1.6528 - val_accuracy: 0.6682
Epoch 240/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4152 - accuracy: 0.7429 - val_loss: 1.6451 - val_accuracy: 0.6682
Epoch 241/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3201 - accuracy: 0.7044 - val_loss: 1.6111 - val_accuracy: 0.6682
Epoch 242/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3414 - accuracy: 0.7018 - val_loss: 1.5798 - val_accuracy: 0.6776
Epoch 243/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3423 - accuracy: 0.7198 - val_loss: 1.6694 - val_accuracy: 0.6636
Epoch 244/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3085 - accuracy: 0.7198 - val_loss: 1.6074 - val_accuracy: 0.6682
Epoch 245/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2888 - accuracy: 0.7326 - val_loss: 1.6117 - val_accuracy: 0.6869
Epoch 246/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3372 - accuracy: 0.7352 - val_loss: 1.6258 - val_accuracy: 0.6729
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2547 - accuracy: 0.7198 - val_loss: 1.6713 - val_accuracy: 0.6822
Epoch 248/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2964 - accuracy: 0.6992 - val_loss: 1.7523 - val_accuracy: 0.6636
Epoch 249/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3287 - accuracy: 0.7172 - val_loss: 1.6269 - val_accuracy: 0.6729
Epoch 250/1000

```
4/4 [=====] - 0s 12ms/step - loss: 0.2420 - accuracy: 0.6967 - val_loss: 1.6927 - val_accuracy: 0.6495
Epoch 251/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2843 - accuracy: 0.7198 - val_loss: 1.6582 - val_accuracy: 0.6495
Epoch 252/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3599 - accuracy: 0.7172 - val_loss: 1.6226 - val_accuracy: 0.6542
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3205 - accuracy: 0.7147 - val_loss: 1.6230 - val_accuracy: 0.6355
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2842 - accuracy: 0.7224 - val_loss: 1.6314 - val_accuracy: 0.6542
Epoch 255/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2992 - accuracy: 0.7249 - val_loss: 1.6564 - val_accuracy: 0.6682
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3022 - accuracy: 0.7172 - val_loss: 1.6330 - val_accuracy: 0.6589
Epoch 257/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2604 - accuracy: 0.7147 - val_loss: 1.7151 - val_accuracy: 0.6682
Epoch 258/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2682 - accuracy: 0.7172 - val_loss: 1.6574 - val_accuracy: 0.6822
Epoch 259/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4060 - accuracy: 0.7095 - val_loss: 1.7084 - val_accuracy: 0.7009
Epoch 260/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3077 - accuracy: 0.7224 - val_loss: 1.6616 - val_accuracy: 0.6963
Epoch 261/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2822 - accuracy: 0.7018 - val_loss: 1.6832 - val_accuracy: 0.6963
Epoch 262/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2994 - accuracy: 0.7429 - val_loss: 1.7134 - val_accuracy: 0.6869
Epoch 263/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3328 - accuracy: 0.7249 - val_loss: 1.7495 - val_accuracy: 0.6729
Epoch 264/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3559 - accuracy: 0.7095 - val_loss: 1.7609 - val_accuracy: 0.6869
Epoch 265/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2998 - accuracy: 0.7069 - val_loss: 1.6885 - val_accuracy: 0.6776
Epoch 266/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3179 - accuracy: 0.6941 - val_loss: 1.8095 - val_accuracy: 0.6963
Epoch 267/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3431 - accuracy: 0.7121 - val_loss: 1.7601 - val_accuracy: 0.6869
Epoch 268/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3259 - accuracy: 0.7172 - val_loss: 1.7696 - val_accuracy: 0.6963
Epoch 269/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2309 - accuracy: 0.7069 - val_loss: 1.7093 - val_accuracy: 0.6963
Epoch 270/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2397 - accuracy: 0.7301 - val_loss: 1.7131 - val_accuracy: 0.6963
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4133 - accuracy: 0.7301 - val_loss: 1.6776 - val_accuracy: 0.6963
Epoch 272/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2959 - accuracy: 0.6992 - val_loss: 1.6244 - val_accuracy: 0.6822
Epoch 273/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2999 - accuracy: 0.7044 - val_loss: 1.6152 - val_accuracy: 0.6636
Epoch 274/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2556 - accuracy: 0.7301 - val_loss: 1.6228 - val_accuracy: 0.6776
Epoch 275/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2302 - accuracy: 0.7121 - val_loss: 1.6187 - val_accuracy: 0.6963
Epoch 276/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2780 - accuracy: 0.7198 - val_loss: 1.7615 - val_accuracy: 0.6682
Epoch 277/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2588 - accuracy: 0.7378 - val_loss: 1.7015 - val_accuracy: 0.6822
Epoch 278/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2552 - accuracy: 0.6658 - val_loss: 1.6970 - val_accuracy: 0.6682
Epoch 279/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2608 - accuracy: 0.6941 - val_loss: 1.7170 - val_accuracy: 0.6729
```

Epoch 280/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3327 - accuracy: 0.7069 - val_loss: 1.7085 - val_accuracy: 0.6822
 Epoch 281/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2983 - accuracy: 0.7147 - val_loss: 1.7419 - val_accuracy: 0.6636
 Epoch 282/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3363 - accuracy: 0.7198 - val_loss: 1.7602 - val_accuracy: 0.6636
 Epoch 283/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2808 - accuracy: 0.7198 - val_loss: 1.9347 - val_accuracy: 0.6449
 Epoch 284/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3010 - accuracy: 0.7147 - val_loss: 1.7398 - val_accuracy: 0.6449
 Epoch 285/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2443 - accuracy: 0.7044 - val_loss: 1.7829 - val_accuracy: 0.6402
 Epoch 286/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2998 - accuracy: 0.7224 - val_loss: 1.8043 - val_accuracy: 0.6355
 Epoch 287/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2917 - accuracy: 0.6941 - val_loss: 1.7618 - val_accuracy: 0.6355
 Epoch 288/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2685 - accuracy: 0.6941 - val_loss: 1.7317 - val_accuracy: 0.6776
 Epoch 289/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2031 - accuracy: 0.7147 - val_loss: 1.8215 - val_accuracy: 0.6729
 Epoch 290/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2227 - accuracy: 0.6992 - val_loss: 1.8051 - val_accuracy: 0.6682
 Epoch 291/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3063 - accuracy: 0.7095 - val_loss: 1.7523 - val_accuracy: 0.6682
 Epoch 292/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3194 - accuracy: 0.6915 - val_loss: 1.5859 - val_accuracy: 0.6963
 Epoch 293/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3460 - accuracy: 0.7044 - val_loss: 1.5852 - val_accuracy: 0.7056
 Epoch 294/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2506 - accuracy: 0.7224 - val_loss: 1.6805 - val_accuracy: 0.6916
 Epoch 295/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2234 - accuracy: 0.7121 - val_loss: 1.7635 - val_accuracy: 0.6869
 Epoch 296/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2480 - accuracy: 0.7095 - val_loss: 1.7983 - val_accuracy: 0.6869
 Epoch 297/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3438 - accuracy: 0.7249 - val_loss: 1.7326 - val_accuracy: 0.6916
 Epoch 298/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2491 - accuracy: 0.7069 - val_loss: 1.7064 - val_accuracy: 0.6636
 Epoch 299/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2932 - accuracy: 0.6941 - val_loss: 1.7167 - val_accuracy: 0.6729
 Epoch 300/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2875 - accuracy: 0.7095 - val_loss: 1.6850 - val_accuracy: 0.6636
 Epoch 301/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3240 - accuracy: 0.7018 - val_loss: 1.6839 - val_accuracy: 0.6355
 Epoch 302/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3029 - accuracy: 0.6992 - val_loss: 1.6787 - val_accuracy: 0.6589
 Epoch 303/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2496 - accuracy: 0.6992 - val_loss: 1.6862 - val_accuracy: 0.6729
 Epoch 304/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2236 - accuracy: 0.6992 - val_loss: 1.7093 - val_accuracy: 0.6682
 Epoch 305/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2060 - accuracy: 0.6967 - val_loss: 1.6243 - val_accuracy: 0.6729
 Epoch 306/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.3443 - accuracy: 0.7344Restoring model weights from the end of the best epoch: 156.
 4/4 [=====] - 0s 15ms/step - loss: 0.3191 - accuracy: 0.7069 - val_loss: 1.6205 - val_accuracy: 0.6589
 Epoch 306: early stopping
 2/2 [=====] - 0s 4ms/step - loss: 0.6150 - accuracy: 0.7674
 [CV] ENDDense1=25, Dense2=50; total time= 16.3s
 Model: "sequential_34"

Layer (type)	Output Shape	Param #
--------------	--------------	---------

```
=====
dense_136 (Dense)          (None, 25)           175
batch_normalization_102 (Ba (None, 25)
tchNormalization)          100
activation_102 (Activation) (None, 25)           0
dense_137 (Dense)          (None, 50)            1300
batch_normalization_103 (Ba (None, 50)
tchNormalization)          200
activation_103 (Activation) (None, 50)           0
dense_138 (Dense)          (None, 10)            510
batch_normalization_104 (Ba (None, 10)
tchNormalization)          40
activation_104 (Activation) (None, 10)           0
dense_139 (Dense)          (None, 2)             22
=====

Total params: 2,347
Trainable params: 2,177
Non-trainable params: 170

Epoch 1/1000
4/4 [=====] - 1s 59ms/step - loss: 5.0502 - accuracy: 0.4859 - val_loss: 3.0204 - val_accuracy: 0.5794
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3875 - accuracy: 0.5270 - val_loss: 2.6474 - val_accuracy: 0.5654
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 2.9922 - accuracy: 0.5707 - val_loss: 2.3602 - val_accuracy: 0.5794
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8071 - accuracy: 0.5270 - val_loss: 2.2163 - val_accuracy: 0.6215
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3960 - accuracy: 0.5578 - val_loss: 2.1495 - val_accuracy: 0.6168
Epoch 6/1000
4/4 [=====] - 0s 15ms/step - loss: 2.3851 - accuracy: 0.5476 - val_loss: 2.1568 - val_accuracy: 0.6402
Epoch 7/1000
4/4 [=====] - 0s 15ms/step - loss: 2.5071 - accuracy: 0.5656 - val_loss: 2.1812 - val_accuracy: 0.6636
Epoch 8/1000
4/4 [=====] - 0s 15ms/step - loss: 2.2866 - accuracy: 0.5578 - val_loss: 2.1036 - val_accuracy: 0.7103
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3578 - accuracy: 0.5835 - val_loss: 2.0797 - val_accuracy: 0.7103
Epoch 10/1000
4/4 [=====] - 0s 15ms/step - loss: 2.1219 - accuracy: 0.5887 - val_loss: 2.0602 - val_accuracy: 0.7103
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0487 - accuracy: 0.5733 - val_loss: 2.0292 - val_accuracy: 0.7056
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9943 - accuracy: 0.5964 - val_loss: 1.9500 - val_accuracy: 0.6916
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0967 - accuracy: 0.5964 - val_loss: 1.9158 - val_accuracy: 0.6916
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6425 - accuracy: 0.6041 - val_loss: 1.8459 - val_accuracy: 0.6916
Epoch 15/1000
4/4 [=====] - 0s 15ms/step - loss: 1.7880 - accuracy: 0.5990 - val_loss: 1.8086 - val_accuracy: 0.6916
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7429 - accuracy: 0.6093 - val_loss: 1.7912 - val_accuracy: 0.6822
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7880 - accuracy: 0.5938 - val_loss: 1.7871 - val_accuracy: 0.6729
Epoch 18/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6238 - accuracy: 0.6221 - val_loss: 1.7553 - val_accuracy: 0.6682
Epoch 19/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6319 - accuracy: 0.6041 - val_loss: 1.7299 - val_accuracy: 0.6963
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4739 - accuracy: 0.6221 - val_loss: 1.7467 - val_accuracy: 0.6869
```

Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6194 - accuracy: 0.6144 - val_loss: 1.6942 - val_accuracy: 0.6822
Epoch 22/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4183 - accuracy: 0.6221 - val_loss: 1.6683 - val_accuracy: 0.6822
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7301 - accuracy: 0.6093 - val_loss: 1.6513 - val_accuracy: 0.6776
Epoch 24/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4272 - accuracy: 0.6298 - val_loss: 1.5712 - val_accuracy: 0.6729
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3302 - accuracy: 0.6272 - val_loss: 1.5752 - val_accuracy: 0.6776
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3595 - accuracy: 0.6221 - val_loss: 1.5719 - val_accuracy: 0.6729
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3403 - accuracy: 0.6350 - val_loss: 1.5485 - val_accuracy: 0.6682
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2626 - accuracy: 0.6427 - val_loss: 1.5144 - val_accuracy: 0.6729
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5516 - accuracy: 0.6684 - val_loss: 1.4806 - val_accuracy: 0.6682
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3237 - accuracy: 0.6735 - val_loss: 1.4990 - val_accuracy: 0.6636
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1526 - accuracy: 0.6607 - val_loss: 1.4690 - val_accuracy: 0.6682
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1206 - accuracy: 0.6761 - val_loss: 1.4588 - val_accuracy: 0.6636
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1747 - accuracy: 0.6607 - val_loss: 1.4335 - val_accuracy: 0.6682
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3281 - accuracy: 0.6581 - val_loss: 1.4026 - val_accuracy: 0.6682
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2929 - accuracy: 0.6607 - val_loss: 1.3865 - val_accuracy: 0.6776
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2056 - accuracy: 0.6684 - val_loss: 1.3665 - val_accuracy: 0.6776
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1103 - accuracy: 0.6941 - val_loss: 1.3299 - val_accuracy: 0.6589
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2347 - accuracy: 0.6787 - val_loss: 1.3396 - val_accuracy: 0.6682
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2818 - accuracy: 0.6838 - val_loss: 1.2789 - val_accuracy: 0.6963
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2518 - accuracy: 0.6632 - val_loss: 1.2277 - val_accuracy: 0.6916
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0195 - accuracy: 0.6864 - val_loss: 1.2094 - val_accuracy: 0.6963
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0215 - accuracy: 0.6941 - val_loss: 1.1937 - val_accuracy: 0.6916
Epoch 43/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1080 - accuracy: 0.7147 - val_loss: 1.1897 - val_accuracy: 0.6869
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9978 - accuracy: 0.7198 - val_loss: 1.1731 - val_accuracy: 0.6916
Epoch 45/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0339 - accuracy: 0.6915 - val_loss: 1.1575 - val_accuracy: 0.6916
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0056 - accuracy: 0.6992 - val_loss: 1.1375 - val_accuracy: 0.6963
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9724 - accuracy: 0.6787 - val_loss: 1.1325 - val_accuracy: 0.6916
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8979 - accuracy: 0.7018 - val_loss: 1.1262 - val_accuracy: 0.6869
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7172 - accuracy: 0.7326 - val_loss: 1.0848 - val_accuracy: 0.6822
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8848 - accuracy: 0.6864 - val_loss: 1.0242 - val_accuracy: 0.6822

```
accuracy: 0.6869
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7848 - accuracy: 0.6992 - val_loss: 1.0336 - val_accuracy: 0.6822
Epoch 52/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8896 - accuracy: 0.6992 - val_loss: 1.0094 - val_accuracy: 0.6729
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8127 - accuracy: 0.6967 - val_loss: 1.0305 - val_accuracy: 0.6916
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9198 - accuracy: 0.6864 - val_loss: 1.0238 - val_accuracy: 0.7056
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7376 - accuracy: 0.7301 - val_loss: 0.9993 - val_accuracy: 0.7103
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7697 - accuracy: 0.6915 - val_loss: 0.9882 - val_accuracy: 0.7056
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7202 - accuracy: 0.7198 - val_loss: 0.9821 - val_accuracy: 0.7056
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7256 - accuracy: 0.6915 - val_loss: 0.9703 - val_accuracy: 0.7056
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6599 - accuracy: 0.7378 - val_loss: 0.9581 - val_accuracy: 0.7196
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6868 - accuracy: 0.7121 - val_loss: 0.9473 - val_accuracy: 0.7056
Epoch 61/1000
4/4 [=====] - 0s 18ms/step - loss: 0.7508 - accuracy: 0.6889 - val_loss: 0.9296 - val_accuracy: 0.7103
Epoch 62/1000
4/4 [=====] - 0s 17ms/step - loss: 0.7514 - accuracy: 0.6889 - val_loss: 0.9220 - val_accuracy: 0.7196
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7649 - accuracy: 0.7249 - val_loss: 0.9062 - val_accuracy: 0.7196
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7020 - accuracy: 0.7404 - val_loss: 0.8987 - val_accuracy: 0.7103
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6528 - accuracy: 0.7301 - val_loss: 0.8941 - val_accuracy: 0.7103
Epoch 66/1000
4/4 [=====] - 0s 17ms/step - loss: 0.9505 - accuracy: 0.6992 - val_loss: 0.8724 - val_accuracy: 0.7243
Epoch 67/1000
4/4 [=====] - 0s 17ms/step - loss: 0.6374 - accuracy: 0.7481 - val_loss: 0.8724 - val_accuracy: 0.7243
Epoch 68/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5629 - accuracy: 0.7429 - val_loss: 0.8381 - val_accuracy: 0.7290
Epoch 69/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6671 - accuracy: 0.7352 - val_loss: 0.8522 - val_accuracy: 0.7430
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6181 - accuracy: 0.7455 - val_loss: 0.9119 - val_accuracy: 0.7150
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5608 - accuracy: 0.7326 - val_loss: 0.8820 - val_accuracy: 0.7290
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6107 - accuracy: 0.7275 - val_loss: 0.8853 - val_accuracy: 0.7290
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5845 - accuracy: 0.7429 - val_loss: 0.8766 - val_accuracy: 0.7336
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6624 - accuracy: 0.7429 - val_loss: 0.8722 - val_accuracy: 0.7243
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5602 - accuracy: 0.7275 - val_loss: 0.8514 - val_accuracy: 0.7383
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6155 - accuracy: 0.7147 - val_loss: 0.9175 - val_accuracy: 0.7430
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5906 - accuracy: 0.7481 - val_loss: 0.9123 - val_accuracy: 0.7383
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5789 - accuracy: 0.7609 - val_loss: 0.9480 - val_accuracy: 0.7336
Epoch 79/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6258 - accuracy: 0.7404 - val_loss: 0.9410 - val_accuracy: 0.7336
Epoch 80/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 0.5825 - accuracy: 0.7326 - val_loss: 0.8875 - val_accuracy: 0.7336
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5606 - accuracy: 0.7481 - val_loss: 0.8938 - val_accuracy: 0.7430
Epoch 82/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6698 - accuracy: 0.7147 - val_loss: 0.8712 - val_accuracy: 0.7336
Epoch 83/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5862 - accuracy: 0.7558 - val_loss: 0.9003 - val_accuracy: 0.7477
Epoch 84/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4855 - accuracy: 0.7429 - val_loss: 0.9238 - val_accuracy: 0.7523
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6042 - accuracy: 0.7172 - val_loss: 0.8689 - val_accuracy: 0.7477
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5078 - accuracy: 0.7686 - val_loss: 0.9134 - val_accuracy: 0.7477
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5324 - accuracy: 0.7352 - val_loss: 0.9143 - val_accuracy: 0.7430
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5797 - accuracy: 0.7558 - val_loss: 0.9770 - val_accuracy: 0.7290
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6338 - accuracy: 0.7224 - val_loss: 0.9431 - val_accuracy: 0.7196
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5547 - accuracy: 0.7352 - val_loss: 0.9641 - val_accuracy: 0.7383
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4941 - accuracy: 0.7609 - val_loss: 0.9844 - val_accuracy: 0.7336
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5793 - accuracy: 0.7352 - val_loss: 0.9846 - val_accuracy: 0.7196
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5381 - accuracy: 0.7481 - val_loss: 0.9304 - val_accuracy: 0.7103
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5017 - accuracy: 0.7481 - val_loss: 0.9303 - val_accuracy: 0.7150
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5908 - accuracy: 0.7198 - val_loss: 0.9559 - val_accuracy: 0.7383
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6833 - accuracy: 0.7481 - val_loss: 0.9288 - val_accuracy: 0.7290
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5748 - accuracy: 0.7455 - val_loss: 0.9669 - val_accuracy: 0.7243
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4867 - accuracy: 0.7404 - val_loss: 0.9378 - val_accuracy: 0.7196
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4287 - accuracy: 0.7686 - val_loss: 0.9306 - val_accuracy: 0.7243
Epoch 100/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5004 - accuracy: 0.7455 - val_loss: 0.9365 - val_accuracy: 0.7336
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4699 - accuracy: 0.7558 - val_loss: 0.9374 - val_accuracy: 0.7243
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5152 - accuracy: 0.7738 - val_loss: 0.9914 - val_accuracy: 0.7290
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6708 - accuracy: 0.7455 - val_loss: 1.0576 - val_accuracy: 0.7243
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4910 - accuracy: 0.7558 - val_loss: 1.0295 - val_accuracy: 0.7196
Epoch 105/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4405 - accuracy: 0.7404 - val_loss: 1.0278 - val_accuracy: 0.7336
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5820 - accuracy: 0.7661 - val_loss: 1.0509 - val_accuracy: 0.7150
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6107 - accuracy: 0.7789 - val_loss: 1.0063 - val_accuracy: 0.7196
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5187 - accuracy: 0.7249 - val_loss: 1.0011 - val_accuracy: 0.7196
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4703 - accuracy: 0.7661 - val_loss: 0.9749 - val_accuracy: 0.7150
```

Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4298 - accuracy: 0.7429 - val_loss: 0.9819 - val_accuracy: 0.7150
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5930 - accuracy: 0.7326 - val_loss: 1.0012 - val_accuracy: 0.7103
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5004 - accuracy: 0.7532 - val_loss: 0.9892 - val_accuracy: 0.7103
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5067 - accuracy: 0.7481 - val_loss: 0.9586 - val_accuracy: 0.7150
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4407 - accuracy: 0.7584 - val_loss: 0.9291 - val_accuracy: 0.7056
Epoch 115/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5192 - accuracy: 0.7841 - val_loss: 0.9486 - val_accuracy: 0.7150
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4847 - accuracy: 0.7635 - val_loss: 0.9418 - val_accuracy: 0.7243
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5215 - accuracy: 0.7815 - val_loss: 0.9352 - val_accuracy: 0.7290
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5365 - accuracy: 0.7635 - val_loss: 0.9499 - val_accuracy: 0.7243
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5678 - accuracy: 0.7532 - val_loss: 0.9532 - val_accuracy: 0.7150
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5568 - accuracy: 0.7584 - val_loss: 0.9809 - val_accuracy: 0.7243
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4341 - accuracy: 0.7661 - val_loss: 1.0066 - val_accuracy: 0.7103
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4673 - accuracy: 0.7738 - val_loss: 1.0172 - val_accuracy: 0.7383
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5658 - accuracy: 0.7506 - val_loss: 1.0362 - val_accuracy: 0.7383
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6311 - accuracy: 0.7763 - val_loss: 1.0668 - val_accuracy: 0.7383
Epoch 125/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5279 - accuracy: 0.7789 - val_loss: 1.0228 - val_accuracy: 0.6776
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5712 - accuracy: 0.7455 - val_loss: 0.9798 - val_accuracy: 0.6822
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5401 - accuracy: 0.7506 - val_loss: 0.9503 - val_accuracy: 0.6822
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5744 - accuracy: 0.7326 - val_loss: 1.0254 - val_accuracy: 0.7150
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4782 - accuracy: 0.7481 - val_loss: 1.0675 - val_accuracy: 0.7056
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5233 - accuracy: 0.7481 - val_loss: 1.0692 - val_accuracy: 0.6869
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5451 - accuracy: 0.7404 - val_loss: 1.0928 - val_accuracy: 0.7103
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4190 - accuracy: 0.7609 - val_loss: 1.0936 - val_accuracy: 0.7150
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5686 - accuracy: 0.7712 - val_loss: 1.0689 - val_accuracy: 0.7196
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4505 - accuracy: 0.7506 - val_loss: 1.0684 - val_accuracy: 0.7196
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4491 - accuracy: 0.7661 - val_loss: 1.1693 - val_accuracy: 0.7196
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5109 - accuracy: 0.7763 - val_loss: 1.1696 - val_accuracy: 0.7243
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5188 - accuracy: 0.7584 - val_loss: 1.1482 - val_accuracy: 0.7243
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5580 - accuracy: 0.7789 - val_loss: 1.1371 - val_accuracy: 0.7056
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6083 - accuracy: 0.7172 - val_loss: 1.1242 - val_accuracy: 0.7150

```
accuracy: 0.7103
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5241 - accuracy: 0.7352 - val_loss: 1.1213 - val_
accuracy: 0.7009
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4578 - accuracy: 0.7326 - val_loss: 1.1201 - val_
accuracy: 0.7056
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4924 - accuracy: 0.7326 - val_loss: 1.1184 - val_
accuracy: 0.7103
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4464 - accuracy: 0.7763 - val_loss: 1.1157 - val_
accuracy: 0.7150
Epoch 144/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4074 - accuracy: 0.7609 - val_loss: 1.1505 - val_
accuracy: 0.7009
Epoch 145/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5273 - accuracy: 0.7455 - val_loss: 1.1829 - val_
accuracy: 0.6963
Epoch 146/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5281 - accuracy: 0.7481 - val_loss: 1.1923 - val_
accuracy: 0.7009
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4165 - accuracy: 0.7481 - val_loss: 1.1603 - val_
accuracy: 0.7009
Epoch 148/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7000 - accuracy: 0.7481 - val_loss: 1.2312 - val_
accuracy: 0.7009
Epoch 149/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6082 - accuracy: 0.7506 - val_loss: 1.2331 - val_
accuracy: 0.7009
Epoch 150/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3750 - accuracy: 0.7455 - val_loss: 1.2537 - val_
accuracy: 0.6963
Epoch 151/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4805 - accuracy: 0.7147 - val_loss: 1.2824 - val_
accuracy: 0.7290
Epoch 152/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4521 - accuracy: 0.7866 - val_loss: 1.3079 - val_
accuracy: 0.7336
Epoch 153/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5841 - accuracy: 0.7378 - val_loss: 1.3625 - val_
accuracy: 0.7477
Epoch 154/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4299 - accuracy: 0.7686 - val_loss: 1.3852 - val_
accuracy: 0.7383
Epoch 155/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4810 - accuracy: 0.7532 - val_loss: 1.3801 - val_
accuracy: 0.7477
Epoch 156/1000
4/4 [=====] - 0s 19ms/step - loss: 0.4179 - accuracy: 0.7532 - val_loss: 1.3564 - val_
accuracy: 0.7617
Epoch 157/1000
4/4 [=====] - 0s 18ms/step - loss: 0.3963 - accuracy: 0.7686 - val_loss: 1.3885 - val_
accuracy: 0.7523
Epoch 158/1000
4/4 [=====] - 0s 17ms/step - loss: 0.5529 - accuracy: 0.7584 - val_loss: 1.3615 - val_
accuracy: 0.7477
Epoch 159/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4687 - accuracy: 0.7532 - val_loss: 1.3553 - val_
accuracy: 0.7477
Epoch 160/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5224 - accuracy: 0.7609 - val_loss: 1.3599 - val_
accuracy: 0.7523
Epoch 161/1000
4/4 [=====] - 0s 18ms/step - loss: 0.4342 - accuracy: 0.7352 - val_loss: 1.4533 - val_
accuracy: 0.7477
Epoch 162/1000
4/4 [=====] - 0s 20ms/step - loss: 0.4602 - accuracy: 0.7635 - val_loss: 1.3405 - val_
accuracy: 0.7523
Epoch 163/1000
4/4 [=====] - 0s 17ms/step - loss: 0.5069 - accuracy: 0.7738 - val_loss: 1.2572 - val_
accuracy: 0.7103
Epoch 164/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4112 - accuracy: 0.7532 - val_loss: 1.2715 - val_
accuracy: 0.7150
Epoch 165/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4457 - accuracy: 0.7609 - val_loss: 1.2747 - val_
accuracy: 0.7196
Epoch 166/1000
4/4 [=====] - 0s 17ms/step - loss: 0.5059 - accuracy: 0.7712 - val_loss: 1.2759 - val_
accuracy: 0.7196
Epoch 167/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4296 - accuracy: 0.7584 - val_loss: 1.2627 - val_
accuracy: 0.7477
Epoch 168/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4815 - accuracy: 0.7661 - val_loss: 1.3137 - val_
accuracy: 0.7523
Epoch 169/1000
```

```
4/4 [=====] - 0s 15ms/step - loss: 0.4759 - accuracy: 0.7404 - val_loss: 1.2950 - val_accuracy: 0.7383
Epoch 170/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4491 - accuracy: 0.7738 - val_loss: 1.2930 - val_accuracy: 0.7383
Epoch 171/1000
4/4 [=====] - 0s 18ms/step - loss: 0.4592 - accuracy: 0.7712 - val_loss: 1.3546 - val_accuracy: 0.7523
Epoch 172/1000
4/4 [=====] - 0s 18ms/step - loss: 0.4181 - accuracy: 0.7609 - val_loss: 1.3713 - val_accuracy: 0.7336
Epoch 173/1000
4/4 [=====] - 0s 19ms/step - loss: 0.5477 - accuracy: 0.7584 - val_loss: 1.3702 - val_accuracy: 0.7336
Epoch 174/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4974 - accuracy: 0.7558 - val_loss: 1.4434 - val_accuracy: 0.7336
Epoch 175/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4969 - accuracy: 0.7506 - val_loss: 1.4320 - val_accuracy: 0.7523
Epoch 176/1000
4/4 [=====] - 0s 18ms/step - loss: 0.4677 - accuracy: 0.7584 - val_loss: 1.4673 - val_accuracy: 0.7570
Epoch 177/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4304 - accuracy: 0.7661 - val_loss: 1.4421 - val_accuracy: 0.7617
Epoch 178/1000
4/4 [=====] - 0s 19ms/step - loss: 0.4100 - accuracy: 0.7943 - val_loss: 1.4327 - val_accuracy: 0.7617
Epoch 179/1000
4/4 [=====] - 0s 20ms/step - loss: 0.4193 - accuracy: 0.7815 - val_loss: 1.4311 - val_accuracy: 0.7710
Epoch 180/1000
4/4 [=====] - 0s 17ms/step - loss: 0.3805 - accuracy: 0.7455 - val_loss: 1.4594 - val_accuracy: 0.7617
Epoch 181/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4794 - accuracy: 0.7661 - val_loss: 1.3977 - val_accuracy: 0.7617
Epoch 182/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5014 - accuracy: 0.7738 - val_loss: 1.4355 - val_accuracy: 0.7570
Epoch 183/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5063 - accuracy: 0.7661 - val_loss: 1.4563 - val_accuracy: 0.7523
Epoch 184/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4658 - accuracy: 0.7301 - val_loss: 1.4849 - val_accuracy: 0.7523
Epoch 185/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4816 - accuracy: 0.7506 - val_loss: 1.4900 - val_accuracy: 0.7523
Epoch 186/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4118 - accuracy: 0.7584 - val_loss: 1.5024 - val_accuracy: 0.7523
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5016 - accuracy: 0.7301 - val_loss: 1.5175 - val_accuracy: 0.7243
Epoch 188/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3504 - accuracy: 0.7532 - val_loss: 1.5485 - val_accuracy: 0.7056
Epoch 189/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4063 - accuracy: 0.7172 - val_loss: 1.5150 - val_accuracy: 0.7150
Epoch 190/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4118 - accuracy: 0.7609 - val_loss: 1.5648 - val_accuracy: 0.6729
Epoch 191/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3855 - accuracy: 0.7069 - val_loss: 1.5625 - val_accuracy: 0.6682
Epoch 192/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4241 - accuracy: 0.7352 - val_loss: 1.5795 - val_accuracy: 0.6916
Epoch 193/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4434 - accuracy: 0.7326 - val_loss: 1.6092 - val_accuracy: 0.6963
Epoch 194/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3994 - accuracy: 0.7481 - val_loss: 1.5623 - val_accuracy: 0.6776
Epoch 195/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4443 - accuracy: 0.7172 - val_loss: 1.6363 - val_accuracy: 0.6963
Epoch 196/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4310 - accuracy: 0.7326 - val_loss: 1.6288 - val_accuracy: 0.7009
Epoch 197/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4224 - accuracy: 0.7018 - val_loss: 1.6792 - val_accuracy: 0.6916
Epoch 198/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4274 - accuracy: 0.7326 - val_loss: 1.6806 - val_accuracy: 0.7056
```

Epoch 199/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3990 - accuracy: 0.7429 - val_loss: 1.5098 - val_accuracy: 0.6729
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3455 - accuracy: 0.7301 - val_loss: 1.5694 - val_accuracy: 0.6963
Epoch 201/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4512 - accuracy: 0.7378 - val_loss: 1.4902 - val_accuracy: 0.6822
Epoch 202/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4713 - accuracy: 0.7275 - val_loss: 1.4692 - val_accuracy: 0.6916
Epoch 203/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5260 - accuracy: 0.7121 - val_loss: 1.4427 - val_accuracy: 0.6869
Epoch 204/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3754 - accuracy: 0.7429 - val_loss: 1.4640 - val_accuracy: 0.6869
Epoch 205/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4673 - accuracy: 0.7532 - val_loss: 1.4650 - val_accuracy: 0.6729
Epoch 206/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5220 - accuracy: 0.7275 - val_loss: 1.6434 - val_accuracy: 0.6589
Epoch 207/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5277 - accuracy: 0.7301 - val_loss: 1.5854 - val_accuracy: 0.6729
Epoch 208/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4710 - accuracy: 0.7249 - val_loss: 1.4990 - val_accuracy: 0.6776
Epoch 209/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5635 - accuracy: 0.7326 - val_loss: 1.5526 - val_accuracy: 0.6776
Epoch 210/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4766 - accuracy: 0.7352 - val_loss: 1.5555 - val_accuracy: 0.6869
Epoch 211/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4400 - accuracy: 0.7455 - val_loss: 1.5189 - val_accuracy: 0.7103
Epoch 212/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4279 - accuracy: 0.7326 - val_loss: 1.4243 - val_accuracy: 0.7196
Epoch 213/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3954 - accuracy: 0.7738 - val_loss: 1.4698 - val_accuracy: 0.6963
Epoch 214/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4479 - accuracy: 0.7481 - val_loss: 1.5312 - val_accuracy: 0.6916
Epoch 215/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4915 - accuracy: 0.7352 - val_loss: 1.6171 - val_accuracy: 0.6822
Epoch 216/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4559 - accuracy: 0.7661 - val_loss: 1.5863 - val_accuracy: 0.6869
Epoch 217/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4238 - accuracy: 0.7224 - val_loss: 1.4706 - val_accuracy: 0.6822
Epoch 218/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6006 - accuracy: 0.7455 - val_loss: 1.5395 - val_accuracy: 0.6869
Epoch 219/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4598 - accuracy: 0.7481 - val_loss: 1.5429 - val_accuracy: 0.6729
Epoch 220/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5618 - accuracy: 0.6992 - val_loss: 1.5009 - val_accuracy: 0.6822
Epoch 221/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4535 - accuracy: 0.7326 - val_loss: 1.5509 - val_accuracy: 0.6963
Epoch 222/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5575 - accuracy: 0.7404 - val_loss: 1.5215 - val_accuracy: 0.7009
Epoch 223/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4380 - accuracy: 0.7198 - val_loss: 1.5225 - val_accuracy: 0.7103
Epoch 224/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4129 - accuracy: 0.7532 - val_loss: 1.5417 - val_accuracy: 0.7103
Epoch 225/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4921 - accuracy: 0.7506 - val_loss: 1.5712 - val_accuracy: 0.6822
Epoch 226/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4475 - accuracy: 0.7404 - val_loss: 1.6037 - val_accuracy: 0.6822
Epoch 227/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3733 - accuracy: 0.7481 - val_loss: 1.6269 - val_accuracy: 0.6729
Epoch 228/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3917 - accuracy: 0.7661 - val_loss: 1.6026 - val_accuracy: 0.6729

```
accuracy: 0.6636
Epoch 229/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4680 - accuracy: 0.7301 - val_loss: 1.6734 - val_accuracy: 0.6636
Epoch 230/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4039 - accuracy: 0.7352 - val_loss: 1.5977 - val_accuracy: 0.6776
Epoch 231/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4623 - accuracy: 0.7147 - val_loss: 1.6018 - val_accuracy: 0.6776
Epoch 232/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4939 - accuracy: 0.7455 - val_loss: 1.6124 - val_accuracy: 0.6495
Epoch 233/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4254 - accuracy: 0.7506 - val_loss: 1.5338 - val_accuracy: 0.6495
Epoch 234/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4049 - accuracy: 0.7275 - val_loss: 1.5505 - val_accuracy: 0.6542
Epoch 235/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3976 - accuracy: 0.7378 - val_loss: 1.4950 - val_accuracy: 0.6682
Epoch 236/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3836 - accuracy: 0.7532 - val_loss: 1.4997 - val_accuracy: 0.6682
Epoch 237/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5213 - accuracy: 0.7429 - val_loss: 1.5592 - val_accuracy: 0.6636
Epoch 238/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4543 - accuracy: 0.7609 - val_loss: 1.5327 - val_accuracy: 0.6869
Epoch 239/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4327 - accuracy: 0.7455 - val_loss: 1.5663 - val_accuracy: 0.6822
Epoch 240/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4908 - accuracy: 0.7635 - val_loss: 1.5985 - val_accuracy: 0.6729
Epoch 241/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5481 - accuracy: 0.7326 - val_loss: 1.6659 - val_accuracy: 0.6729
Epoch 242/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4733 - accuracy: 0.7301 - val_loss: 1.6649 - val_accuracy: 0.6682
Epoch 243/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5438 - accuracy: 0.7095 - val_loss: 1.6527 - val_accuracy: 0.6682
Epoch 244/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3882 - accuracy: 0.7429 - val_loss: 1.6876 - val_accuracy: 0.6776
Epoch 245/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3123 - accuracy: 0.7506 - val_loss: 1.6787 - val_accuracy: 0.6682
Epoch 246/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5084 - accuracy: 0.7249 - val_loss: 1.6391 - val_accuracy: 0.6542
Epoch 247/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4123 - accuracy: 0.7249 - val_loss: 1.6369 - val_accuracy: 0.6636
Epoch 248/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4802 - accuracy: 0.7198 - val_loss: 1.6803 - val_accuracy: 0.6542
Epoch 249/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3988 - accuracy: 0.7841 - val_loss: 1.6699 - val_accuracy: 0.6776
Epoch 250/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4617 - accuracy: 0.7609 - val_loss: 1.7043 - val_accuracy: 0.6776
Epoch 251/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4135 - accuracy: 0.7635 - val_loss: 1.6034 - val_accuracy: 0.6682
Epoch 252/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4391 - accuracy: 0.7635 - val_loss: 1.5997 - val_accuracy: 0.6822
Epoch 253/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5111 - accuracy: 0.7429 - val_loss: 1.6055 - val_accuracy: 0.6822
Epoch 254/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4250 - accuracy: 0.7558 - val_loss: 1.5749 - val_accuracy: 0.6822
Epoch 255/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4571 - accuracy: 0.7609 - val_loss: 1.6107 - val_accuracy: 0.6542
Epoch 256/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4214 - accuracy: 0.7661 - val_loss: 1.6149 - val_accuracy: 0.6682
Epoch 257/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3926 - accuracy: 0.7584 - val_loss: 1.6331 - val_accuracy: 0.6729
Epoch 258/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3840 - accuracy: 0.7455 - val_loss: 1.6460 - val_accuracy: 0.6729
Epoch 259/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5482 - accuracy: 0.7378 - val_loss: 1.6021 - val_accuracy: 0.7009
Epoch 260/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4044 - accuracy: 0.7661 - val_loss: 1.5005 - val_accuracy: 0.6729
Epoch 261/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4179 - accuracy: 0.7404 - val_loss: 1.6249 - val_accuracy: 0.6682
Epoch 262/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4353 - accuracy: 0.7147 - val_loss: 1.6804 - val_accuracy: 0.6729
Epoch 263/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4378 - accuracy: 0.7558 - val_loss: 1.6715 - val_accuracy: 0.6542
Epoch 264/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3681 - accuracy: 0.7532 - val_loss: 1.6771 - val_accuracy: 0.6636
Epoch 265/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3929 - accuracy: 0.7378 - val_loss: 1.7025 - val_accuracy: 0.6729
Epoch 266/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4385 - accuracy: 0.7326 - val_loss: 1.7655 - val_accuracy: 0.6636
Epoch 267/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4093 - accuracy: 0.7429 - val_loss: 1.7439 - val_accuracy: 0.6776
Epoch 268/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3523 - accuracy: 0.7506 - val_loss: 1.5771 - val_accuracy: 0.6682
Epoch 269/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4773 - accuracy: 0.7378 - val_loss: 1.7850 - val_accuracy: 0.6776
Epoch 270/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4019 - accuracy: 0.7532 - val_loss: 1.8035 - val_accuracy: 0.6869
Epoch 271/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3761 - accuracy: 0.7584 - val_loss: 1.7364 - val_accuracy: 0.7430
Epoch 272/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4370 - accuracy: 0.7506 - val_loss: 1.6661 - val_accuracy: 0.7523
Epoch 273/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3424 - accuracy: 0.7506 - val_loss: 1.5846 - val_accuracy: 0.6916
Epoch 274/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5353 - accuracy: 0.7121 - val_loss: 1.5783 - val_accuracy: 0.6916
Epoch 275/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4097 - accuracy: 0.7481 - val_loss: 1.5732 - val_accuracy: 0.6963
Epoch 276/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3656 - accuracy: 0.7506 - val_loss: 1.5343 - val_accuracy: 0.7009
Epoch 277/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5097 - accuracy: 0.7558 - val_loss: 1.4851 - val_accuracy: 0.6729
Epoch 278/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4363 - accuracy: 0.7481 - val_loss: 1.4274 - val_accuracy: 0.7196
Epoch 279/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3630 - accuracy: 0.7661 - val_loss: 1.4778 - val_accuracy: 0.7150
Epoch 280/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4074 - accuracy: 0.7506 - val_loss: 1.4841 - val_accuracy: 0.7009
Epoch 281/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4089 - accuracy: 0.7481 - val_loss: 1.4570 - val_accuracy: 0.7056
Epoch 282/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4589 - accuracy: 0.7224 - val_loss: 1.5523 - val_accuracy: 0.6963
Epoch 283/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4316 - accuracy: 0.7558 - val_loss: 1.5121 - val_accuracy: 0.6916
Epoch 284/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3684 - accuracy: 0.7429 - val_loss: 1.4761 - val_accuracy: 0.6916
Epoch 285/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3051 - accuracy: 0.7584 - val_loss: 1.4631 - val_accuracy: 0.7196
Epoch 286/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3051 - accuracy: 0.7558 - val_loss: 1.4569 - val_accuracy: 0.6869
Epoch 287/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4482 - accuracy: 0.7249 - val_loss: 1.4546 - val_accuracy: 0.7056
```

Epoch 288/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3921 - accuracy: 0.7404 - val_loss: 1.5108 - val_accuracy: 0.7103
Epoch 289/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4346 - accuracy: 0.7301 - val_loss: 1.4799 - val_accuracy: 0.7103
Epoch 290/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3897 - accuracy: 0.7584 - val_loss: 1.5267 - val_accuracy: 0.7103
Epoch 291/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4900 - accuracy: 0.7378 - val_loss: 1.6320 - val_accuracy: 0.7056
Epoch 292/1000
4/4 [=====] - 0s 20ms/step - loss: 0.3659 - accuracy: 0.7326 - val_loss: 1.6091 - val_accuracy: 0.7103
Epoch 293/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3496 - accuracy: 0.7712 - val_loss: 1.6188 - val_accuracy: 0.7056
Epoch 294/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3686 - accuracy: 0.7506 - val_loss: 1.6627 - val_accuracy: 0.7056
Epoch 295/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3178 - accuracy: 0.7584 - val_loss: 1.6857 - val_accuracy: 0.7056
Epoch 296/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3999 - accuracy: 0.7712 - val_loss: 1.5786 - val_accuracy: 0.7009
Epoch 297/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4788 - accuracy: 0.7249 - val_loss: 1.6026 - val_accuracy: 0.6963
Epoch 298/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3780 - accuracy: 0.7609 - val_loss: 1.5690 - val_accuracy: 0.7056
Epoch 299/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3648 - accuracy: 0.7943 - val_loss: 1.5131 - val_accuracy: 0.6916
Epoch 300/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4294 - accuracy: 0.7609 - val_loss: 1.4148 - val_accuracy: 0.6963
Epoch 301/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5311 - accuracy: 0.7584 - val_loss: 1.4884 - val_accuracy: 0.7103
Epoch 302/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2951 - accuracy: 0.7558 - val_loss: 1.5152 - val_accuracy: 0.7243
Epoch 303/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4085 - accuracy: 0.7686 - val_loss: 1.5499 - val_accuracy: 0.7103
Epoch 304/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4867 - accuracy: 0.7584 - val_loss: 1.5464 - val_accuracy: 0.7243
Epoch 305/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4896 - accuracy: 0.7609 - val_loss: 1.5508 - val_accuracy: 0.7150
Epoch 306/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5135 - accuracy: 0.7378 - val_loss: 1.5192 - val_accuracy: 0.7103
Epoch 307/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3377 - accuracy: 0.7661 - val_loss: 1.5596 - val_accuracy: 0.7103
Epoch 308/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4322 - accuracy: 0.7558 - val_loss: 1.6365 - val_accuracy: 0.7150
Epoch 309/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4183 - accuracy: 0.7558 - val_loss: 1.6638 - val_accuracy: 0.7243
Epoch 310/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4419 - accuracy: 0.7429 - val_loss: 1.6290 - val_accuracy: 0.7290
Epoch 311/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4659 - accuracy: 0.7532 - val_loss: 1.6824 - val_accuracy: 0.7430
Epoch 312/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3805 - accuracy: 0.7584 - val_loss: 1.6039 - val_accuracy: 0.7430
Epoch 313/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3349 - accuracy: 0.7506 - val_loss: 1.6607 - val_accuracy: 0.7477
Epoch 314/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3666 - accuracy: 0.7326 - val_loss: 1.7171 - val_accuracy: 0.7383
Epoch 315/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4282 - accuracy: 0.7455 - val_loss: 1.7216 - val_accuracy: 0.7336
Epoch 316/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3295 - accuracy: 0.7326 - val_loss: 1.7398 - val_accuracy: 0.7477
Epoch 317/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5137 - accuracy: 0.7404 - val_loss: 1.6818 - val_accuracy: 0.7103

```

accuracy: 0.7196
Epoch 318/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4456 - accuracy: 0.7506 - val_loss: 1.7053 - val_accuracy: 0.7243
Epoch 319/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3758 - accuracy: 0.7326 - val_loss: 1.7649 - val_accuracy: 0.7383
Epoch 320/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4358 - accuracy: 0.7635 - val_loss: 1.7566 - val_accuracy: 0.7336
Epoch 321/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3417 - accuracy: 0.7584 - val_loss: 1.8149 - val_accuracy: 0.7290
Epoch 322/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3814 - accuracy: 0.7352 - val_loss: 1.8143 - val_accuracy: 0.7243
Epoch 323/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4165 - accuracy: 0.7352 - val_loss: 1.7597 - val_accuracy: 0.6869
Epoch 324/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3176 - accuracy: 0.7481 - val_loss: 1.7454 - val_accuracy: 0.7196
Epoch 325/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3156 - accuracy: 0.7455 - val_loss: 1.7417 - val_accuracy: 0.7196
Epoch 326/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3418 - accuracy: 0.7455 - val_loss: 1.7276 - val_accuracy: 0.7290
Epoch 327/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3844 - accuracy: 0.7738 - val_loss: 1.6352 - val_accuracy: 0.7383
Epoch 328/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4033 - accuracy: 0.7738 - val_loss: 1.6350 - val_accuracy: 0.7383
Epoch 329/1000
1/4 [====>.....] - ETA: 0s - loss: 0.2442 - accuracy: 0.7812Restoring model weights from the end of the best epoch: 179.
4/4 [=====] - 0s 18ms/step - loss: 0.4168 - accuracy: 0.7352 - val_loss: 1.7903 - val_accuracy: 0.7336
Epoch 329: early stopping
2/2 [=====] - 0s 5ms/step - loss: 1.6421 - accuracy: 0.6977
[CV] END .....Dense1=25, Dense2=50; total time= 18.5s
Model: "sequential_35"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_140 (Dense)	(None, 25)	175
batch_normalization_105 (BatchNormalization)	(None, 25)	100
activation_105 (Activation)	(None, 25)	0
dense_141 (Dense)	(None, 50)	1300
batch_normalization_106 (BatchNormalization)	(None, 50)	200
activation_106 (Activation)	(None, 50)	0
dense_142 (Dense)	(None, 10)	510
batch_normalization_107 (BatchNormalization)	(None, 10)	40
activation_107 (Activation)	(None, 10)	0
dense_143 (Dense)	(None, 2)	22
<hr/>		

Total params: 2,347

Trainable params: 2,177

Non-trainable params: 170

Epoch 1/1000

```

4/4 [=====] - 1s 59ms/step - loss: 4.8999 - accuracy: 0.4833 - val_loss: 4.9464 - val_accuracy: 0.4486
Epoch 2/1000
4/4 [=====] - 0s 15ms/step - loss: 3.5552 - accuracy: 0.4833 - val_loss: 4.8778 - val_accuracy: 0.4533
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 3.1678 - accuracy: 0.5013 - val_loss: 4.3890 - val_accuracy: 0.4626
Epoch 4/1000
4/4 [=====] - 0s 17ms/step - loss: 3.0301 - accuracy: 0.4627 - val_loss: 3.8436 - val_accuracy: 0.5187
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 2.8487 - accuracy: 0.4859 - val_loss: 3.1308 - val_accuracy: 0.5888

```

Epoch 6/1000
4/4 [=====] - 0s 15ms/step - loss: 2.7521 - accuracy: 0.4679 - val_loss: 2.7335 - val_accuracy: 0.5935
Epoch 7/1000
4/4 [=====] - 0s 15ms/step - loss: 2.6783 - accuracy: 0.4833 - val_loss: 2.6012 - val_accuracy: 0.6308
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5038 - accuracy: 0.4987 - val_loss: 2.4928 - val_accuracy: 0.6262
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5024 - accuracy: 0.4807 - val_loss: 2.3379 - val_accuracy: 0.6215
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6892 - accuracy: 0.4781 - val_loss: 2.1633 - val_accuracy: 0.6168
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2816 - accuracy: 0.4704 - val_loss: 2.0481 - val_accuracy: 0.5935
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2771 - accuracy: 0.4781 - val_loss: 2.0012 - val_accuracy: 0.5981
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3186 - accuracy: 0.4524 - val_loss: 1.9235 - val_accuracy: 0.6121
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1610 - accuracy: 0.4679 - val_loss: 1.8565 - val_accuracy: 0.6075
Epoch 15/1000
4/4 [=====] - 0s 15ms/step - loss: 2.0823 - accuracy: 0.4679 - val_loss: 1.8246 - val_accuracy: 0.6075
Epoch 16/1000
4/4 [=====] - 0s 17ms/step - loss: 2.1978 - accuracy: 0.4756 - val_loss: 1.7738 - val_accuracy: 0.5981
Epoch 17/1000
4/4 [=====] - 0s 16ms/step - loss: 1.9703 - accuracy: 0.4653 - val_loss: 1.7208 - val_accuracy: 0.5981
Epoch 18/1000
4/4 [=====] - 0s 18ms/step - loss: 1.9437 - accuracy: 0.4422 - val_loss: 1.6837 - val_accuracy: 0.5981
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8083 - accuracy: 0.4550 - val_loss: 1.6615 - val_accuracy: 0.5981
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7962 - accuracy: 0.4807 - val_loss: 1.6069 - val_accuracy: 0.5981
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7649 - accuracy: 0.4550 - val_loss: 1.5675 - val_accuracy: 0.5935
Epoch 22/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6763 - accuracy: 0.4267 - val_loss: 1.5198 - val_accuracy: 0.6028
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7227 - accuracy: 0.4499 - val_loss: 1.4934 - val_accuracy: 0.5981
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6139 - accuracy: 0.4602 - val_loss: 1.4643 - val_accuracy: 0.5841
Epoch 25/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6609 - accuracy: 0.4704 - val_loss: 1.4495 - val_accuracy: 0.5981
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5369 - accuracy: 0.4936 - val_loss: 1.4183 - val_accuracy: 0.6121
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3922 - accuracy: 0.4756 - val_loss: 1.3995 - val_accuracy: 0.6308
Epoch 28/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3362 - accuracy: 0.4859 - val_loss: 1.3871 - val_accuracy: 0.6402
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2971 - accuracy: 0.4627 - val_loss: 1.3667 - val_accuracy: 0.6355
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3789 - accuracy: 0.4602 - val_loss: 1.3271 - val_accuracy: 0.6355
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2509 - accuracy: 0.4781 - val_loss: 1.3505 - val_accuracy: 0.6355
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2007 - accuracy: 0.4473 - val_loss: 1.3563 - val_accuracy: 0.6355
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1646 - accuracy: 0.4344 - val_loss: 1.3301 - val_accuracy: 0.6402
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0962 - accuracy: 0.4704 - val_loss: 1.3260 - val_accuracy: 0.6449
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1178 - accuracy: 0.4704 - val_loss: 1.3056 - val_accuracy: 0.6449

```
accuracy: 0.6308
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1861 - accuracy: 0.4627 - val_loss: 1.2912 - val_accuracy: 0.5935
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0862 - accuracy: 0.4499 - val_loss: 1.2815 - val_accuracy: 0.5701
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1289 - accuracy: 0.4704 - val_loss: 1.2624 - val_accuracy: 0.5140
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1050 - accuracy: 0.4756 - val_loss: 1.2526 - val_accuracy: 0.5047
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0297 - accuracy: 0.4936 - val_loss: 1.2456 - val_accuracy: 0.5280
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1025 - accuracy: 0.4730 - val_loss: 1.2368 - val_accuracy: 0.5140
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0212 - accuracy: 0.4653 - val_loss: 1.2225 - val_accuracy: 0.4860
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0197 - accuracy: 0.4653 - val_loss: 1.2127 - val_accuracy: 0.4953
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0287 - accuracy: 0.4653 - val_loss: 1.2047 - val_accuracy: 0.5047
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1031 - accuracy: 0.4627 - val_loss: 1.1908 - val_accuracy: 0.5047
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0044 - accuracy: 0.4602 - val_loss: 1.1872 - val_accuracy: 0.5093
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9734 - accuracy: 0.4422 - val_loss: 1.1752 - val_accuracy: 0.5140
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9047 - accuracy: 0.4344 - val_loss: 1.1489 - val_accuracy: 0.5000
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9835 - accuracy: 0.5039 - val_loss: 1.1387 - val_accuracy: 0.5140
Epoch 50/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9755 - accuracy: 0.4653 - val_loss: 1.1081 - val_accuracy: 0.5093
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9729 - accuracy: 0.4730 - val_loss: 1.0847 - val_accuracy: 0.5093
Epoch 52/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9602 - accuracy: 0.4499 - val_loss: 1.0852 - val_accuracy: 0.5280
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0082 - accuracy: 0.4447 - val_loss: 1.0606 - val_accuracy: 0.5140
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9630 - accuracy: 0.4344 - val_loss: 1.0851 - val_accuracy: 0.5421
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9341 - accuracy: 0.4473 - val_loss: 1.0737 - val_accuracy: 0.5561
Epoch 56/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9159 - accuracy: 0.4807 - val_loss: 1.0455 - val_accuracy: 0.5514
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9507 - accuracy: 0.4267 - val_loss: 1.0346 - val_accuracy: 0.5561
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8940 - accuracy: 0.4370 - val_loss: 1.0026 - val_accuracy: 0.5327
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8582 - accuracy: 0.4396 - val_loss: 0.9838 - val_accuracy: 0.5047
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9214 - accuracy: 0.4242 - val_loss: 0.9653 - val_accuracy: 0.5093
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8911 - accuracy: 0.4422 - val_loss: 0.9474 - val_accuracy: 0.4766
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9090 - accuracy: 0.4165 - val_loss: 0.9419 - val_accuracy: 0.4813
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8376 - accuracy: 0.4010 - val_loss: 0.9199 - val_accuracy: 0.4673
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7952 - accuracy: 0.4319 - val_loss: 0.9085 - val_accuracy: 0.4626
Epoch 65/1000
```

4/4 [=====] - 0s 13ms/step - loss: 0.8950 - accuracy: 0.4190 - val_loss: 0.9135 - val_accuracy: 0.4346
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7773 - accuracy: 0.4190 - val_loss: 0.8675 - val_accuracy: 0.4346
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8472 - accuracy: 0.4370 - val_loss: 0.8479 - val_accuracy: 0.4626
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8949 - accuracy: 0.4370 - val_loss: 0.8603 - val_accuracy: 0.4720
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7721 - accuracy: 0.4370 - val_loss: 0.8392 - val_accuracy: 0.4860
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7986 - accuracy: 0.4576 - val_loss: 0.8532 - val_accuracy: 0.4907
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8967 - accuracy: 0.4139 - val_loss: 0.8413 - val_accuracy: 0.4673
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7801 - accuracy: 0.4447 - val_loss: 0.8537 - val_accuracy: 0.4626
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7670 - accuracy: 0.4319 - val_loss: 0.8328 - val_accuracy: 0.4673
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7398 - accuracy: 0.4139 - val_loss: 0.8415 - val_accuracy: 0.4673
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7522 - accuracy: 0.4396 - val_loss: 0.8225 - val_accuracy: 0.4299
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8107 - accuracy: 0.4499 - val_loss: 0.8103 - val_accuracy: 0.4206
Epoch 77/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7304 - accuracy: 0.4422 - val_loss: 0.8113 - val_accuracy: 0.4299
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7519 - accuracy: 0.4396 - val_loss: 0.8186 - val_accuracy: 0.4346
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7484 - accuracy: 0.4396 - val_loss: 0.8107 - val_accuracy: 0.4346
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7532 - accuracy: 0.4190 - val_loss: 0.7953 - val_accuracy: 0.4159
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7268 - accuracy: 0.4139 - val_loss: 0.7795 - val_accuracy: 0.4206
Epoch 82/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8058 - accuracy: 0.4370 - val_loss: 0.7729 - val_accuracy: 0.4159
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7357 - accuracy: 0.3856 - val_loss: 0.7626 - val_accuracy: 0.4206
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6608 - accuracy: 0.4344 - val_loss: 0.7487 - val_accuracy: 0.4299
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7421 - accuracy: 0.4190 - val_loss: 0.7334 - val_accuracy: 0.4346
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8070 - accuracy: 0.4319 - val_loss: 0.7331 - val_accuracy: 0.4579
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7256 - accuracy: 0.4190 - val_loss: 0.7271 - val_accuracy: 0.4486
Epoch 88/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7607 - accuracy: 0.4010 - val_loss: 0.7197 - val_accuracy: 0.4486
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6844 - accuracy: 0.4165 - val_loss: 0.7190 - val_accuracy: 0.4579
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6374 - accuracy: 0.4139 - val_loss: 0.7065 - val_accuracy: 0.4579
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9091 - accuracy: 0.4447 - val_loss: 0.7047 - val_accuracy: 0.4673
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7872 - accuracy: 0.4422 - val_loss: 0.7045 - val_accuracy: 0.4626
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7116 - accuracy: 0.4422 - val_loss: 0.7016 - val_accuracy: 0.4766
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7225 - accuracy: 0.4370 - val_loss: 0.7059 - val_accuracy: 0.4813

Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6795 - accuracy: 0.4576 - val_loss: 0.7270 - val_accuracy: 0.5093
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6215 - accuracy: 0.4756 - val_loss: 0.6891 - val_accuracy: 0.5140
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6279 - accuracy: 0.4859 - val_loss: 0.6866 - val_accuracy: 0.5047
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7050 - accuracy: 0.4576 - val_loss: 0.6903 - val_accuracy: 0.5140
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7766 - accuracy: 0.5039 - val_loss: 0.6847 - val_accuracy: 0.5514
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6089 - accuracy: 0.5064 - val_loss: 0.7221 - val_accuracy: 0.5748
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6847 - accuracy: 0.5013 - val_loss: 0.7348 - val_accuracy: 0.5794
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7391 - accuracy: 0.5039 - val_loss: 0.7367 - val_accuracy: 0.5981
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7182 - accuracy: 0.5090 - val_loss: 0.7371 - val_accuracy: 0.5981
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7149 - accuracy: 0.4910 - val_loss: 0.8000 - val_accuracy: 0.5794
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6333 - accuracy: 0.4859 - val_loss: 0.7797 - val_accuracy: 0.5654
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5734 - accuracy: 0.5064 - val_loss: 0.7496 - val_accuracy: 0.5654
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6604 - accuracy: 0.5039 - val_loss: 0.7461 - val_accuracy: 0.5607
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6201 - accuracy: 0.4859 - val_loss: 0.7395 - val_accuracy: 0.5748
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6498 - accuracy: 0.4807 - val_loss: 0.7426 - val_accuracy: 0.5794
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6605 - accuracy: 0.4936 - val_loss: 0.7781 - val_accuracy: 0.5654
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5926 - accuracy: 0.5013 - val_loss: 0.7745 - val_accuracy: 0.5607
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5831 - accuracy: 0.4884 - val_loss: 0.7876 - val_accuracy: 0.5654
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6666 - accuracy: 0.4910 - val_loss: 0.7849 - val_accuracy: 0.5748
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6213 - accuracy: 0.5167 - val_loss: 0.7928 - val_accuracy: 0.5794
Epoch 115/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6011 - accuracy: 0.4987 - val_loss: 0.7602 - val_accuracy: 0.5748
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5644 - accuracy: 0.4807 - val_loss: 0.7492 - val_accuracy: 0.5794
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6671 - accuracy: 0.5039 - val_loss: 0.7644 - val_accuracy: 0.5607
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5965 - accuracy: 0.4781 - val_loss: 0.8115 - val_accuracy: 0.5561
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6340 - accuracy: 0.4730 - val_loss: 0.7761 - val_accuracy: 0.5654
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5280 - accuracy: 0.5090 - val_loss: 0.7432 - val_accuracy: 0.5794
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5578 - accuracy: 0.5398 - val_loss: 0.7726 - val_accuracy: 0.5561
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5981 - accuracy: 0.4781 - val_loss: 0.7660 - val_accuracy: 0.5607
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5749 - accuracy: 0.5116 - val_loss: 0.7893 - val_accuracy: 0.5561
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6947 - accuracy: 0.5039 - val_loss: 0.7704 - val_accuracy: 0.5607

```
accuracy: 0.5514
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6213 - accuracy: 0.4961 - val_loss: 0.7705 - val_accuracy: 0.5467
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6498 - accuracy: 0.5090 - val_loss: 0.7960 - val_accuracy: 0.5467
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6093 - accuracy: 0.5039 - val_loss: 0.8524 - val_accuracy: 0.5234
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5478 - accuracy: 0.4807 - val_loss: 0.8174 - val_accuracy: 0.5140
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5754 - accuracy: 0.4884 - val_loss: 0.8494 - val_accuracy: 0.5187
Epoch 130/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5935 - accuracy: 0.4704 - val_loss: 0.7959 - val_accuracy: 0.5093
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5634 - accuracy: 0.4807 - val_loss: 0.9050 - val_accuracy: 0.5327
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6858 - accuracy: 0.4602 - val_loss: 0.9428 - val_accuracy: 0.5280
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5567 - accuracy: 0.4524 - val_loss: 0.9871 - val_accuracy: 0.5140
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5020 - accuracy: 0.4627 - val_loss: 0.9454 - val_accuracy: 0.5280
Epoch 135/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4987 - accuracy: 0.4756 - val_loss: 0.9796 - val_accuracy: 0.5047
Epoch 136/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5432 - accuracy: 0.4396 - val_loss: 0.8405 - val_accuracy: 0.4813
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6424 - accuracy: 0.4704 - val_loss: 0.9447 - val_accuracy: 0.4766
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5272 - accuracy: 0.4602 - val_loss: 0.8749 - val_accuracy: 0.4907
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5135 - accuracy: 0.4627 - val_loss: 0.9755 - val_accuracy: 0.5093
Epoch 140/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5332 - accuracy: 0.4627 - val_loss: 0.9956 - val_accuracy: 0.5093
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5082 - accuracy: 0.4499 - val_loss: 0.9440 - val_accuracy: 0.5093
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5562 - accuracy: 0.4704 - val_loss: 0.9657 - val_accuracy: 0.5047
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4765 - accuracy: 0.4370 - val_loss: 0.9966 - val_accuracy: 0.5047
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5785 - accuracy: 0.4679 - val_loss: 0.9342 - val_accuracy: 0.5047
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5026 - accuracy: 0.4833 - val_loss: 0.9491 - val_accuracy: 0.4953
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6059 - accuracy: 0.4679 - val_loss: 0.9598 - val_accuracy: 0.5140
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4634 - accuracy: 0.4627 - val_loss: 0.8764 - val_accuracy: 0.5140
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4494 - accuracy: 0.4730 - val_loss: 0.8438 - val_accuracy: 0.4766
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5057 - accuracy: 0.4499 - val_loss: 0.8139 - val_accuracy: 0.4860
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4372 - accuracy: 0.4936 - val_loss: 0.8772 - val_accuracy: 0.4860
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4740 - accuracy: 0.4550 - val_loss: 0.8675 - val_accuracy: 0.4766
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4910 - accuracy: 0.4293 - val_loss: 0.9109 - val_accuracy: 0.4766
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4911 - accuracy: 0.4627 - val_loss: 0.8897 - val_accuracy: 0.4907
Epoch 154/1000
```

4/4 [=====] - 0s 12ms/step - loss: 0.5019 - accuracy: 0.4499 - val_loss: 0.8235 - val_accuracy: 0.4766
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3923 - accuracy: 0.4319 - val_loss: 0.8631 - val_accuracy: 0.4860
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4890 - accuracy: 0.4473 - val_loss: 0.8400 - val_accuracy: 0.5047
Epoch 157/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4359 - accuracy: 0.4499 - val_loss: 0.8305 - val_accuracy: 0.5000
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4505 - accuracy: 0.4653 - val_loss: 0.8670 - val_accuracy: 0.4907
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4666 - accuracy: 0.4704 - val_loss: 0.8635 - val_accuracy: 0.4813
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3887 - accuracy: 0.4550 - val_loss: 0.9096 - val_accuracy: 0.4953
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4135 - accuracy: 0.4499 - val_loss: 0.9080 - val_accuracy: 0.5093
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4216 - accuracy: 0.4524 - val_loss: 0.9102 - val_accuracy: 0.5047
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3758 - accuracy: 0.4473 - val_loss: 0.8681 - val_accuracy: 0.4813
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3794 - accuracy: 0.4807 - val_loss: 0.8943 - val_accuracy: 0.5093
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3528 - accuracy: 0.4756 - val_loss: 0.8813 - val_accuracy: 0.4907
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4017 - accuracy: 0.4679 - val_loss: 0.8930 - val_accuracy: 0.5140
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4121 - accuracy: 0.4833 - val_loss: 0.8928 - val_accuracy: 0.4953
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3837 - accuracy: 0.4859 - val_loss: 0.8930 - val_accuracy: 0.5000
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3866 - accuracy: 0.5039 - val_loss: 0.8999 - val_accuracy: 0.5327
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3348 - accuracy: 0.5141 - val_loss: 0.9000 - val_accuracy: 0.5093
Epoch 171/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2993 - accuracy: 0.5193 - val_loss: 0.9006 - val_accuracy: 0.5374
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3843 - accuracy: 0.5219 - val_loss: 0.8929 - val_accuracy: 0.5234
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3304 - accuracy: 0.5193 - val_loss: 0.8952 - val_accuracy: 0.5327
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3460 - accuracy: 0.4987 - val_loss: 0.8944 - val_accuracy: 0.5234
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3562 - accuracy: 0.5347 - val_loss: 0.9187 - val_accuracy: 0.5000
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3789 - accuracy: 0.4961 - val_loss: 0.9199 - val_accuracy: 0.5140
Epoch 177/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3133 - accuracy: 0.5193 - val_loss: 0.9184 - val_accuracy: 0.4907
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3798 - accuracy: 0.4936 - val_loss: 0.8648 - val_accuracy: 0.4953
Epoch 179/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3686 - accuracy: 0.5013 - val_loss: 0.8889 - val_accuracy: 0.4907
Epoch 180/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3292 - accuracy: 0.5193 - val_loss: 0.9179 - val_accuracy: 0.4579
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2919 - accuracy: 0.4961 - val_loss: 0.9209 - val_accuracy: 0.4766
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3510 - accuracy: 0.5141 - val_loss: 0.9237 - val_accuracy: 0.5187
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3090 - accuracy: 0.5321 - val_loss: 0.9173 - val_accuracy: 0.5140

```

Epoch 184/1000
1/4 [=====>.....] - ETA: 0s - loss: 0.3377 - accuracy: 0.5625Restoring model weights from th
e end of the best epoch: 34.
4/4 [=====] - 0s 17ms/step - loss: 0.3926 - accuracy: 0.5296 - val_loss: 0.9177 - val_
accuracy: 0.5187
Epoch 184: early stopping
2/2 [=====] - 0s 4ms/step - loss: 1.4131 - accuracy: 0.6977
[CV] END .....Dense1=25, Dense2=50; total time= 10.2s
Model: "sequential_36"

```

Layer (type)	Output Shape	Param #
dense_144 (Dense)	(None, 25)	175
batch_normalization_108 (BatchNormalization)	(None, 25)	100
activation_108 (Activation)	(None, 25)	0
dense_145 (Dense)	(None, 50)	1300
batch_normalization_109 (BatchNormalization)	(None, 50)	200
activation_109 (Activation)	(None, 50)	0
dense_146 (Dense)	(None, 10)	510
batch_normalization_110 (BatchNormalization)	(None, 10)	40
activation_110 (Activation)	(None, 10)	0
dense_147 (Dense)	(None, 2)	22

```

=====
Total params: 2,347
Trainable params: 2,177
Non-trainable params: 170

```

```

Epoch 1/1000
4/4 [=====] - 1s 57ms/step - loss: 5.2398 - accuracy: 0.5810 - val_loss: 5.4208 - val_
accuracy: 0.5561
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 4.2229 - accuracy: 0.6067 - val_loss: 3.9991 - val_
accuracy: 0.5888
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 3.7708 - accuracy: 0.6530 - val_loss: 3.2191 - val_
accuracy: 0.5561
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5295 - accuracy: 0.6581 - val_loss: 2.9698 - val_
accuracy: 0.5701
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4411 - accuracy: 0.6401 - val_loss: 2.9303 - val_
accuracy: 0.5794
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4242 - accuracy: 0.6632 - val_loss: 2.7064 - val_
accuracy: 0.5748
Epoch 7/1000
4/4 [=====] - 0s 15ms/step - loss: 3.3737 - accuracy: 0.6684 - val_loss: 2.5280 - val_
accuracy: 0.5981
Epoch 8/1000
4/4 [=====] - 0s 15ms/step - loss: 3.2162 - accuracy: 0.6632 - val_loss: 2.3689 - val_
accuracy: 0.6028
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1428 - accuracy: 0.6967 - val_loss: 2.2151 - val_
accuracy: 0.5981
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 3.2841 - accuracy: 0.6915 - val_loss: 2.0556 - val_
accuracy: 0.5935
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1408 - accuracy: 0.7018 - val_loss: 2.0333 - val_
accuracy: 0.5981
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0881 - accuracy: 0.6967 - val_loss: 2.0093 - val_
accuracy: 0.5935
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1391 - accuracy: 0.6838 - val_loss: 1.9587 - val_
accuracy: 0.5981
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1801 - accuracy: 0.6967 - val_loss: 1.9335 - val_
accuracy: 0.5981
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0918 - accuracy: 0.6530 - val_loss: 1.8994 - val_
accuracy: 0.5841
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0528 - accuracy: 0.6632 - val_loss: 1.8815 - val_
accuracy: 0.5701
Epoch 17/1000

```

```
4/4 [=====] - 0s 13ms/step - loss: 2.9977 - accuracy: 0.6864 - val_loss: 1.8438 - val_accuracy: 0.5748
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9171 - accuracy: 0.6684 - val_loss: 1.8138 - val_accuracy: 0.5654
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8988 - accuracy: 0.6864 - val_loss: 1.7636 - val_accuracy: 0.5841
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9031 - accuracy: 0.6735 - val_loss: 1.7328 - val_accuracy: 0.5841
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9053 - accuracy: 0.6787 - val_loss: 1.7124 - val_accuracy: 0.5841
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8416 - accuracy: 0.6787 - val_loss: 1.6803 - val_accuracy: 0.5841
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6999 - accuracy: 0.6889 - val_loss: 1.6465 - val_accuracy: 0.5748
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6276 - accuracy: 0.6915 - val_loss: 1.6280 - val_accuracy: 0.5654
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5179 - accuracy: 0.6632 - val_loss: 1.6190 - val_accuracy: 0.5654
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4681 - accuracy: 0.6607 - val_loss: 1.6082 - val_accuracy: 0.5607
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4511 - accuracy: 0.6581 - val_loss: 1.5752 - val_accuracy: 0.5841
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4550 - accuracy: 0.6607 - val_loss: 1.5637 - val_accuracy: 0.5888
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3739 - accuracy: 0.6401 - val_loss: 1.5492 - val_accuracy: 0.5935
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2723 - accuracy: 0.6530 - val_loss: 1.5343 - val_accuracy: 0.6028
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2086 - accuracy: 0.6478 - val_loss: 1.4794 - val_accuracy: 0.5841
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2119 - accuracy: 0.6632 - val_loss: 1.4564 - val_accuracy: 0.6028
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2490 - accuracy: 0.6401 - val_loss: 1.4454 - val_accuracy: 0.5981
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2369 - accuracy: 0.6452 - val_loss: 1.4210 - val_accuracy: 0.6028
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1389 - accuracy: 0.6478 - val_loss: 1.4067 - val_accuracy: 0.5981
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9727 - accuracy: 0.6478 - val_loss: 1.3359 - val_accuracy: 0.5981
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8902 - accuracy: 0.6607 - val_loss: 1.3133 - val_accuracy: 0.5794
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7887 - accuracy: 0.6555 - val_loss: 1.3267 - val_accuracy: 0.5935
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7600 - accuracy: 0.6401 - val_loss: 1.3571 - val_accuracy: 0.5654
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7324 - accuracy: 0.6452 - val_loss: 1.3466 - val_accuracy: 0.5794
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5863 - accuracy: 0.6375 - val_loss: 1.3261 - val_accuracy: 0.5794
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5089 - accuracy: 0.6324 - val_loss: 1.3209 - val_accuracy: 0.5841
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4012 - accuracy: 0.6478 - val_loss: 1.3713 - val_accuracy: 0.5841
Epoch 44/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4963 - accuracy: 0.6298 - val_loss: 1.3200 - val_accuracy: 0.5841
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3376 - accuracy: 0.6478 - val_loss: 1.3042 - val_accuracy: 0.5791
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3855 - accuracy: 0.6247 - val_loss: 1.2416 - val_accuracy: 0.5888
```

Epoch 47/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2487 - accuracy: 0.6401 - val_loss: 1.2319 - val_accuracy: 0.5748
Epoch 48/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3709 - accuracy: 0.6375 - val_loss: 1.1986 - val_accuracy: 0.5794
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2306 - accuracy: 0.6221 - val_loss: 1.1432 - val_accuracy: 0.6028
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1864 - accuracy: 0.6375 - val_loss: 1.2567 - val_accuracy: 0.5607
Epoch 51/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1581 - accuracy: 0.6170 - val_loss: 1.2493 - val_accuracy: 0.5607
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0200 - accuracy: 0.6195 - val_loss: 1.1794 - val_accuracy: 0.5561
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1776 - accuracy: 0.6350 - val_loss: 1.1277 - val_accuracy: 0.5654
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0841 - accuracy: 0.6144 - val_loss: 1.1513 - val_accuracy: 0.5794
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0333 - accuracy: 0.6452 - val_loss: 1.1259 - val_accuracy: 0.5841
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1193 - accuracy: 0.6041 - val_loss: 1.1125 - val_accuracy: 0.6075
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9853 - accuracy: 0.6195 - val_loss: 1.1011 - val_accuracy: 0.5981
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9933 - accuracy: 0.6452 - val_loss: 1.1144 - val_accuracy: 0.6075
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0552 - accuracy: 0.6452 - val_loss: 1.0787 - val_accuracy: 0.6028
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0158 - accuracy: 0.6324 - val_loss: 1.0567 - val_accuracy: 0.5935
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9826 - accuracy: 0.6221 - val_loss: 1.0478 - val_accuracy: 0.6028
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9159 - accuracy: 0.6195 - val_loss: 1.0364 - val_accuracy: 0.6028
Epoch 63/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0371 - accuracy: 0.6067 - val_loss: 1.0263 - val_accuracy: 0.6121
Epoch 64/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9612 - accuracy: 0.6375 - val_loss: 1.0164 - val_accuracy: 0.6262
Epoch 65/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8799 - accuracy: 0.6324 - val_loss: 0.9960 - val_accuracy: 0.6308
Epoch 66/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8673 - accuracy: 0.6170 - val_loss: 0.9868 - val_accuracy: 0.6121
Epoch 67/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8940 - accuracy: 0.5964 - val_loss: 0.9753 - val_accuracy: 0.6075
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8491 - accuracy: 0.6375 - val_loss: 0.9461 - val_accuracy: 0.6075
Epoch 69/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8832 - accuracy: 0.6247 - val_loss: 0.9548 - val_accuracy: 0.6028
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8384 - accuracy: 0.6324 - val_loss: 0.9602 - val_accuracy: 0.6075
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7643 - accuracy: 0.6015 - val_loss: 0.9775 - val_accuracy: 0.6168
Epoch 72/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8046 - accuracy: 0.5887 - val_loss: 0.9328 - val_accuracy: 0.6215
Epoch 73/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7474 - accuracy: 0.6221 - val_loss: 0.9895 - val_accuracy: 0.6308
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7875 - accuracy: 0.6015 - val_loss: 0.9457 - val_accuracy: 0.6262
Epoch 75/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7923 - accuracy: 0.6427 - val_loss: 0.9599 - val_accuracy: 0.6308
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7230 - accuracy: 0.6530 - val_loss: 0.9516 - val_accuracy: 0.6262

```
accuracy: 0.6215
Epoch 77/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7573 - accuracy: 0.6787 - val_loss: 0.9890 - val_accuracy: 0.6308
Epoch 78/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7018 - accuracy: 0.6350 - val_loss: 0.9722 - val_accuracy: 0.6402
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7415 - accuracy: 0.6452 - val_loss: 0.9814 - val_accuracy: 0.6355
Epoch 80/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7843 - accuracy: 0.6478 - val_loss: 0.9377 - val_accuracy: 0.6355
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7233 - accuracy: 0.6735 - val_loss: 0.9018 - val_accuracy: 0.6355
Epoch 82/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6744 - accuracy: 0.6684 - val_loss: 0.8901 - val_accuracy: 0.6355
Epoch 83/1000
4/4 [=====] - 0s 17ms/step - loss: 0.6690 - accuracy: 0.6401 - val_loss: 0.9290 - val_accuracy: 0.6449
Epoch 84/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6520 - accuracy: 0.6530 - val_loss: 0.9229 - val_accuracy: 0.6402
Epoch 85/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7280 - accuracy: 0.6607 - val_loss: 0.9145 - val_accuracy: 0.6636
Epoch 86/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6314 - accuracy: 0.6581 - val_loss: 0.8885 - val_accuracy: 0.6682
Epoch 87/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6576 - accuracy: 0.6684 - val_loss: 0.9095 - val_accuracy: 0.6729
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6077 - accuracy: 0.6889 - val_loss: 0.9075 - val_accuracy: 0.6729
Epoch 89/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7389 - accuracy: 0.6761 - val_loss: 0.9032 - val_accuracy: 0.6822
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6432 - accuracy: 0.6581 - val_loss: 0.8949 - val_accuracy: 0.6822
Epoch 91/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7090 - accuracy: 0.6298 - val_loss: 0.8846 - val_accuracy: 0.6869
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6527 - accuracy: 0.6401 - val_loss: 0.8704 - val_accuracy: 0.6869
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6583 - accuracy: 0.6710 - val_loss: 0.8847 - val_accuracy: 0.6869
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6339 - accuracy: 0.6401 - val_loss: 0.9064 - val_accuracy: 0.6822
Epoch 95/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6219 - accuracy: 0.6298 - val_loss: 0.9001 - val_accuracy: 0.6916
Epoch 96/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6766 - accuracy: 0.6710 - val_loss: 0.9033 - val_accuracy: 0.6776
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6017 - accuracy: 0.6632 - val_loss: 0.8994 - val_accuracy: 0.6776
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6264 - accuracy: 0.6555 - val_loss: 0.9219 - val_accuracy: 0.6869
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5773 - accuracy: 0.6581 - val_loss: 0.9207 - val_accuracy: 0.6682
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6819 - accuracy: 0.6401 - val_loss: 0.8520 - val_accuracy: 0.6776
Epoch 101/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5897 - accuracy: 0.6581 - val_loss: 0.8541 - val_accuracy: 0.6963
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6146 - accuracy: 0.6710 - val_loss: 0.8697 - val_accuracy: 0.6729
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6229 - accuracy: 0.6555 - val_loss: 0.8729 - val_accuracy: 0.6869
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5569 - accuracy: 0.6555 - val_loss: 0.9385 - val_accuracy: 0.6542
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6320 - accuracy: 0.6350 - val_loss: 0.9355 - val_accuracy: 0.6495
Epoch 106/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.6175 - accuracy: 0.6427 - val_loss: 0.8592 - val_accuracy: 0.6355
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5964 - accuracy: 0.6632 - val_loss: 0.8318 - val_accuracy: 0.6402
Epoch 108/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6310 - accuracy: 0.6452 - val_loss: 0.8545 - val_accuracy: 0.6495
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5594 - accuracy: 0.6684 - val_loss: 0.8863 - val_accuracy: 0.6308
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5651 - accuracy: 0.6478 - val_loss: 0.9029 - val_accuracy: 0.6402
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5700 - accuracy: 0.6915 - val_loss: 0.9128 - val_accuracy: 0.6402
Epoch 112/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6833 - accuracy: 0.6684 - val_loss: 0.9272 - val_accuracy: 0.6308
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6084 - accuracy: 0.6298 - val_loss: 0.9009 - val_accuracy: 0.6121
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6158 - accuracy: 0.6195 - val_loss: 0.9340 - val_accuracy: 0.6075
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5496 - accuracy: 0.6658 - val_loss: 0.9149 - val_accuracy: 0.6262
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5192 - accuracy: 0.6658 - val_loss: 0.9029 - val_accuracy: 0.6215
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5651 - accuracy: 0.6478 - val_loss: 0.9442 - val_accuracy: 0.6121
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5986 - accuracy: 0.6555 - val_loss: 0.9729 - val_accuracy: 0.6121
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5588 - accuracy: 0.6375 - val_loss: 1.0524 - val_accuracy: 0.6168
Epoch 120/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5461 - accuracy: 0.6735 - val_loss: 1.0526 - val_accuracy: 0.6262
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5599 - accuracy: 0.6735 - val_loss: 1.0280 - val_accuracy: 0.6168
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5206 - accuracy: 0.6504 - val_loss: 0.9993 - val_accuracy: 0.6168
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5304 - accuracy: 0.6324 - val_loss: 0.9878 - val_accuracy: 0.6075
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5213 - accuracy: 0.6427 - val_loss: 0.9918 - val_accuracy: 0.6308
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5923 - accuracy: 0.6478 - val_loss: 0.9850 - val_accuracy: 0.6308
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5602 - accuracy: 0.6375 - val_loss: 0.9902 - val_accuracy: 0.6262
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5309 - accuracy: 0.6555 - val_loss: 0.9885 - val_accuracy: 0.6121
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4945 - accuracy: 0.6452 - val_loss: 1.0228 - val_accuracy: 0.6215
Epoch 129/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5405 - accuracy: 0.6504 - val_loss: 1.0509 - val_accuracy: 0.6075
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4999 - accuracy: 0.6478 - val_loss: 1.0379 - val_accuracy: 0.6168
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5585 - accuracy: 0.6350 - val_loss: 1.0336 - val_accuracy: 0.6028
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5798 - accuracy: 0.6118 - val_loss: 1.0049 - val_accuracy: 0.5981
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5320 - accuracy: 0.6195 - val_loss: 1.0083 - val_accuracy: 0.6075
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5358 - accuracy: 0.6195 - val_loss: 0.9977 - val_accuracy: 0.5794
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6135 - accuracy: 0.6221 - val_loss: 0.9982 - val_accuracy: 0.5794
```

Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5184 - accuracy: 0.6195 - val_loss: 0.9678 - val_accuracy: 0.6075
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5948 - accuracy: 0.6684 - val_loss: 1.0276 - val_accuracy: 0.6121
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5195 - accuracy: 0.6427 - val_loss: 1.0270 - val_accuracy: 0.5981
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5155 - accuracy: 0.6427 - val_loss: 1.0530 - val_accuracy: 0.6121
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5388 - accuracy: 0.6247 - val_loss: 1.0254 - val_accuracy: 0.6028
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5129 - accuracy: 0.6478 - val_loss: 0.9721 - val_accuracy: 0.6028
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4747 - accuracy: 0.6401 - val_loss: 1.0465 - val_accuracy: 0.6028
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4876 - accuracy: 0.6350 - val_loss: 0.9848 - val_accuracy: 0.5935
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4977 - accuracy: 0.6555 - val_loss: 0.9605 - val_accuracy: 0.6075
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5400 - accuracy: 0.6658 - val_loss: 0.9418 - val_accuracy: 0.5981
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4806 - accuracy: 0.6504 - val_loss: 0.9594 - val_accuracy: 0.6168
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4555 - accuracy: 0.6735 - val_loss: 0.9524 - val_accuracy: 0.6262
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4908 - accuracy: 0.6247 - val_loss: 0.9518 - val_accuracy: 0.6215
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5096 - accuracy: 0.6118 - val_loss: 0.9523 - val_accuracy: 0.6121
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5912 - accuracy: 0.6015 - val_loss: 0.9165 - val_accuracy: 0.5935
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5565 - accuracy: 0.6221 - val_loss: 0.9174 - val_accuracy: 0.5981
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4899 - accuracy: 0.6195 - val_loss: 0.9188 - val_accuracy: 0.5888
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4496 - accuracy: 0.5887 - val_loss: 0.9206 - val_accuracy: 0.5888
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4613 - accuracy: 0.6298 - val_loss: 0.9197 - val_accuracy: 0.5888
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4460 - accuracy: 0.6298 - val_loss: 0.9168 - val_accuracy: 0.5888
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5014 - accuracy: 0.6581 - val_loss: 0.9180 - val_accuracy: 0.5841
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4822 - accuracy: 0.6350 - val_loss: 0.9435 - val_accuracy: 0.5841
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4671 - accuracy: 0.6221 - val_loss: 0.9471 - val_accuracy: 0.5327
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4366 - accuracy: 0.6041 - val_loss: 0.9444 - val_accuracy: 0.5467
Epoch 160/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5050 - accuracy: 0.6632 - val_loss: 0.9430 - val_accuracy: 0.5607
Epoch 161/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4371 - accuracy: 0.6581 - val_loss: 0.9424 - val_accuracy: 0.5607
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4642 - accuracy: 0.6632 - val_loss: 0.9679 - val_accuracy: 0.5654
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4888 - accuracy: 0.6632 - val_loss: 0.9616 - val_accuracy: 0.5654
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5455 - accuracy: 0.6298 - val_loss: 0.9349 - val_accuracy: 0.5654
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4448 - accuracy: 0.6298 - val_loss: 0.9412 - val_accuracy: 0.5654

```
accuracy: 0.5748
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6111 - accuracy: 0.6350 - val_loss: 1.0011 - val_accuracy: 0.5794
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4319 - accuracy: 0.6581 - val_loss: 1.0252 - val_accuracy: 0.5701
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5006 - accuracy: 0.6427 - val_loss: 0.9935 - val_accuracy: 0.5794
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4786 - accuracy: 0.6195 - val_loss: 0.9922 - val_accuracy: 0.5701
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5247 - accuracy: 0.6632 - val_loss: 0.9741 - val_accuracy: 0.5701
Epoch 171/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4207 - accuracy: 0.6170 - val_loss: 0.9763 - val_accuracy: 0.5794
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4179 - accuracy: 0.6504 - val_loss: 0.9746 - val_accuracy: 0.5701
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4545 - accuracy: 0.6504 - val_loss: 0.9778 - val_accuracy: 0.5935
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4890 - accuracy: 0.6581 - val_loss: 1.0264 - val_accuracy: 0.5935
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4711 - accuracy: 0.6375 - val_loss: 1.0258 - val_accuracy: 0.5701
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3802 - accuracy: 0.6555 - val_loss: 1.0041 - val_accuracy: 0.5607
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4021 - accuracy: 0.6530 - val_loss: 1.0072 - val_accuracy: 0.5794
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4287 - accuracy: 0.6607 - val_loss: 1.0084 - val_accuracy: 0.5981
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4526 - accuracy: 0.6761 - val_loss: 1.0024 - val_accuracy: 0.5981
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4475 - accuracy: 0.6684 - val_loss: 1.0590 - val_accuracy: 0.5748
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5022 - accuracy: 0.6504 - val_loss: 1.0303 - val_accuracy: 0.5701
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3966 - accuracy: 0.6478 - val_loss: 1.0305 - val_accuracy: 0.5561
Epoch 183/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4187 - accuracy: 0.6787 - val_loss: 0.9980 - val_accuracy: 0.5607
Epoch 184/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6028 - accuracy: 0.6581 - val_loss: 0.9960 - val_accuracy: 0.5748
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4672 - accuracy: 0.6658 - val_loss: 0.9951 - val_accuracy: 0.5841
Epoch 186/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4074 - accuracy: 0.6530 - val_loss: 1.0215 - val_accuracy: 0.5748
Epoch 187/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3950 - accuracy: 0.6581 - val_loss: 1.0189 - val_accuracy: 0.6075
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3868 - accuracy: 0.6787 - val_loss: 0.9876 - val_accuracy: 0.5981
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4248 - accuracy: 0.6581 - val_loss: 1.0182 - val_accuracy: 0.6121
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4170 - accuracy: 0.6787 - val_loss: 0.9644 - val_accuracy: 0.5935
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3830 - accuracy: 0.6658 - val_loss: 1.0255 - val_accuracy: 0.6542
Epoch 192/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4845 - accuracy: 0.6401 - val_loss: 1.0310 - val_accuracy: 0.6636
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5086 - accuracy: 0.6478 - val_loss: 1.0542 - val_accuracy: 0.6776
Epoch 194/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3895 - accuracy: 0.6915 - val_loss: 1.0521 - val_accuracy: 0.6776
Epoch 195/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3875 - accuracy: 0.6812 - val_loss: 1.0585 - val_accuracy: 0.6589
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4201 - accuracy: 0.6607 - val_loss: 1.0608 - val_accuracy: 0.6869
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3717 - accuracy: 0.6838 - val_loss: 1.1163 - val_accuracy: 0.6776
Epoch 198/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4075 - accuracy: 0.6812 - val_loss: 1.0223 - val_accuracy: 0.6729
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4043 - accuracy: 0.6761 - val_loss: 0.9949 - val_accuracy: 0.6262
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3818 - accuracy: 0.6710 - val_loss: 0.9917 - val_accuracy: 0.6215
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3789 - accuracy: 0.6864 - val_loss: 0.9599 - val_accuracy: 0.6262
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4750 - accuracy: 0.6992 - val_loss: 0.9674 - val_accuracy: 0.6402
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4148 - accuracy: 0.7121 - val_loss: 0.9674 - val_accuracy: 0.6215
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4350 - accuracy: 0.6967 - val_loss: 0.9497 - val_accuracy: 0.6402
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3744 - accuracy: 0.6812 - val_loss: 0.9552 - val_accuracy: 0.6121
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3749 - accuracy: 0.6735 - val_loss: 0.9810 - val_accuracy: 0.6168
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4319 - accuracy: 0.6658 - val_loss: 0.9763 - val_accuracy: 0.6121
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4285 - accuracy: 0.6607 - val_loss: 0.9962 - val_accuracy: 0.6168
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3676 - accuracy: 0.6684 - val_loss: 0.9934 - val_accuracy: 0.6308
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3919 - accuracy: 0.6632 - val_loss: 0.9972 - val_accuracy: 0.6121
Epoch 211/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4396 - accuracy: 0.6555 - val_loss: 0.9946 - val_accuracy: 0.5981
Epoch 212/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4012 - accuracy: 0.6889 - val_loss: 0.9956 - val_accuracy: 0.5888
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4262 - accuracy: 0.6504 - val_loss: 0.9865 - val_accuracy: 0.6121
Epoch 214/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4335 - accuracy: 0.6530 - val_loss: 0.9635 - val_accuracy: 0.6308
Epoch 215/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4565 - accuracy: 0.6247 - val_loss: 0.9815 - val_accuracy: 0.6075
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3673 - accuracy: 0.6581 - val_loss: 0.9547 - val_accuracy: 0.5981
Epoch 217/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3473 - accuracy: 0.6427 - val_loss: 0.9489 - val_accuracy: 0.5841
Epoch 218/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3631 - accuracy: 0.6298 - val_loss: 0.9509 - val_accuracy: 0.5748
Epoch 219/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3989 - accuracy: 0.6581 - val_loss: 0.9783 - val_accuracy: 0.5888
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4124 - accuracy: 0.6375 - val_loss: 0.9509 - val_accuracy: 0.5935
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3543 - accuracy: 0.6581 - val_loss: 0.9486 - val_accuracy: 0.5701
Epoch 222/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3465 - accuracy: 0.6632 - val_loss: 0.9558 - val_accuracy: 0.5701
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4182 - accuracy: 0.6684 - val_loss: 0.9616 - val_accuracy: 0.5841
Epoch 224/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3438 - accuracy: 0.6632 - val_loss: 0.9602 - val_accuracy: 0.5794
```

Epoch 225/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3647 - accuracy: 0.6684 - val_loss: 0.9663 - val_accuracy: 0.5701
 Epoch 226/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3817 - accuracy: 0.6838 - val_loss: 0.9817 - val_accuracy: 0.5514
 Epoch 227/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4180 - accuracy: 0.6504 - val_loss: 0.9305 - val_accuracy: 0.5701
 Epoch 228/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3450 - accuracy: 0.6607 - val_loss: 0.9521 - val_accuracy: 0.5841
 Epoch 229/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4118 - accuracy: 0.6581 - val_loss: 0.9534 - val_accuracy: 0.5654
 Epoch 230/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3548 - accuracy: 0.6735 - val_loss: 1.0081 - val_accuracy: 0.5794
 Epoch 231/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3443 - accuracy: 0.6581 - val_loss: 0.9556 - val_accuracy: 0.5748
 Epoch 232/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3614 - accuracy: 0.6889 - val_loss: 0.9545 - val_accuracy: 0.5935
 Epoch 233/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3535 - accuracy: 0.6735 - val_loss: 0.9574 - val_accuracy: 0.5935
 Epoch 234/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3152 - accuracy: 0.6684 - val_loss: 0.9781 - val_accuracy: 0.5607
 Epoch 235/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3753 - accuracy: 0.6761 - val_loss: 0.9432 - val_accuracy: 0.5421
 Epoch 236/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4790 - accuracy: 0.6735 - val_loss: 0.9477 - val_accuracy: 0.5607
 Epoch 237/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4265 - accuracy: 0.6658 - val_loss: 0.9492 - val_accuracy: 0.5421
 Epoch 238/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3869 - accuracy: 0.6504 - val_loss: 0.9079 - val_accuracy: 0.6075
 Epoch 239/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3642 - accuracy: 0.6710 - val_loss: 0.9017 - val_accuracy: 0.6075
 Epoch 240/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3388 - accuracy: 0.6530 - val_loss: 0.8993 - val_accuracy: 0.6075
 Epoch 241/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4043 - accuracy: 0.6478 - val_loss: 0.8989 - val_accuracy: 0.6028
 Epoch 242/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3867 - accuracy: 0.6427 - val_loss: 0.9267 - val_accuracy: 0.5981
 Epoch 243/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4454 - accuracy: 0.6478 - val_loss: 0.9391 - val_accuracy: 0.5841
 Epoch 244/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3920 - accuracy: 0.6170 - val_loss: 1.0174 - val_accuracy: 0.5841
 Epoch 245/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3983 - accuracy: 0.6350 - val_loss: 0.9952 - val_accuracy: 0.5841
 Epoch 246/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3190 - accuracy: 0.6710 - val_loss: 0.9071 - val_accuracy: 0.5794
 Epoch 247/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3350 - accuracy: 0.6427 - val_loss: 0.8622 - val_accuracy: 0.5888
 Epoch 248/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4981 - accuracy: 0.6401 - val_loss: 0.8304 - val_accuracy: 0.5888
 Epoch 249/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.3525 - accuracy: 0.6350 - val_loss: 0.8490 - val_accuracy: 0.5888
 Epoch 250/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3555 - accuracy: 0.6324 - val_loss: 0.8762 - val_accuracy: 0.5888
 Epoch 251/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.3411 - accuracy: 0.6250Restoring model weights from the end of the best epoch: 101.
 4/4 [=====] - 0s 14ms/step - loss: 0.3911 - accuracy: 0.6427 - val_loss: 0.9221 - val_accuracy: 0.5794
 Epoch 251: early stopping
 2/2 [=====] - 1s 3ms/step - loss: 0.5460 - accuracy: 0.6279
 [CV] ENDDense1=25, Dense2=50; total time= 13.9s
 Model: "sequential_37"

Layer (type)	Output Shape	Param #
--------------	--------------	---------

```
=====
dense_148 (Dense)          (None, 25)           175
batch_normalization_111 (Ba (None, 25)
tchNormalization)          100
activation_111 (Activation) (None, 25)           0
dense_149 (Dense)          (None, 50)            1300
batch_normalization_112 (Ba (None, 50)
tchNormalization)          200
activation_112 (Activation) (None, 50)           0
dense_150 (Dense)          (None, 10)            510
batch_normalization_113 (Ba (None, 10)
tchNormalization)          40
activation_113 (Activation) (None, 10)           0
dense_151 (Dense)          (None, 2)             22
=====

Total params: 2,347
Trainable params: 2,177
Non-trainable params: 170

Epoch 1/1000
4/4 [=====] - 1s 61ms/step - loss: 3.7417 - accuracy: 0.4627 - val_loss: 2.8490 - val_accuracy: 0.7009
Epoch 2/1000
4/4 [=====] - 0s 15ms/step - loss: 2.7756 - accuracy: 0.4473 - val_loss: 2.6318 - val_accuracy: 0.7103
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 2.5327 - accuracy: 0.4807 - val_loss: 2.5544 - val_accuracy: 0.7103
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3242 - accuracy: 0.4936 - val_loss: 2.2812 - val_accuracy: 0.7196
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 2.4663 - accuracy: 0.4730 - val_loss: 2.0106 - val_accuracy: 0.7243
Epoch 6/1000
4/4 [=====] - 0s 15ms/step - loss: 2.3317 - accuracy: 0.4781 - val_loss: 1.9270 - val_accuracy: 0.7150
Epoch 7/1000
4/4 [=====] - 0s 15ms/step - loss: 2.1349 - accuracy: 0.5064 - val_loss: 1.9471 - val_accuracy: 0.7290
Epoch 8/1000
4/4 [=====] - 0s 15ms/step - loss: 1.8880 - accuracy: 0.4627 - val_loss: 1.9604 - val_accuracy: 0.7290
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8940 - accuracy: 0.4859 - val_loss: 1.9831 - val_accuracy: 0.7056
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9776 - accuracy: 0.4807 - val_loss: 1.9709 - val_accuracy: 0.7009
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7366 - accuracy: 0.5039 - val_loss: 1.9708 - val_accuracy: 0.7103
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6614 - accuracy: 0.4781 - val_loss: 1.9577 - val_accuracy: 0.7056
Epoch 13/1000
4/4 [=====] - 0s 15ms/step - loss: 1.7495 - accuracy: 0.5141 - val_loss: 1.9412 - val_accuracy: 0.6682
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5655 - accuracy: 0.5116 - val_loss: 1.8548 - val_accuracy: 0.6729
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5880 - accuracy: 0.5193 - val_loss: 1.8626 - val_accuracy: 0.6215
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4184 - accuracy: 0.5219 - val_loss: 1.8562 - val_accuracy: 0.6355
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4858 - accuracy: 0.4987 - val_loss: 1.7939 - val_accuracy: 0.5981
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3247 - accuracy: 0.5219 - val_loss: 1.7648 - val_accuracy: 0.5888
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3643 - accuracy: 0.5039 - val_loss: 1.7425 - val_accuracy: 0.6075
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2802 - accuracy: 0.5013 - val_loss: 1.7153 - val_accuracy: 0.5981
```

Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3016 - accuracy: 0.5167 - val_loss: 1.7142 - val_accuracy: 0.6028
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3304 - accuracy: 0.5244 - val_loss: 1.6631 - val_accuracy: 0.5981
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2545 - accuracy: 0.5244 - val_loss: 1.6409 - val_accuracy: 0.5888
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2210 - accuracy: 0.5373 - val_loss: 1.5889 - val_accuracy: 0.5841
Epoch 25/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2436 - accuracy: 0.5501 - val_loss: 1.5663 - val_accuracy: 0.5794
Epoch 26/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1461 - accuracy: 0.5193 - val_loss: 1.5343 - val_accuracy: 0.5607
Epoch 27/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1276 - accuracy: 0.5167 - val_loss: 1.4970 - val_accuracy: 0.5514
Epoch 28/1000
4/4 [=====] - 0s 15ms/step - loss: 1.3847 - accuracy: 0.5219 - val_loss: 1.5421 - val_accuracy: 0.6215
Epoch 29/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1609 - accuracy: 0.5219 - val_loss: 1.5365 - val_accuracy: 0.6075
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9775 - accuracy: 0.5244 - val_loss: 1.4943 - val_accuracy: 0.5888
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0705 - accuracy: 0.5270 - val_loss: 1.4787 - val_accuracy: 0.5514
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0063 - accuracy: 0.5090 - val_loss: 1.5018 - val_accuracy: 0.6215
Epoch 33/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0572 - accuracy: 0.5141 - val_loss: 1.4752 - val_accuracy: 0.6121
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1943 - accuracy: 0.5219 - val_loss: 1.5232 - val_accuracy: 0.6402
Epoch 35/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9560 - accuracy: 0.5373 - val_loss: 1.5097 - val_accuracy: 0.6402
Epoch 36/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9179 - accuracy: 0.5064 - val_loss: 1.5025 - val_accuracy: 0.6449
Epoch 37/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9962 - accuracy: 0.5039 - val_loss: 1.4908 - val_accuracy: 0.6402
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9964 - accuracy: 0.5141 - val_loss: 1.4744 - val_accuracy: 0.6495
Epoch 39/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8904 - accuracy: 0.5064 - val_loss: 1.4517 - val_accuracy: 0.6495
Epoch 40/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9898 - accuracy: 0.5296 - val_loss: 1.4281 - val_accuracy: 0.6495
Epoch 41/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9755 - accuracy: 0.5476 - val_loss: 1.4088 - val_accuracy: 0.6495
Epoch 42/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9542 - accuracy: 0.5501 - val_loss: 1.3804 - val_accuracy: 0.6308
Epoch 43/1000
4/4 [=====] - 0s 16ms/step - loss: 0.9229 - accuracy: 0.5219 - val_loss: 1.3662 - val_accuracy: 0.6355
Epoch 44/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8593 - accuracy: 0.5347 - val_loss: 1.3744 - val_accuracy: 0.6355
Epoch 45/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8275 - accuracy: 0.5090 - val_loss: 1.3559 - val_accuracy: 0.6449
Epoch 46/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9029 - accuracy: 0.5116 - val_loss: 1.3464 - val_accuracy: 0.6402
Epoch 47/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9183 - accuracy: 0.5013 - val_loss: 1.3512 - val_accuracy: 0.6355
Epoch 48/1000
4/4 [=====] - 0s 18ms/step - loss: 0.8916 - accuracy: 0.5064 - val_loss: 1.3223 - val_accuracy: 0.6636
Epoch 49/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8171 - accuracy: 0.5630 - val_loss: 1.3160 - val_accuracy: 0.6589
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8405 - accuracy: 0.4987 - val_loss: 1.3112 - val_accuracy: 0.6589

```
accuracy: 0.6449
Epoch 51/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7644 - accuracy: 0.5321 - val_loss: 1.2846 - val_accuracy: 0.6449
Epoch 52/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8452 - accuracy: 0.5398 - val_loss: 1.2851 - val_accuracy: 0.6402
Epoch 53/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8271 - accuracy: 0.5167 - val_loss: 1.2411 - val_accuracy: 0.5888
Epoch 54/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8980 - accuracy: 0.5398 - val_loss: 1.2324 - val_accuracy: 0.5981
Epoch 55/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8067 - accuracy: 0.5296 - val_loss: 1.2012 - val_accuracy: 0.5841
Epoch 56/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7935 - accuracy: 0.5398 - val_loss: 1.1583 - val_accuracy: 0.5607
Epoch 57/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7605 - accuracy: 0.5244 - val_loss: 1.1473 - val_accuracy: 0.5701
Epoch 58/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8011 - accuracy: 0.5450 - val_loss: 1.1431 - val_accuracy: 0.5841
Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8538 - accuracy: 0.5321 - val_loss: 1.1259 - val_accuracy: 0.5607
Epoch 60/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8304 - accuracy: 0.5501 - val_loss: 1.1243 - val_accuracy: 0.5607
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8291 - accuracy: 0.5347 - val_loss: 1.1363 - val_accuracy: 0.6028
Epoch 62/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7730 - accuracy: 0.5476 - val_loss: 1.1207 - val_accuracy: 0.5981
Epoch 63/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7083 - accuracy: 0.5347 - val_loss: 1.1043 - val_accuracy: 0.6028
Epoch 64/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6919 - accuracy: 0.5578 - val_loss: 1.1004 - val_accuracy: 0.5935
Epoch 65/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7956 - accuracy: 0.5450 - val_loss: 1.0847 - val_accuracy: 0.5981
Epoch 66/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7037 - accuracy: 0.5270 - val_loss: 1.0630 - val_accuracy: 0.6028
Epoch 67/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6442 - accuracy: 0.5450 - val_loss: 1.0362 - val_accuracy: 0.5935
Epoch 68/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8237 - accuracy: 0.5450 - val_loss: 0.9941 - val_accuracy: 0.5794
Epoch 69/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9600 - accuracy: 0.5424 - val_loss: 0.9952 - val_accuracy: 0.5748
Epoch 70/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7485 - accuracy: 0.5347 - val_loss: 0.9883 - val_accuracy: 0.5514
Epoch 71/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8007 - accuracy: 0.5398 - val_loss: 0.9777 - val_accuracy: 0.5467
Epoch 72/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7861 - accuracy: 0.4987 - val_loss: 0.9685 - val_accuracy: 0.5561
Epoch 73/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7899 - accuracy: 0.5321 - val_loss: 0.9789 - val_accuracy: 0.5654
Epoch 74/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7928 - accuracy: 0.5476 - val_loss: 0.9724 - val_accuracy: 0.5561
Epoch 75/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7155 - accuracy: 0.5219 - val_loss: 0.9648 - val_accuracy: 0.5561
Epoch 76/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7766 - accuracy: 0.5450 - val_loss: 0.9478 - val_accuracy: 0.5280
Epoch 77/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6955 - accuracy: 0.5527 - val_loss: 0.9651 - val_accuracy: 0.5374
Epoch 78/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7701 - accuracy: 0.5296 - val_loss: 0.9625 - val_accuracy: 0.5467
Epoch 79/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6414 - accuracy: 0.5270 - val_loss: 0.9597 - val_accuracy: 0.5421
Epoch 80/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 0.6254 - accuracy: 0.5193 - val_loss: 0.9481 - val_accuracy: 0.5467
Epoch 81/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6837 - accuracy: 0.5398 - val_loss: 0.9633 - val_accuracy: 0.5514
Epoch 82/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6760 - accuracy: 0.5501 - val_loss: 0.9413 - val_accuracy: 0.5467
Epoch 83/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7300 - accuracy: 0.5398 - val_loss: 0.9399 - val_accuracy: 0.5514
Epoch 84/1000
4/4 [=====] - 0s 16ms/step - loss: 0.6117 - accuracy: 0.5553 - val_loss: 0.9305 - val_accuracy: 0.5654
Epoch 85/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6610 - accuracy: 0.5501 - val_loss: 0.9106 - val_accuracy: 0.5374
Epoch 86/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6085 - accuracy: 0.5373 - val_loss: 0.9546 - val_accuracy: 0.5467
Epoch 87/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6921 - accuracy: 0.5244 - val_loss: 0.9559 - val_accuracy: 0.5748
Epoch 88/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7078 - accuracy: 0.5681 - val_loss: 0.9546 - val_accuracy: 0.5607
Epoch 89/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5631 - accuracy: 0.5630 - val_loss: 0.9947 - val_accuracy: 0.5280
Epoch 90/1000
4/4 [=====] - 0s 17ms/step - loss: 0.7396 - accuracy: 0.5476 - val_loss: 1.0687 - val_accuracy: 0.5280
Epoch 91/1000
4/4 [=====] - 0s 19ms/step - loss: 0.6875 - accuracy: 0.5630 - val_loss: 1.0528 - val_accuracy: 0.5327
Epoch 92/1000
4/4 [=====] - 0s 17ms/step - loss: 0.7026 - accuracy: 0.5707 - val_loss: 1.0152 - val_accuracy: 0.5000
Epoch 93/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5098 - accuracy: 0.5861 - val_loss: 0.9826 - val_accuracy: 0.5280
Epoch 94/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6771 - accuracy: 0.5656 - val_loss: 0.9729 - val_accuracy: 0.5140
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5376 - accuracy: 0.5476 - val_loss: 0.9760 - val_accuracy: 0.4860
Epoch 96/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5907 - accuracy: 0.5578 - val_loss: 0.9826 - val_accuracy: 0.4813
Epoch 97/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5795 - accuracy: 0.5656 - val_loss: 1.0079 - val_accuracy: 0.4673
Epoch 98/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6318 - accuracy: 0.5501 - val_loss: 1.0103 - val_accuracy: 0.4673
Epoch 99/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6178 - accuracy: 0.5424 - val_loss: 1.0109 - val_accuracy: 0.4766
Epoch 100/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6170 - accuracy: 0.5656 - val_loss: 1.0164 - val_accuracy: 0.4720
Epoch 101/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5574 - accuracy: 0.5424 - val_loss: 1.0682 - val_accuracy: 0.4766
Epoch 102/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7327 - accuracy: 0.5398 - val_loss: 1.1050 - val_accuracy: 0.4626
Epoch 103/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5437 - accuracy: 0.5296 - val_loss: 1.0379 - val_accuracy: 0.4813
Epoch 104/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5588 - accuracy: 0.5527 - val_loss: 1.1709 - val_accuracy: 0.4673
Epoch 105/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5644 - accuracy: 0.5733 - val_loss: 1.1823 - val_accuracy: 0.4673
Epoch 106/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5948 - accuracy: 0.5527 - val_loss: 1.2158 - val_accuracy: 0.4673
Epoch 107/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5339 - accuracy: 0.5398 - val_loss: 1.2639 - val_accuracy: 0.4673
Epoch 108/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5892 - accuracy: 0.5296 - val_loss: 1.2710 - val_accuracy: 0.4673
Epoch 109/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6779 - accuracy: 0.5296 - val_loss: 1.2353 - val_accuracy: 0.4766
```

Epoch 110/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6300 - accuracy: 0.5141 - val_loss: 1.2096 - val_accuracy: 0.5047
Epoch 111/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5890 - accuracy: 0.5219 - val_loss: 1.1861 - val_accuracy: 0.4953
Epoch 112/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5830 - accuracy: 0.5553 - val_loss: 1.1508 - val_accuracy: 0.5093
Epoch 113/1000
4/4 [=====] - 0s 16ms/step - loss: 0.6268 - accuracy: 0.5578 - val_loss: 1.1043 - val_accuracy: 0.5047
Epoch 114/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5793 - accuracy: 0.5707 - val_loss: 1.0975 - val_accuracy: 0.5187
Epoch 115/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6255 - accuracy: 0.5733 - val_loss: 1.1098 - val_accuracy: 0.5140
Epoch 116/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6318 - accuracy: 0.5887 - val_loss: 1.2144 - val_accuracy: 0.4813
Epoch 117/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5497 - accuracy: 0.5707 - val_loss: 1.3232 - val_accuracy: 0.4766
Epoch 118/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4791 - accuracy: 0.5373 - val_loss: 1.4053 - val_accuracy: 0.4907
Epoch 119/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5662 - accuracy: 0.5733 - val_loss: 1.3241 - val_accuracy: 0.4907
Epoch 120/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5164 - accuracy: 0.5501 - val_loss: 1.4040 - val_accuracy: 0.4953
Epoch 121/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5122 - accuracy: 0.5604 - val_loss: 1.4129 - val_accuracy: 0.4813
Epoch 122/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5343 - accuracy: 0.5347 - val_loss: 1.3612 - val_accuracy: 0.4907
Epoch 123/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5668 - accuracy: 0.5450 - val_loss: 1.4433 - val_accuracy: 0.4860
Epoch 124/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5760 - accuracy: 0.5090 - val_loss: 1.4671 - val_accuracy: 0.4860
Epoch 125/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5455 - accuracy: 0.5707 - val_loss: 1.4547 - val_accuracy: 0.4953
Epoch 126/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5112 - accuracy: 0.5527 - val_loss: 1.4598 - val_accuracy: 0.5047
Epoch 127/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5472 - accuracy: 0.5296 - val_loss: 1.4433 - val_accuracy: 0.5000
Epoch 128/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4483 - accuracy: 0.5681 - val_loss: 1.4493 - val_accuracy: 0.5047
Epoch 129/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5431 - accuracy: 0.5527 - val_loss: 1.4353 - val_accuracy: 0.5093
Epoch 130/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5294 - accuracy: 0.5064 - val_loss: 1.4287 - val_accuracy: 0.5187
Epoch 131/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4876 - accuracy: 0.5501 - val_loss: 1.4269 - val_accuracy: 0.5187
Epoch 132/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5663 - accuracy: 0.5373 - val_loss: 1.5238 - val_accuracy: 0.5093
Epoch 133/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4970 - accuracy: 0.5219 - val_loss: 1.5240 - val_accuracy: 0.5140
Epoch 134/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4632 - accuracy: 0.5347 - val_loss: 1.5263 - val_accuracy: 0.5093
Epoch 135/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5361 - accuracy: 0.5141 - val_loss: 1.4833 - val_accuracy: 0.5234
Epoch 136/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4637 - accuracy: 0.5167 - val_loss: 1.4930 - val_accuracy: 0.5234
Epoch 137/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4115 - accuracy: 0.5347 - val_loss: 1.5908 - val_accuracy: 0.5234
Epoch 138/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5538 - accuracy: 0.5270 - val_loss: 1.4388 - val_accuracy: 0.5514
Epoch 139/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4943 - accuracy: 0.5681 - val_loss: 1.4382 - val_accuracy: 0.5514

```

accuracy: 0.5000
Epoch 140/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5418 - accuracy: 0.5347 - val_loss: 1.4732 - val_
accuracy: 0.4953
Epoch 141/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5066 - accuracy: 0.5553 - val_loss: 1.4343 - val_
accuracy: 0.4953
Epoch 142/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3915 - accuracy: 0.5270 - val_loss: 1.4375 - val_
accuracy: 0.5000
Epoch 143/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4416 - accuracy: 0.5193 - val_loss: 1.4619 - val_
accuracy: 0.5000
Epoch 144/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5082 - accuracy: 0.5296 - val_loss: 1.4242 - val_
accuracy: 0.4953
Epoch 145/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4419 - accuracy: 0.5321 - val_loss: 1.4622 - val_
accuracy: 0.4673
Epoch 146/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4044 - accuracy: 0.5321 - val_loss: 1.4807 - val_
accuracy: 0.4813
Epoch 147/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4665 - accuracy: 0.5398 - val_loss: 1.4406 - val_
accuracy: 0.4860
Epoch 148/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5235 - accuracy: 0.5630 - val_loss: 1.4480 - val_
accuracy: 0.4953
Epoch 149/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4348 - accuracy: 0.5373 - val_loss: 1.4410 - val_
accuracy: 0.4953
Epoch 150/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3478 - accuracy: 0.5398 - val_loss: 1.4410 - val_
accuracy: 0.5047
Epoch 151/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4328 - accuracy: 0.5321 - val_loss: 1.4213 - val_
accuracy: 0.5093
Epoch 152/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4107 - accuracy: 0.5476 - val_loss: 1.7574 - val_
accuracy: 0.4860
Epoch 153/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4862 - accuracy: 0.5553 - val_loss: 1.6028 - val_
accuracy: 0.5234
Epoch 154/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4271 - accuracy: 0.5630 - val_loss: 1.5333 - val_
accuracy: 0.5327
Epoch 155/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4289 - accuracy: 0.5835 - val_loss: 1.5370 - val_
accuracy: 0.5421
Epoch 156/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4417 - accuracy: 0.5476 - val_loss: 1.4358 - val_
accuracy: 0.5467
Epoch 157/1000
1/4 [====>.....] - ETA: 0s - loss: 0.4514 - accuracy: 0.5859Restoring model weights from th
e end of the best epoch: 7.
4/4 [=====] - 0s 16ms/step - loss: 0.3744 - accuracy: 0.5476 - val_loss: 1.5407 - val_
accuracy: 0.5421
Epoch 157: early stopping
2/2 [=====] - 0s 4ms/step - loss: 1.5373 - accuracy: 0.6047
[CV] END .....Dense1=25, Dense2=50; total time= 9.6s
Model: "sequential_38"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_152 (Dense)	(None, 25)	175
<hr/>		
batch_normalization_114 (BatchNormalization)	(None, 25)	100
activation_114 (Activation)	(None, 25)	0
dense_153 (Dense)	(None, 50)	1300
batch_normalization_115 (BatchNormalization)	(None, 50)	200
activation_115 (Activation)	(None, 50)	0
dense_154 (Dense)	(None, 10)	510
batch_normalization_116 (BatchNormalization)	(None, 10)	40
activation_116 (Activation)	(None, 10)	0
dense_155 (Dense)	(None, 2)	22
<hr/>		
Total params: 2,347		

Trainable params: 2,177
Non-trainable params: 170

Epoch 1/1000
4/4 [=====] - 1s 64ms/step - loss: 4.4426 - accuracy: 0.4807 - val_loss: 5.0399 - val_accuracy: 0.5794
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5022 - accuracy: 0.4319 - val_loss: 5.0581 - val_accuracy: 0.5888
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1911 - accuracy: 0.4550 - val_loss: 4.9960 - val_accuracy: 0.5841
Epoch 4/1000
4/4 [=====] - 0s 16ms/step - loss: 3.0766 - accuracy: 0.4499 - val_loss: 4.7921 - val_accuracy: 0.6308
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 2.7436 - accuracy: 0.4627 - val_loss: 4.3792 - val_accuracy: 0.6589
Epoch 6/1000
4/4 [=====] - 0s 17ms/step - loss: 2.6607 - accuracy: 0.4602 - val_loss: 3.7918 - val_accuracy: 0.6682
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4906 - accuracy: 0.4807 - val_loss: 3.4789 - val_accuracy: 0.6262
Epoch 8/1000
4/4 [=====] - 0s 22ms/step - loss: 2.3331 - accuracy: 0.4704 - val_loss: 3.1097 - val_accuracy: 0.5981
Epoch 9/1000
4/4 [=====] - 0s 16ms/step - loss: 2.3338 - accuracy: 0.4987 - val_loss: 2.8627 - val_accuracy: 0.6075
Epoch 10/1000
4/4 [=====] - 0s 15ms/step - loss: 2.2605 - accuracy: 0.5347 - val_loss: 2.6480 - val_accuracy: 0.5000
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1165 - accuracy: 0.4679 - val_loss: 2.5061 - val_accuracy: 0.4673
Epoch 12/1000
4/4 [=====] - 0s 15ms/step - loss: 2.0873 - accuracy: 0.4627 - val_loss: 2.4051 - val_accuracy: 0.4533
Epoch 13/1000
4/4 [=====] - 0s 15ms/step - loss: 2.0974 - accuracy: 0.5039 - val_loss: 2.3393 - val_accuracy: 0.4393
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1168 - accuracy: 0.4833 - val_loss: 2.2693 - val_accuracy: 0.4486
Epoch 15/1000
4/4 [=====] - 0s 16ms/step - loss: 2.0340 - accuracy: 0.4910 - val_loss: 2.2168 - val_accuracy: 0.4439
Epoch 16/1000
4/4 [=====] - 0s 16ms/step - loss: 2.0017 - accuracy: 0.4807 - val_loss: 2.1950 - val_accuracy: 0.4439
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9642 - accuracy: 0.4679 - val_loss: 2.1828 - val_accuracy: 0.4393
Epoch 18/1000
4/4 [=====] - 0s 15ms/step - loss: 1.8996 - accuracy: 0.4704 - val_loss: 2.1853 - val_accuracy: 0.4393
Epoch 19/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8954 - accuracy: 0.4756 - val_loss: 2.1285 - val_accuracy: 0.4439
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7374 - accuracy: 0.4627 - val_loss: 2.0867 - val_accuracy: 0.4439
Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8041 - accuracy: 0.4627 - val_loss: 2.0652 - val_accuracy: 0.4393
Epoch 22/1000
4/4 [=====] - 0s 15ms/step - loss: 1.7936 - accuracy: 0.4756 - val_loss: 1.9946 - val_accuracy: 0.4346
Epoch 23/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8269 - accuracy: 0.4550 - val_loss: 1.9788 - val_accuracy: 0.4393
Epoch 24/1000
4/4 [=====] - 0s 15ms/step - loss: 1.7992 - accuracy: 0.4936 - val_loss: 1.9293 - val_accuracy: 0.4533
Epoch 25/1000
4/4 [=====] - 0s 15ms/step - loss: 1.6691 - accuracy: 0.4704 - val_loss: 1.9771 - val_accuracy: 0.4673
Epoch 26/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6004 - accuracy: 0.5090 - val_loss: 1.9528 - val_accuracy: 0.4579
Epoch 27/1000
4/4 [=====] - 0s 16ms/step - loss: 1.6357 - accuracy: 0.4961 - val_loss: 1.8961 - val_accuracy: 0.4626
Epoch 28/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5086 - accuracy: 0.4936 - val_loss: 1.8775 - val_accuracy: 0.4579
Epoch 29/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5385 - accuracy: 0.4987 - val_loss: 1.8458 - val_accuracy: 0.4579

```
accuracy: 0.4720
Epoch 30/1000
4/4 [=====] - 0s 15ms/step - loss: 1.5398 - accuracy: 0.5347 - val_loss: 1.8223 - val_accuracy: 0.4766
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4516 - accuracy: 0.5219 - val_loss: 1.7977 - val_accuracy: 0.4720
Epoch 32/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4004 - accuracy: 0.4987 - val_loss: 1.7413 - val_accuracy: 0.4720
Epoch 33/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3374 - accuracy: 0.5013 - val_loss: 1.6728 - val_accuracy: 0.4720
Epoch 34/1000
4/4 [=====] - 0s 15ms/step - loss: 1.4068 - accuracy: 0.5116 - val_loss: 1.7019 - val_accuracy: 0.4766
Epoch 35/1000
4/4 [=====] - 0s 15ms/step - loss: 1.3864 - accuracy: 0.5193 - val_loss: 1.6504 - val_accuracy: 0.4766
Epoch 36/1000
4/4 [=====] - 0s 15ms/step - loss: 1.3111 - accuracy: 0.5270 - val_loss: 1.5813 - val_accuracy: 0.4907
Epoch 37/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3560 - accuracy: 0.5219 - val_loss: 1.5660 - val_accuracy: 0.4907
Epoch 38/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3440 - accuracy: 0.5116 - val_loss: 1.5848 - val_accuracy: 0.4860
Epoch 39/1000
4/4 [=====] - 0s 16ms/step - loss: 1.2537 - accuracy: 0.5219 - val_loss: 1.5753 - val_accuracy: 0.4860
Epoch 40/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2582 - accuracy: 0.5116 - val_loss: 1.5654 - val_accuracy: 0.4860
Epoch 41/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3087 - accuracy: 0.4910 - val_loss: 1.5642 - val_accuracy: 0.4860
Epoch 42/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2785 - accuracy: 0.5013 - val_loss: 1.5591 - val_accuracy: 0.4860
Epoch 43/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2906 - accuracy: 0.5064 - val_loss: 1.5305 - val_accuracy: 0.4907
Epoch 44/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2392 - accuracy: 0.4987 - val_loss: 1.5077 - val_accuracy: 0.4907
Epoch 45/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2296 - accuracy: 0.4961 - val_loss: 1.4768 - val_accuracy: 0.4907
Epoch 46/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2453 - accuracy: 0.4910 - val_loss: 1.4783 - val_accuracy: 0.4953
Epoch 47/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2503 - accuracy: 0.5167 - val_loss: 1.4716 - val_accuracy: 0.4953
Epoch 48/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3126 - accuracy: 0.5064 - val_loss: 1.4601 - val_accuracy: 0.4953
Epoch 49/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2416 - accuracy: 0.5013 - val_loss: 1.4507 - val_accuracy: 0.4953
Epoch 50/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1621 - accuracy: 0.5039 - val_loss: 1.4396 - val_accuracy: 0.4953
Epoch 51/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1787 - accuracy: 0.5013 - val_loss: 1.4226 - val_accuracy: 0.4720
Epoch 52/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1848 - accuracy: 0.5141 - val_loss: 1.4007 - val_accuracy: 0.4626
Epoch 53/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1532 - accuracy: 0.4961 - val_loss: 1.3883 - val_accuracy: 0.4626
Epoch 54/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1604 - accuracy: 0.5193 - val_loss: 1.3795 - val_accuracy: 0.4626
Epoch 55/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1300 - accuracy: 0.4910 - val_loss: 1.3587 - val_accuracy: 0.4533
Epoch 56/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0531 - accuracy: 0.4859 - val_loss: 1.3438 - val_accuracy: 0.4533
Epoch 57/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0995 - accuracy: 0.4936 - val_loss: 1.3321 - val_accuracy: 0.4720
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0193 - accuracy: 0.5193 - val_loss: 1.3286 - val_accuracy: 0.4953
Epoch 59/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 1.0378 - accuracy: 0.5013 - val_loss: 1.3206 - val_accuracy: 0.4953
Epoch 60/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0045 - accuracy: 0.5167 - val_loss: 1.3116 - val_accuracy: 0.4860
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0298 - accuracy: 0.5116 - val_loss: 1.2764 - val_accuracy: 0.4673
Epoch 62/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9214 - accuracy: 0.5116 - val_loss: 1.2513 - val_accuracy: 0.4673
Epoch 63/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9800 - accuracy: 0.5167 - val_loss: 1.2356 - val_accuracy: 0.4766
Epoch 64/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9557 - accuracy: 0.5244 - val_loss: 1.2191 - val_accuracy: 0.4673
Epoch 65/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8289 - accuracy: 0.5193 - val_loss: 1.1671 - val_accuracy: 0.4720
Epoch 66/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8560 - accuracy: 0.5116 - val_loss: 1.1515 - val_accuracy: 0.4673
Epoch 67/1000
4/4 [=====] - 0s 16ms/step - loss: 0.8412 - accuracy: 0.5167 - val_loss: 1.1464 - val_accuracy: 0.4720
Epoch 68/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7858 - accuracy: 0.4987 - val_loss: 1.1376 - val_accuracy: 0.4579
Epoch 69/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7990 - accuracy: 0.4961 - val_loss: 1.1236 - val_accuracy: 0.4579
Epoch 70/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7464 - accuracy: 0.4987 - val_loss: 1.1023 - val_accuracy: 0.4533
Epoch 71/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7728 - accuracy: 0.5013 - val_loss: 1.1146 - val_accuracy: 0.4626
Epoch 72/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7501 - accuracy: 0.5116 - val_loss: 1.1095 - val_accuracy: 0.4626
Epoch 73/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7328 - accuracy: 0.5244 - val_loss: 1.1069 - val_accuracy: 0.4673
Epoch 74/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7198 - accuracy: 0.5296 - val_loss: 1.0282 - val_accuracy: 0.4486
Epoch 75/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7279 - accuracy: 0.5141 - val_loss: 1.0809 - val_accuracy: 0.4579
Epoch 76/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7326 - accuracy: 0.5244 - val_loss: 1.0500 - val_accuracy: 0.4626
Epoch 77/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7289 - accuracy: 0.5270 - val_loss: 1.0292 - val_accuracy: 0.4720
Epoch 78/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6589 - accuracy: 0.5527 - val_loss: 1.0300 - val_accuracy: 0.4720
Epoch 79/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7143 - accuracy: 0.5450 - val_loss: 1.0502 - val_accuracy: 0.4860
Epoch 80/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6696 - accuracy: 0.5450 - val_loss: 1.0073 - val_accuracy: 0.4626
Epoch 81/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7008 - accuracy: 0.5450 - val_loss: 0.9867 - val_accuracy: 0.4673
Epoch 82/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6823 - accuracy: 0.5398 - val_loss: 0.9995 - val_accuracy: 0.4673
Epoch 83/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5996 - accuracy: 0.5758 - val_loss: 1.0316 - val_accuracy: 0.4252
Epoch 84/1000
4/4 [=====] - 0s 16ms/step - loss: 0.6892 - accuracy: 0.5296 - val_loss: 1.0335 - val_accuracy: 0.4346
Epoch 85/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6603 - accuracy: 0.5373 - val_loss: 0.9247 - val_accuracy: 0.4206
Epoch 86/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6129 - accuracy: 0.5167 - val_loss: 0.9200 - val_accuracy: 0.4159
Epoch 87/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6042 - accuracy: 0.5141 - val_loss: 0.9297 - val_accuracy: 0.4439
Epoch 88/1000
4/4 [=====] - 0s 17ms/step - loss: 0.6048 - accuracy: 0.5219 - val_loss: 0.9272 - val_accuracy: 0.4393
```

Epoch 89/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5638 - accuracy: 0.5296 - val_loss: 0.8684 - val_accuracy: 0.4206
Epoch 90/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5085 - accuracy: 0.5398 - val_loss: 0.8686 - val_accuracy: 0.4393
Epoch 91/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5460 - accuracy: 0.5630 - val_loss: 0.8642 - val_accuracy: 0.4486
Epoch 92/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5857 - accuracy: 0.5347 - val_loss: 0.8567 - val_accuracy: 0.4439
Epoch 93/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5373 - accuracy: 0.5476 - val_loss: 0.8524 - val_accuracy: 0.4393
Epoch 94/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5284 - accuracy: 0.5167 - val_loss: 0.8563 - val_accuracy: 0.4486
Epoch 95/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5211 - accuracy: 0.5398 - val_loss: 0.8548 - val_accuracy: 0.4439
Epoch 96/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5126 - accuracy: 0.5527 - val_loss: 0.8186 - val_accuracy: 0.4486
Epoch 97/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5563 - accuracy: 0.5296 - val_loss: 0.8093 - val_accuracy: 0.4299
Epoch 98/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5019 - accuracy: 0.5167 - val_loss: 0.8009 - val_accuracy: 0.4439
Epoch 99/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5413 - accuracy: 0.5758 - val_loss: 0.8218 - val_accuracy: 0.4346
Epoch 100/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5456 - accuracy: 0.5090 - val_loss: 0.8317 - val_accuracy: 0.4579
Epoch 101/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5644 - accuracy: 0.5578 - val_loss: 0.8282 - val_accuracy: 0.4813
Epoch 102/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4689 - accuracy: 0.5373 - val_loss: 0.8140 - val_accuracy: 0.4766
Epoch 103/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5151 - accuracy: 0.5527 - val_loss: 0.8055 - val_accuracy: 0.4813
Epoch 104/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5162 - accuracy: 0.5656 - val_loss: 0.8656 - val_accuracy: 0.4907
Epoch 105/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4408 - accuracy: 0.5373 - val_loss: 0.8715 - val_accuracy: 0.4720
Epoch 106/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4637 - accuracy: 0.5733 - val_loss: 0.8619 - val_accuracy: 0.4813
Epoch 107/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4881 - accuracy: 0.5784 - val_loss: 0.8337 - val_accuracy: 0.4766
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4793 - accuracy: 0.5681 - val_loss: 0.8701 - val_accuracy: 0.4907
Epoch 109/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5081 - accuracy: 0.5527 - val_loss: 0.8819 - val_accuracy: 0.4953
Epoch 110/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4236 - accuracy: 0.5604 - val_loss: 0.8808 - val_accuracy: 0.5140
Epoch 111/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5051 - accuracy: 0.5553 - val_loss: 0.8714 - val_accuracy: 0.4953
Epoch 112/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5443 - accuracy: 0.5887 - val_loss: 0.8667 - val_accuracy: 0.5047
Epoch 113/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4770 - accuracy: 0.5681 - val_loss: 0.8367 - val_accuracy: 0.4953
Epoch 114/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4203 - accuracy: 0.5527 - val_loss: 0.8026 - val_accuracy: 0.4953
Epoch 115/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5098 - accuracy: 0.5527 - val_loss: 0.8190 - val_accuracy: 0.5000
Epoch 116/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4562 - accuracy: 0.6093 - val_loss: 0.7881 - val_accuracy: 0.5000
Epoch 117/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4683 - accuracy: 0.5578 - val_loss: 0.8244 - val_accuracy: 0.4579
Epoch 118/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3990 - accuracy: 0.5938 - val_loss: 0.8322 - val_accuracy: 0.5000

```
accuracy: 0.4720
Epoch 119/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4548 - accuracy: 0.5604 - val_loss: 0.7811 - val_accuracy: 0.4766
Epoch 120/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4365 - accuracy: 0.5784 - val_loss: 0.8017 - val_accuracy: 0.4720
Epoch 121/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3967 - accuracy: 0.5578 - val_loss: 0.8218 - val_accuracy: 0.4813
Epoch 122/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4236 - accuracy: 0.5707 - val_loss: 0.8088 - val_accuracy: 0.4813
Epoch 123/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4119 - accuracy: 0.5733 - val_loss: 0.8373 - val_accuracy: 0.4907
Epoch 124/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4934 - accuracy: 0.6041 - val_loss: 0.8409 - val_accuracy: 0.4953
Epoch 125/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3995 - accuracy: 0.5656 - val_loss: 0.8323 - val_accuracy: 0.4907
Epoch 126/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4658 - accuracy: 0.5758 - val_loss: 0.8324 - val_accuracy: 0.5000
Epoch 127/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4297 - accuracy: 0.5681 - val_loss: 0.8358 - val_accuracy: 0.5000
Epoch 128/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4461 - accuracy: 0.5604 - val_loss: 0.8257 - val_accuracy: 0.5047
Epoch 129/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4018 - accuracy: 0.5733 - val_loss: 0.8241 - val_accuracy: 0.5093
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4340 - accuracy: 0.5707 - val_loss: 0.7857 - val_accuracy: 0.5000
Epoch 131/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4069 - accuracy: 0.5733 - val_loss: 0.8209 - val_accuracy: 0.5187
Epoch 132/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4728 - accuracy: 0.5835 - val_loss: 0.8167 - val_accuracy: 0.5280
Epoch 133/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4208 - accuracy: 0.5887 - val_loss: 0.8425 - val_accuracy: 0.5234
Epoch 134/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4265 - accuracy: 0.5758 - val_loss: 0.8840 - val_accuracy: 0.5327
Epoch 135/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4080 - accuracy: 0.5527 - val_loss: 0.8627 - val_accuracy: 0.5374
Epoch 136/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4317 - accuracy: 0.5733 - val_loss: 0.9373 - val_accuracy: 0.5467
Epoch 137/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4461 - accuracy: 0.5913 - val_loss: 0.9553 - val_accuracy: 0.5374
Epoch 138/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4495 - accuracy: 0.5835 - val_loss: 0.9547 - val_accuracy: 0.5421
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3694 - accuracy: 0.5810 - val_loss: 0.9600 - val_accuracy: 0.5374
Epoch 140/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4676 - accuracy: 0.5938 - val_loss: 0.9824 - val_accuracy: 0.5421
Epoch 141/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4179 - accuracy: 0.5835 - val_loss: 0.9807 - val_accuracy: 0.5374
Epoch 142/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4803 - accuracy: 0.5810 - val_loss: 0.9244 - val_accuracy: 0.5280
Epoch 143/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4243 - accuracy: 0.5707 - val_loss: 0.9237 - val_accuracy: 0.5234
Epoch 144/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3639 - accuracy: 0.5733 - val_loss: 0.9309 - val_accuracy: 0.5327
Epoch 145/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4190 - accuracy: 0.5887 - val_loss: 0.9472 - val_accuracy: 0.5280
Epoch 146/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4463 - accuracy: 0.5784 - val_loss: 0.9493 - val_accuracy: 0.5327
Epoch 147/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3656 - accuracy: 0.5913 - val_loss: 0.9503 - val_accuracy: 0.5327
Epoch 148/1000
```

```

4/4 [=====] - 0s 14ms/step - loss: 0.3501 - accuracy: 0.5913 - val_loss: 0.9502 - val_accuracy: 0.5374
Epoch 149/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3511 - accuracy: 0.5630 - val_loss: 0.9519 - val_accuracy: 0.5234
Epoch 150/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3791 - accuracy: 0.5810 - val_loss: 0.9442 - val_accuracy: 0.5327
Epoch 151/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3722 - accuracy: 0.6093 - val_loss: 0.9815 - val_accuracy: 0.5280
Epoch 152/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3919 - accuracy: 0.5810 - val_loss: 1.0660 - val_accuracy: 0.5327
Epoch 153/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4466 - accuracy: 0.5784 - val_loss: 1.0605 - val_accuracy: 0.5421
Epoch 154/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4731 - accuracy: 0.6144 - val_loss: 1.0684 - val_accuracy: 0.5514
Epoch 155/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3690 - accuracy: 0.6041 - val_loss: 1.0510 - val_accuracy: 0.5561
Epoch 156/1000
1/4 [====>.....] - ETA: 0s - loss: 0.4533 - accuracy: 0.5781Restoring model weights from the end of the best epoch: 6.
4/4 [=====] - 0s 16ms/step - loss: 0.3807 - accuracy: 0.6067 - val_loss: 1.0205 - val_accuracy: 0.5467
Epoch 156: early stopping
2/2 [=====] - 0s 4ms/step - loss: 3.7738 - accuracy: 0.6512
[CV] END .....Dense1=25, Dense2=50; total time= 9.8s
Model: "sequential_39"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_156 (Dense)	(None, 50)	350
batch_normalization_117 (BatchNormalization)	(None, 50)	200
activation_117 (Activation)	(None, 50)	0
dense_157 (Dense)	(None, 10)	510
batch_normalization_118 (BatchNormalization)	(None, 10)	40
activation_118 (Activation)	(None, 10)	0
dense_158 (Dense)	(None, 10)	110
batch_normalization_119 (BatchNormalization)	(None, 10)	40
activation_119 (Activation)	(None, 10)	0
dense_159 (Dense)	(None, 2)	22
<hr/>		

Total params: 1,272
Trainable params: 1,132
Non-trainable params: 140

Epoch 1/1000
4/4 [=====] - 1s 63ms/step - loss: 3.6905 - accuracy: 0.5155 - val_loss: 2.0954 - val_accuracy: 0.6729
Epoch 2/1000
4/4 [=====] - 0s 16ms/step - loss: 2.3420 - accuracy: 0.5567 - val_loss: 1.8143 - val_accuracy: 0.7056
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 2.3070 - accuracy: 0.5825 - val_loss: 1.7632 - val_accuracy: 0.7056
Epoch 4/1000
4/4 [=====] - 0s 15ms/step - loss: 2.3050 - accuracy: 0.5747 - val_loss: 1.7699 - val_accuracy: 0.6776
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 1.9528 - accuracy: 0.5954 - val_loss: 1.7763 - val_accuracy: 0.6589
Epoch 6/1000
4/4 [=====] - 0s 15ms/step - loss: 1.9032 - accuracy: 0.5567 - val_loss: 1.7373 - val_accuracy: 0.6682
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0076 - accuracy: 0.6005 - val_loss: 1.7182 - val_accuracy: 0.6542
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6867 - accuracy: 0.5696 - val_loss: 1.6178 - val_accuracy: 0.6822
Epoch 9/1000
4/4 [=====] - 0s 16ms/step - loss: 1.4788 - accuracy: 0.5387 - val_loss: 1.6087 - val_accuracy: 0.6087

```
accuracy: 0.6355
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4611 - accuracy: 0.5747 - val_loss: 1.5743 - val_accuracy: 0.6729
Epoch 11/1000
4/4 [=====] - 0s 15ms/step - loss: 1.4448 - accuracy: 0.5799 - val_loss: 1.4843 - val_accuracy: 0.6402
Epoch 12/1000
4/4 [=====] - 0s 15ms/step - loss: 1.5680 - accuracy: 0.5541 - val_loss: 1.4889 - val_accuracy: 0.6308
Epoch 13/1000
4/4 [=====] - 0s 15ms/step - loss: 1.4433 - accuracy: 0.5979 - val_loss: 1.4981 - val_accuracy: 0.6916
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2173 - accuracy: 0.6160 - val_loss: 1.4526 - val_accuracy: 0.6729
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1481 - accuracy: 0.5799 - val_loss: 1.4290 - val_accuracy: 0.6121
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1915 - accuracy: 0.5979 - val_loss: 1.4197 - val_accuracy: 0.6121
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1043 - accuracy: 0.5954 - val_loss: 1.4253 - val_accuracy: 0.6121
Epoch 18/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1164 - accuracy: 0.6289 - val_loss: 1.3660 - val_accuracy: 0.6075
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1552 - accuracy: 0.6263 - val_loss: 1.3451 - val_accuracy: 0.6028
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0913 - accuracy: 0.5876 - val_loss: 1.3097 - val_accuracy: 0.5981
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1676 - accuracy: 0.5722 - val_loss: 1.2413 - val_accuracy: 0.6075
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9829 - accuracy: 0.6005 - val_loss: 1.2322 - val_accuracy: 0.6075
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0234 - accuracy: 0.6134 - val_loss: 1.2554 - val_accuracy: 0.6121
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0786 - accuracy: 0.6057 - val_loss: 1.2701 - val_accuracy: 0.6028
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0304 - accuracy: 0.6289 - val_loss: 1.2665 - val_accuracy: 0.6215
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9568 - accuracy: 0.6211 - val_loss: 1.2604 - val_accuracy: 0.5187
Epoch 27/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9531 - accuracy: 0.6418 - val_loss: 1.2542 - val_accuracy: 0.4860
Epoch 28/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0446 - accuracy: 0.6263 - val_loss: 1.2618 - val_accuracy: 0.5467
Epoch 29/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8963 - accuracy: 0.6082 - val_loss: 1.2625 - val_accuracy: 0.5794
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9926 - accuracy: 0.6211 - val_loss: 1.2445 - val_accuracy: 0.4626
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8380 - accuracy: 0.6314 - val_loss: 1.2359 - val_accuracy: 0.4953
Epoch 32/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8243 - accuracy: 0.6211 - val_loss: 1.2087 - val_accuracy: 0.4673
Epoch 33/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8894 - accuracy: 0.6314 - val_loss: 1.1947 - val_accuracy: 0.4673
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7895 - accuracy: 0.6314 - val_loss: 1.1768 - val_accuracy: 0.4813
Epoch 35/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8274 - accuracy: 0.6392 - val_loss: 1.1653 - val_accuracy: 0.6215
Epoch 36/1000
4/4 [=====] - 0s 16ms/step - loss: 0.6864 - accuracy: 0.6186 - val_loss: 1.1714 - val_accuracy: 0.6262
Epoch 37/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7810 - accuracy: 0.6289 - val_loss: 1.1314 - val_accuracy: 0.6402
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8583 - accuracy: 0.6495 - val_loss: 1.0959 - val_accuracy: 0.4907
Epoch 39/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 0.7281 - accuracy: 0.6082 - val_loss: 1.0783 - val_accuracy: 0.6402
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7656 - accuracy: 0.6263 - val_loss: 1.0644 - val_accuracy: 0.6308
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6706 - accuracy: 0.6495 - val_loss: 1.0506 - val_accuracy: 0.5981
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7328 - accuracy: 0.6340 - val_loss: 1.0549 - val_accuracy: 0.5888
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6761 - accuracy: 0.6469 - val_loss: 1.0333 - val_accuracy: 0.5794
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7773 - accuracy: 0.6392 - val_loss: 1.0366 - val_accuracy: 0.5888
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6540 - accuracy: 0.6186 - val_loss: 1.0193 - val_accuracy: 0.5935
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6778 - accuracy: 0.6108 - val_loss: 0.9907 - val_accuracy: 0.5794
Epoch 47/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5615 - accuracy: 0.6108 - val_loss: 0.9773 - val_accuracy: 0.5841
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5938 - accuracy: 0.6263 - val_loss: 0.9456 - val_accuracy: 0.5794
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5550 - accuracy: 0.6186 - val_loss: 0.9485 - val_accuracy: 0.5748
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5670 - accuracy: 0.6392 - val_loss: 0.8851 - val_accuracy: 0.5654
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6272 - accuracy: 0.6211 - val_loss: 0.8748 - val_accuracy: 0.5514
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5241 - accuracy: 0.5747 - val_loss: 0.8646 - val_accuracy: 0.5514
Epoch 53/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6046 - accuracy: 0.5851 - val_loss: 0.8275 - val_accuracy: 0.5421
Epoch 54/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5173 - accuracy: 0.5954 - val_loss: 0.8081 - val_accuracy: 0.5374
Epoch 55/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4776 - accuracy: 0.5825 - val_loss: 0.7891 - val_accuracy: 0.5421
Epoch 56/1000
4/4 [=====] - 0s 19ms/step - loss: 0.5272 - accuracy: 0.5928 - val_loss: 0.7888 - val_accuracy: 0.5514
Epoch 57/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4721 - accuracy: 0.5773 - val_loss: 0.7777 - val_accuracy: 0.5421
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6064 - accuracy: 0.5593 - val_loss: 0.7511 - val_accuracy: 0.5374
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4750 - accuracy: 0.5825 - val_loss: 0.7382 - val_accuracy: 0.5374
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5023 - accuracy: 0.5696 - val_loss: 0.7243 - val_accuracy: 0.5374
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4818 - accuracy: 0.5773 - val_loss: 0.7033 - val_accuracy: 0.5374
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4523 - accuracy: 0.5954 - val_loss: 0.6923 - val_accuracy: 0.5374
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4779 - accuracy: 0.5928 - val_loss: 0.6845 - val_accuracy: 0.5421
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4653 - accuracy: 0.5876 - val_loss: 0.6583 - val_accuracy: 0.5467
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4599 - accuracy: 0.5593 - val_loss: 0.6094 - val_accuracy: 0.5187
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4714 - accuracy: 0.5722 - val_loss: 0.6049 - val_accuracy: 0.5093
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4474 - accuracy: 0.5567 - val_loss: 0.5892 - val_accuracy: 0.5000
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4315 - accuracy: 0.5825 - val_loss: 0.5733 - val_accuracy: 0.5093
```

Epoch 69/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3729 - accuracy: 0.5696 - val_loss: 0.5479 - val_accuracy: 0.5187
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4420 - accuracy: 0.5696 - val_loss: 0.5359 - val_accuracy: 0.5327
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4394 - accuracy: 0.5876 - val_loss: 0.5336 - val_accuracy: 0.5327
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4283 - accuracy: 0.5747 - val_loss: 0.5294 - val_accuracy: 0.5327
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4995 - accuracy: 0.5825 - val_loss: 0.5323 - val_accuracy: 0.5280
Epoch 74/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4583 - accuracy: 0.6005 - val_loss: 0.5315 - val_accuracy: 0.5187
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3792 - accuracy: 0.5799 - val_loss: 0.5353 - val_accuracy: 0.5280
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4958 - accuracy: 0.5825 - val_loss: 0.5291 - val_accuracy: 0.5514
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4617 - accuracy: 0.5567 - val_loss: 0.5200 - val_accuracy: 0.5280
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5029 - accuracy: 0.5928 - val_loss: 0.5133 - val_accuracy: 0.5327
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4278 - accuracy: 0.5799 - val_loss: 0.5105 - val_accuracy: 0.5421
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3965 - accuracy: 0.6057 - val_loss: 0.5002 - val_accuracy: 0.5327
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3777 - accuracy: 0.5876 - val_loss: 0.5069 - val_accuracy: 0.5374
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4762 - accuracy: 0.5876 - val_loss: 0.5031 - val_accuracy: 0.5421
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4101 - accuracy: 0.5979 - val_loss: 0.5146 - val_accuracy: 0.5374
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4137 - accuracy: 0.5979 - val_loss: 0.4963 - val_accuracy: 0.5327
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4405 - accuracy: 0.5902 - val_loss: 0.4896 - val_accuracy: 0.5280
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4033 - accuracy: 0.5799 - val_loss: 0.4859 - val_accuracy: 0.5047
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3662 - accuracy: 0.5541 - val_loss: 0.5045 - val_accuracy: 0.5000
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4674 - accuracy: 0.5515 - val_loss: 0.5032 - val_accuracy: 0.5093
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3737 - accuracy: 0.5851 - val_loss: 0.5018 - val_accuracy: 0.5000
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4151 - accuracy: 0.5567 - val_loss: 0.4923 - val_accuracy: 0.4953
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4235 - accuracy: 0.5412 - val_loss: 0.4938 - val_accuracy: 0.4953
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4163 - accuracy: 0.5387 - val_loss: 0.5621 - val_accuracy: 0.5047
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4924 - accuracy: 0.5515 - val_loss: 0.5843 - val_accuracy: 0.4533
Epoch 94/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4091 - accuracy: 0.4923 - val_loss: 0.6081 - val_accuracy: 0.4393
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4759 - accuracy: 0.4897 - val_loss: 0.6080 - val_accuracy: 0.4112
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4365 - accuracy: 0.5026 - val_loss: 0.6053 - val_accuracy: 0.4252
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4623 - accuracy: 0.5052 - val_loss: 0.5845 - val_accuracy: 0.4766
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4575 - accuracy: 0.5515 - val_loss: 0.5844 - val_accuracy: 0.5000

```
accuracy: 0.4860
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3699 - accuracy: 0.5464 - val_loss: 0.6092 - val_
accuracy: 0.4907
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4762 - accuracy: 0.5464 - val_loss: 0.6070 - val_
accuracy: 0.5000
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4081 - accuracy: 0.5284 - val_loss: 0.6334 - val_
accuracy: 0.4813
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4043 - accuracy: 0.5232 - val_loss: 0.5989 - val_
accuracy: 0.4766
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3743 - accuracy: 0.5361 - val_loss: 0.6013 - val_
accuracy: 0.4860
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3979 - accuracy: 0.5670 - val_loss: 0.6438 - val_
accuracy: 0.5234
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3972 - accuracy: 0.5747 - val_loss: 0.6194 - val_
accuracy: 0.4907
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4062 - accuracy: 0.5335 - val_loss: 0.6961 - val_
accuracy: 0.5093
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3641 - accuracy: 0.5979 - val_loss: 0.6932 - val_
accuracy: 0.5187
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3705 - accuracy: 0.5515 - val_loss: 0.6904 - val_
accuracy: 0.4907
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4569 - accuracy: 0.5902 - val_loss: 0.6568 - val_
accuracy: 0.4860
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5525 - accuracy: 0.5077 - val_loss: 0.6808 - val_
accuracy: 0.4533
Epoch 111/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4092 - accuracy: 0.5387 - val_loss: 0.5984 - val_
accuracy: 0.4907
Epoch 112/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4651 - accuracy: 0.5541 - val_loss: 0.6001 - val_
accuracy: 0.4907
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3619 - accuracy: 0.5567 - val_loss: 0.6031 - val_
accuracy: 0.4907
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4572 - accuracy: 0.5670 - val_loss: 0.6550 - val_
accuracy: 0.4720
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3981 - accuracy: 0.5361 - val_loss: 0.5947 - val_
accuracy: 0.4439
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4656 - accuracy: 0.5515 - val_loss: 0.6306 - val_
accuracy: 0.4393
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3830 - accuracy: 0.5258 - val_loss: 0.6560 - val_
accuracy: 0.4486
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3388 - accuracy: 0.5232 - val_loss: 0.6794 - val_
accuracy: 0.4439
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3853 - accuracy: 0.5206 - val_loss: 0.6329 - val_
accuracy: 0.4533
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4348 - accuracy: 0.4948 - val_loss: 0.6756 - val_
accuracy: 0.4533
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4613 - accuracy: 0.5180 - val_loss: 0.6747 - val_
accuracy: 0.4626
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3876 - accuracy: 0.5541 - val_loss: 0.6725 - val_
accuracy: 0.4579
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3639 - accuracy: 0.5387 - val_loss: 0.6902 - val_
accuracy: 0.4720
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4048 - accuracy: 0.5412 - val_loss: 0.6700 - val_
accuracy: 0.4766
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5242 - accuracy: 0.5644 - val_loss: 0.6737 - val_
accuracy: 0.4766
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4994 - accuracy: 0.5309 - val_loss: 0.7899 - val_
accuracy: 0.4860
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4353 - accuracy: 0.5309 - val_loss: 0.7677 - val_
accuracy: 0.4907
Epoch 128/1000
```

4/4 [=====] - 0s 11ms/step - loss: 0.3557 - accuracy: 0.5361 - val_loss: 0.7445 - val_accuracy: 0.4813
 Epoch 129/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3611 - accuracy: 0.5206 - val_loss: 0.7521 - val_accuracy: 0.4626
 Epoch 130/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.5078 - accuracy: 0.5619 - val_loss: 0.7203 - val_accuracy: 0.4673
 Epoch 131/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3764 - accuracy: 0.5206 - val_loss: 0.6430 - val_accuracy: 0.4720
 Epoch 132/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4317 - accuracy: 0.5335 - val_loss: 0.8343 - val_accuracy: 0.4393
 Epoch 133/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.4447 - accuracy: 0.5464 - val_loss: 0.8557 - val_accuracy: 0.4626
 Epoch 134/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4300 - accuracy: 0.5722 - val_loss: 0.8251 - val_accuracy: 0.4579
 Epoch 135/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4473 - accuracy: 0.5412 - val_loss: 0.7931 - val_accuracy: 0.4720
 Epoch 136/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3450 - accuracy: 0.5387 - val_loss: 0.7715 - val_accuracy: 0.4579
 Epoch 137/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3771 - accuracy: 0.5026 - val_loss: 0.7872 - val_accuracy: 0.4720
 Epoch 138/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3729 - accuracy: 0.5258 - val_loss: 0.8932 - val_accuracy: 0.4860
 Epoch 139/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.5864 - accuracy: 0.5180 - val_loss: 0.8507 - val_accuracy: 0.5093
 Epoch 140/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4411 - accuracy: 0.5206 - val_loss: 0.8564 - val_accuracy: 0.5047
 Epoch 141/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4249 - accuracy: 0.5232 - val_loss: 0.8460 - val_accuracy: 0.4953
 Epoch 142/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4351 - accuracy: 0.5309 - val_loss: 0.8543 - val_accuracy: 0.4813
 Epoch 143/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4273 - accuracy: 0.5361 - val_loss: 0.7614 - val_accuracy: 0.4813
 Epoch 144/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4291 - accuracy: 0.5515 - val_loss: 0.8378 - val_accuracy: 0.4907
 Epoch 145/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4145 - accuracy: 0.5593 - val_loss: 0.7336 - val_accuracy: 0.4813
 Epoch 146/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4541 - accuracy: 0.5026 - val_loss: 0.7617 - val_accuracy: 0.4860
 Epoch 147/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3914 - accuracy: 0.5129 - val_loss: 0.6878 - val_accuracy: 0.4720
 Epoch 148/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3144 - accuracy: 0.4897 - val_loss: 0.7256 - val_accuracy: 0.4953
 Epoch 149/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3435 - accuracy: 0.5593 - val_loss: 0.7030 - val_accuracy: 0.4907
 Epoch 150/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4259 - accuracy: 0.4923 - val_loss: 0.8039 - val_accuracy: 0.5421
 Epoch 151/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3962 - accuracy: 0.5490 - val_loss: 0.8204 - val_accuracy: 0.5187
 Epoch 152/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.3429 - accuracy: 0.5703Restoring model weights from the end of the best epoch: 2.
 4/4 [=====] - 0s 13ms/step - loss: 0.3691 - accuracy: 0.5232 - val_loss: 0.7879 - val_accuracy: 0.5374
 Epoch 152: early stopping
 2/2 [=====] - 0s 3ms/step - loss: 2.8478 - accuracy: 0.5909
 [CV] ENDDense1=50, Dense2=10; total time= 8.6s
 Model: "sequential_40"

Layer (type)	Output Shape	Param #
dense_160 (Dense)	(None, 50)	350
batch_normalization_120 (BatchNormalization)	(None, 50)	200
activation_120 (Activation)	(None, 50)	0

dense_161 (Dense)	(None, 10)	510
batch_normalization_121 (BatchNormalization)	(None, 10)	40
activation_121 (Activation)	(None, 10)	0
dense_162 (Dense)	(None, 10)	110
batch_normalization_122 (BatchNormalization)	(None, 10)	40
activation_122 (Activation)	(None, 10)	0
dense_163 (Dense)	(None, 2)	22

=====

Total params: 1,272
Trainable params: 1,132
Non-trainable params: 140

Epoch 1/1000
4/4 [=====] - 2s 58ms/step - loss: 4.5341 - accuracy: 0.5387 - val_loss: 4.6931 - val_accuracy: 0.6963
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1645 - accuracy: 0.6340 - val_loss: 4.1724 - val_accuracy: 0.7103
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 2.9709 - accuracy: 0.5799 - val_loss: 3.7700 - val_accuracy: 0.7196
Epoch 4/1000
4/4 [=====] - 0s 15ms/step - loss: 2.7243 - accuracy: 0.5928 - val_loss: 3.1551 - val_accuracy: 0.7523
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6500 - accuracy: 0.6263 - val_loss: 2.8477 - val_accuracy: 0.7383
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5677 - accuracy: 0.6237 - val_loss: 2.4807 - val_accuracy: 0.7056
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3915 - accuracy: 0.6134 - val_loss: 2.3376 - val_accuracy: 0.6963
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4122 - accuracy: 0.6237 - val_loss: 2.0969 - val_accuracy: 0.6776
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1941 - accuracy: 0.6340 - val_loss: 1.9811 - val_accuracy: 0.6822
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0772 - accuracy: 0.6134 - val_loss: 1.9337 - val_accuracy: 0.6869
Epoch 11/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9763 - accuracy: 0.6314 - val_loss: 1.8716 - val_accuracy: 0.6776
Epoch 12/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9927 - accuracy: 0.6289 - val_loss: 1.8293 - val_accuracy: 0.6589
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8671 - accuracy: 0.6263 - val_loss: 1.8089 - val_accuracy: 0.6682
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9100 - accuracy: 0.6418 - val_loss: 1.7881 - val_accuracy: 0.6636
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7321 - accuracy: 0.6263 - val_loss: 1.7533 - val_accuracy: 0.6682
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7032 - accuracy: 0.6418 - val_loss: 1.7340 - val_accuracy: 0.6636
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7017 - accuracy: 0.6263 - val_loss: 1.7136 - val_accuracy: 0.6682
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4949 - accuracy: 0.6521 - val_loss: 1.6868 - val_accuracy: 0.6682
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6549 - accuracy: 0.6237 - val_loss: 1.6653 - val_accuracy: 0.6636
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5902 - accuracy: 0.6082 - val_loss: 1.6510 - val_accuracy: 0.7009
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5406 - accuracy: 0.6237 - val_loss: 1.6400 - val_accuracy: 0.7056
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5370 - accuracy: 0.6031 - val_loss: 1.6133 - val_accuracy: 0.7150
Epoch 23/1000

```
4/4 [=====] - 0s 13ms/step - loss: 1.5655 - accuracy: 0.6186 - val_loss: 1.5881 - val_accuracy: 0.7243
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4527 - accuracy: 0.6211 - val_loss: 1.5755 - val_accuracy: 0.7243
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5052 - accuracy: 0.6211 - val_loss: 1.5577 - val_accuracy: 0.7150
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4178 - accuracy: 0.6057 - val_loss: 1.5341 - val_accuracy: 0.7243
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4488 - accuracy: 0.5851 - val_loss: 1.5139 - val_accuracy: 0.4766
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2938 - accuracy: 0.6392 - val_loss: 1.4931 - val_accuracy: 0.4720
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4418 - accuracy: 0.6082 - val_loss: 1.4679 - val_accuracy: 0.4626
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3235 - accuracy: 0.6340 - val_loss: 1.4142 - val_accuracy: 0.4673
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3337 - accuracy: 0.6005 - val_loss: 1.4018 - val_accuracy: 0.4673
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2634 - accuracy: 0.6289 - val_loss: 1.4065 - val_accuracy: 0.4673
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3596 - accuracy: 0.5979 - val_loss: 1.3908 - val_accuracy: 0.4720
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1135 - accuracy: 0.6134 - val_loss: 1.3740 - val_accuracy: 0.4720
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1636 - accuracy: 0.6186 - val_loss: 1.3656 - val_accuracy: 0.4720
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2233 - accuracy: 0.6237 - val_loss: 1.3564 - val_accuracy: 0.4673
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9148 - accuracy: 0.6134 - val_loss: 1.3128 - val_accuracy: 0.4626
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9831 - accuracy: 0.6186 - val_loss: 1.2710 - val_accuracy: 0.4720
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9824 - accuracy: 0.6289 - val_loss: 1.2503 - val_accuracy: 0.4720
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8954 - accuracy: 0.6366 - val_loss: 1.2367 - val_accuracy: 0.4766
Epoch 41/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8322 - accuracy: 0.6289 - val_loss: 1.2286 - val_accuracy: 0.7150
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8505 - accuracy: 0.6211 - val_loss: 1.2011 - val_accuracy: 0.7103
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8323 - accuracy: 0.6366 - val_loss: 1.2244 - val_accuracy: 0.7056
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8487 - accuracy: 0.6546 - val_loss: 1.2276 - val_accuracy: 0.7056
Epoch 45/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8824 - accuracy: 0.6443 - val_loss: 1.1623 - val_accuracy: 0.7009
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8130 - accuracy: 0.6443 - val_loss: 1.1484 - val_accuracy: 0.7056
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7736 - accuracy: 0.6521 - val_loss: 1.1237 - val_accuracy: 0.6916
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8653 - accuracy: 0.6546 - val_loss: 1.1136 - val_accuracy: 0.6916
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7245 - accuracy: 0.6572 - val_loss: 1.0919 - val_accuracy: 0.6916
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7231 - accuracy: 0.6521 - val_loss: 1.0746 - val_accuracy: 0.7103
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7516 - accuracy: 0.6418 - val_loss: 1.0509 - val_accuracy: 0.7103
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6690 - accuracy: 0.6933 - val_loss: 1.0184 - val_accuracy: 0.7150
```

Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6965 - accuracy: 0.6856 - val_loss: 1.0099 - val_accuracy: 0.7196
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8150 - accuracy: 0.6649 - val_loss: 1.0004 - val_accuracy: 0.7150
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6901 - accuracy: 0.6521 - val_loss: 0.9764 - val_accuracy: 0.7150
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6026 - accuracy: 0.6727 - val_loss: 0.9645 - val_accuracy: 0.7196
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5640 - accuracy: 0.6546 - val_loss: 0.9571 - val_accuracy: 0.7196
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6442 - accuracy: 0.6701 - val_loss: 1.0047 - val_accuracy: 0.7150
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6492 - accuracy: 0.6598 - val_loss: 1.0016 - val_accuracy: 0.7196
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5774 - accuracy: 0.6881 - val_loss: 0.9659 - val_accuracy: 0.7196
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5600 - accuracy: 0.6933 - val_loss: 0.9836 - val_accuracy: 0.7290
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6050 - accuracy: 0.6701 - val_loss: 0.9766 - val_accuracy: 0.7336
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6120 - accuracy: 0.6753 - val_loss: 0.9668 - val_accuracy: 0.7290
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6463 - accuracy: 0.6701 - val_loss: 0.9831 - val_accuracy: 0.7243
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5482 - accuracy: 0.6778 - val_loss: 0.9484 - val_accuracy: 0.7290
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5717 - accuracy: 0.6778 - val_loss: 0.9474 - val_accuracy: 0.7290
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5268 - accuracy: 0.6727 - val_loss: 0.9358 - val_accuracy: 0.7243
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5576 - accuracy: 0.6753 - val_loss: 0.9459 - val_accuracy: 0.7243
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6101 - accuracy: 0.6701 - val_loss: 0.9347 - val_accuracy: 0.7196
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5330 - accuracy: 0.6701 - val_loss: 0.9271 - val_accuracy: 0.7196
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5285 - accuracy: 0.6856 - val_loss: 0.9162 - val_accuracy: 0.7196
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5869 - accuracy: 0.6804 - val_loss: 0.9072 - val_accuracy: 0.7290
Epoch 73/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5074 - accuracy: 0.6856 - val_loss: 0.8973 - val_accuracy: 0.7243
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5091 - accuracy: 0.7088 - val_loss: 0.8901 - val_accuracy: 0.7290
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6118 - accuracy: 0.7062 - val_loss: 0.8862 - val_accuracy: 0.7243
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5329 - accuracy: 0.7165 - val_loss: 0.8920 - val_accuracy: 0.7243
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5578 - accuracy: 0.6959 - val_loss: 0.8893 - val_accuracy: 0.7290
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5534 - accuracy: 0.6856 - val_loss: 0.8855 - val_accuracy: 0.7290
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4699 - accuracy: 0.7036 - val_loss: 0.8816 - val_accuracy: 0.7383
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4897 - accuracy: 0.6907 - val_loss: 0.8840 - val_accuracy: 0.7383
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5302 - accuracy: 0.6881 - val_loss: 0.8719 - val_accuracy: 0.7383
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4697 - accuracy: 0.6933 - val_loss: 0.8672 - val_accuracy: 0.7383

```
accuracy: 0.7243
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5512 - accuracy: 0.6881 - val_loss: 0.8648 - val_accuracy: 0.7243
Epoch 84/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5330 - accuracy: 0.6907 - val_loss: 0.8694 - val_accuracy: 0.7243
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4727 - accuracy: 0.6856 - val_loss: 0.8664 - val_accuracy: 0.7383
Epoch 86/1000
4/4 [=====] - 0s 18ms/step - loss: 0.5465 - accuracy: 0.6701 - val_loss: 0.8618 - val_accuracy: 0.7383
Epoch 87/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5507 - accuracy: 0.7062 - val_loss: 0.8553 - val_accuracy: 0.7383
Epoch 88/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5170 - accuracy: 0.6985 - val_loss: 0.8494 - val_accuracy: 0.7336
Epoch 89/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5691 - accuracy: 0.6804 - val_loss: 0.8456 - val_accuracy: 0.7477
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5039 - accuracy: 0.7268 - val_loss: 0.8413 - val_accuracy: 0.7523
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5215 - accuracy: 0.6985 - val_loss: 0.8430 - val_accuracy: 0.7523
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4710 - accuracy: 0.6959 - val_loss: 0.8421 - val_accuracy: 0.7477
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6211 - accuracy: 0.6933 - val_loss: 0.8256 - val_accuracy: 0.7430
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5102 - accuracy: 0.6881 - val_loss: 0.8196 - val_accuracy: 0.7430
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5174 - accuracy: 0.7062 - val_loss: 0.8171 - val_accuracy: 0.7243
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4705 - accuracy: 0.6881 - val_loss: 0.8135 - val_accuracy: 0.7290
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5915 - accuracy: 0.6933 - val_loss: 0.8104 - val_accuracy: 0.7336
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5067 - accuracy: 0.6727 - val_loss: 0.8051 - val_accuracy: 0.7336
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4623 - accuracy: 0.6959 - val_loss: 0.7846 - val_accuracy: 0.7290
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4525 - accuracy: 0.6830 - val_loss: 0.7762 - val_accuracy: 0.7196
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4447 - accuracy: 0.7010 - val_loss: 0.7716 - val_accuracy: 0.7243
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5887 - accuracy: 0.6881 - val_loss: 0.7869 - val_accuracy: 0.7243
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4678 - accuracy: 0.7113 - val_loss: 0.7869 - val_accuracy: 0.7196
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4604 - accuracy: 0.6830 - val_loss: 0.7340 - val_accuracy: 0.7150
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4952 - accuracy: 0.7088 - val_loss: 0.7310 - val_accuracy: 0.7196
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5062 - accuracy: 0.7062 - val_loss: 0.7327 - val_accuracy: 0.7196
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5787 - accuracy: 0.6830 - val_loss: 0.6999 - val_accuracy: 0.7196
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5030 - accuracy: 0.7191 - val_loss: 0.7193 - val_accuracy: 0.7243
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4409 - accuracy: 0.7139 - val_loss: 0.7334 - val_accuracy: 0.7196
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4737 - accuracy: 0.7397 - val_loss: 0.7802 - val_accuracy: 0.7196
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4272 - accuracy: 0.7242 - val_loss: 0.6924 - val_accuracy: 0.7570
Epoch 112/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.5401 - accuracy: 0.7268 - val_loss: 0.7256 - val_accuracy: 0.7523
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5366 - accuracy: 0.7320 - val_loss: 0.6962 - val_accuracy: 0.7570
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4940 - accuracy: 0.7397 - val_loss: 0.6864 - val_accuracy: 0.7477
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5446 - accuracy: 0.7448 - val_loss: 0.7138 - val_accuracy: 0.7664
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4301 - accuracy: 0.7088 - val_loss: 0.7154 - val_accuracy: 0.7664
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4152 - accuracy: 0.7294 - val_loss: 0.7383 - val_accuracy: 0.7804
Epoch 118/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4585 - accuracy: 0.7345 - val_loss: 0.7399 - val_accuracy: 0.7664
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4775 - accuracy: 0.7268 - val_loss: 0.7604 - val_accuracy: 0.7617
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5352 - accuracy: 0.7294 - val_loss: 0.7377 - val_accuracy: 0.7570
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4220 - accuracy: 0.7320 - val_loss: 0.7033 - val_accuracy: 0.7477
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4907 - accuracy: 0.7345 - val_loss: 0.7047 - val_accuracy: 0.7383
Epoch 123/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5262 - accuracy: 0.7371 - val_loss: 0.7035 - val_accuracy: 0.7383
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4161 - accuracy: 0.7526 - val_loss: 0.7010 - val_accuracy: 0.7477
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6299 - accuracy: 0.7320 - val_loss: 0.7371 - val_accuracy: 0.7523
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4130 - accuracy: 0.7268 - val_loss: 0.7378 - val_accuracy: 0.7523
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4773 - accuracy: 0.7526 - val_loss: 0.7316 - val_accuracy: 0.7477
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4451 - accuracy: 0.7216 - val_loss: 0.7293 - val_accuracy: 0.7664
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4931 - accuracy: 0.6108 - val_loss: 0.7313 - val_accuracy: 0.7804
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4454 - accuracy: 0.6057 - val_loss: 0.7567 - val_accuracy: 0.7710
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4515 - accuracy: 0.5979 - val_loss: 0.7563 - val_accuracy: 0.6215
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4511 - accuracy: 0.5799 - val_loss: 0.7575 - val_accuracy: 0.6215
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4219 - accuracy: 0.6134 - val_loss: 0.8145 - val_accuracy: 0.6121
Epoch 134/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4257 - accuracy: 0.5928 - val_loss: 0.7614 - val_accuracy: 0.6075
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4506 - accuracy: 0.5825 - val_loss: 0.8147 - val_accuracy: 0.6168
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5196 - accuracy: 0.6160 - val_loss: 0.8394 - val_accuracy: 0.6121
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4653 - accuracy: 0.6108 - val_loss: 0.8362 - val_accuracy: 0.6121
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5026 - accuracy: 0.6186 - val_loss: 0.8374 - val_accuracy: 0.6075
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4704 - accuracy: 0.6134 - val_loss: 0.8379 - val_accuracy: 0.6075
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4931 - accuracy: 0.6186 - val_loss: 0.8418 - val_accuracy: 0.5981
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4637 - accuracy: 0.5773 - val_loss: 0.7540 - val_accuracy: 0.6075
```

Epoch 142/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4674 - accuracy: 0.6134 - val_loss: 0.7527 - val_accuracy: 0.6075
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4557 - accuracy: 0.6082 - val_loss: 0.7484 - val_accuracy: 0.6215
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5045 - accuracy: 0.6160 - val_loss: 0.7512 - val_accuracy: 0.6215
Epoch 145/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4805 - accuracy: 0.6057 - val_loss: 0.7524 - val_accuracy: 0.6168
Epoch 146/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4957 - accuracy: 0.6237 - val_loss: 0.7447 - val_accuracy: 0.6215
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4301 - accuracy: 0.6237 - val_loss: 0.7509 - val_accuracy: 0.6262
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4559 - accuracy: 0.6031 - val_loss: 0.7539 - val_accuracy: 0.6262
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4436 - accuracy: 0.6186 - val_loss: 0.7447 - val_accuracy: 0.6262
Epoch 150/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5189 - accuracy: 0.6031 - val_loss: 0.7787 - val_accuracy: 0.6168
Epoch 151/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3969 - accuracy: 0.6186 - val_loss: 0.8632 - val_accuracy: 0.6121
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4228 - accuracy: 0.6031 - val_loss: 0.8131 - val_accuracy: 0.6075
Epoch 153/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4152 - accuracy: 0.6160 - val_loss: 0.7797 - val_accuracy: 0.6028
Epoch 154/1000
4/4 [=====] - 0s 21ms/step - loss: 0.4294 - accuracy: 0.6134 - val_loss: 0.7726 - val_accuracy: 0.6121
Epoch 155/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4246 - accuracy: 0.6005 - val_loss: 0.7935 - val_accuracy: 0.6121
Epoch 156/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4681 - accuracy: 0.6057 - val_loss: 0.7925 - val_accuracy: 0.6075
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3975 - accuracy: 0.6418 - val_loss: 0.7851 - val_accuracy: 0.6308
Epoch 158/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5485 - accuracy: 0.5954 - val_loss: 0.7794 - val_accuracy: 0.7991
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4888 - accuracy: 0.6340 - val_loss: 0.7789 - val_accuracy: 0.8037
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4845 - accuracy: 0.6495 - val_loss: 0.7811 - val_accuracy: 0.7850
Epoch 161/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4638 - accuracy: 0.6211 - val_loss: 0.7892 - val_accuracy: 0.6168
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5015 - accuracy: 0.6314 - val_loss: 0.7849 - val_accuracy: 0.6215
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4993 - accuracy: 0.6289 - val_loss: 0.8090 - val_accuracy: 0.7944
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3972 - accuracy: 0.6675 - val_loss: 0.7847 - val_accuracy: 0.7850
Epoch 165/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4277 - accuracy: 0.6546 - val_loss: 0.8098 - val_accuracy: 0.7897
Epoch 166/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4280 - accuracy: 0.6546 - val_loss: 0.8118 - val_accuracy: 0.7850
Epoch 167/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3861 - accuracy: 0.6469 - val_loss: 0.8143 - val_accuracy: 0.7897
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4280 - accuracy: 0.6572 - val_loss: 0.8166 - val_accuracy: 0.7850
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3810 - accuracy: 0.6495 - val_loss: 0.8151 - val_accuracy: 0.7897
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5228 - accuracy: 0.6753 - val_loss: 0.8121 - val_accuracy: 0.7897
Epoch 171/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3964 - accuracy: 0.6907 - val_loss: 0.8135 - val_accuracy: 0.7897

```
accuracy: 0.7897
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5153 - accuracy: 0.6521 - val_loss: 0.8142 - val_
accuracy: 0.7944
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4049 - accuracy: 0.7345 - val_loss: 0.8086 - val_
accuracy: 0.7897
Epoch 174/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4301 - accuracy: 0.6366 - val_loss: 0.8043 - val_
accuracy: 0.7804
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4422 - accuracy: 0.6521 - val_loss: 0.8106 - val_
accuracy: 0.7804
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4491 - accuracy: 0.6804 - val_loss: 0.8202 - val_
accuracy: 0.7710
Epoch 177/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4026 - accuracy: 0.6649 - val_loss: 0.8443 - val_
accuracy: 0.7710
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4436 - accuracy: 0.6314 - val_loss: 0.8079 - val_
accuracy: 0.7710
Epoch 179/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4401 - accuracy: 0.6418 - val_loss: 0.8115 - val_
accuracy: 0.6028
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4491 - accuracy: 0.6469 - val_loss: 0.8218 - val_
accuracy: 0.5981
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4878 - accuracy: 0.6418 - val_loss: 0.8071 - val_
accuracy: 0.6028
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4161 - accuracy: 0.6572 - val_loss: 0.8135 - val_
accuracy: 0.5935
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4925 - accuracy: 0.6392 - val_loss: 0.8381 - val_
accuracy: 0.6262
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4206 - accuracy: 0.6366 - val_loss: 0.8392 - val_
accuracy: 0.6308
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3882 - accuracy: 0.6521 - val_loss: 0.8447 - val_
accuracy: 0.6262
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4300 - accuracy: 0.6495 - val_loss: 0.8505 - val_
accuracy: 0.6262
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4333 - accuracy: 0.6907 - val_loss: 0.8024 - val_
accuracy: 0.7710
Epoch 188/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4145 - accuracy: 0.7809 - val_loss: 0.8592 - val_
accuracy: 0.7617
Epoch 189/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3875 - accuracy: 0.7655 - val_loss: 0.7963 - val_
accuracy: 0.7664
Epoch 190/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4521 - accuracy: 0.7990 - val_loss: 0.8096 - val_
accuracy: 0.7617
Epoch 191/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3681 - accuracy: 0.7706 - val_loss: 0.7840 - val_
accuracy: 0.7617
Epoch 192/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4471 - accuracy: 0.8222 - val_loss: 0.7829 - val_
accuracy: 0.7617
Epoch 193/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5793 - accuracy: 0.7397 - val_loss: 0.8279 - val_
accuracy: 0.7523
Epoch 194/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3778 - accuracy: 0.7500 - val_loss: 0.9100 - val_
accuracy: 0.7523
Epoch 195/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3765 - accuracy: 0.7706 - val_loss: 0.7831 - val_
accuracy: 0.7617
Epoch 196/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3938 - accuracy: 0.7448 - val_loss: 0.8239 - val_
accuracy: 0.7570
Epoch 197/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4341 - accuracy: 0.7345 - val_loss: 0.8785 - val_
accuracy: 0.7664
Epoch 198/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4223 - accuracy: 0.8067 - val_loss: 0.7854 - val_
accuracy: 0.7617
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3780 - accuracy: 0.7912 - val_loss: 0.9405 - val_
accuracy: 0.7664
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4605 - accuracy: 0.7474 - val_loss: 0.9409 - val_
accuracy: 0.7664
Epoch 201/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.5065 - accuracy: 0.7964 - val_loss: 0.8506 - val_accuracy: 0.7664
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3766 - accuracy: 0.7577 - val_loss: 0.8194 - val_accuracy: 0.7757
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3992 - accuracy: 0.7964 - val_loss: 0.7905 - val_accuracy: 0.7664
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4319 - accuracy: 0.7912 - val_loss: 0.8215 - val_accuracy: 0.7617
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3522 - accuracy: 0.7990 - val_loss: 0.7958 - val_accuracy: 0.7757
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4530 - accuracy: 0.7964 - val_loss: 0.7925 - val_accuracy: 0.7757
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3751 - accuracy: 0.8170 - val_loss: 0.8021 - val_accuracy: 0.7804
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4299 - accuracy: 0.7990 - val_loss: 0.7984 - val_accuracy: 0.7664
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3798 - accuracy: 0.8222 - val_loss: 0.7965 - val_accuracy: 0.7804
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3820 - accuracy: 0.7629 - val_loss: 0.9067 - val_accuracy: 0.7710
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3899 - accuracy: 0.7320 - val_loss: 0.7960 - val_accuracy: 0.7523
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3715 - accuracy: 0.8041 - val_loss: 0.7855 - val_accuracy: 0.5794
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4408 - accuracy: 0.6598 - val_loss: 0.8022 - val_accuracy: 0.5935
Epoch 214/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3870 - accuracy: 0.7448 - val_loss: 0.8038 - val_accuracy: 0.5981
Epoch 215/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3581 - accuracy: 0.7423 - val_loss: 0.8014 - val_accuracy: 0.5935
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4330 - accuracy: 0.6907 - val_loss: 0.8619 - val_accuracy: 0.5841
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4178 - accuracy: 0.7062 - val_loss: 0.8128 - val_accuracy: 0.5888
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4320 - accuracy: 0.6675 - val_loss: 0.8337 - val_accuracy: 0.5935
Epoch 219/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3909 - accuracy: 0.6933 - val_loss: 0.8016 - val_accuracy: 0.5794
Epoch 220/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3949 - accuracy: 0.6598 - val_loss: 0.7923 - val_accuracy: 0.7336
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3890 - accuracy: 0.7113 - val_loss: 0.8814 - val_accuracy: 0.7383
Epoch 222/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3891 - accuracy: 0.6701 - val_loss: 0.8465 - val_accuracy: 0.5888
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4093 - accuracy: 0.6778 - val_loss: 0.7889 - val_accuracy: 0.5888
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3517 - accuracy: 0.7088 - val_loss: 0.9362 - val_accuracy: 0.7477
Epoch 225/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4533 - accuracy: 0.6830 - val_loss: 0.9612 - val_accuracy: 0.7430
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4198 - accuracy: 0.7268 - val_loss: 0.9349 - val_accuracy: 0.7523
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4461 - accuracy: 0.7139 - val_loss: 0.9078 - val_accuracy: 0.7523
Epoch 228/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4973 - accuracy: 0.7088 - val_loss: 0.8494 - val_accuracy: 0.7570
Epoch 229/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4259 - accuracy: 0.7165 - val_loss: 0.9089 - val_accuracy: 0.7617
Epoch 230/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4006 - accuracy: 0.7216 - val_loss: 0.7938 - val_accuracy: 0.6308
```

Epoch 231/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3892 - accuracy: 0.6675 - val_loss: 0.7886 - val_accuracy: 0.6121
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3556 - accuracy: 0.6701 - val_loss: 0.8462 - val_accuracy: 0.6075
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4181 - accuracy: 0.6753 - val_loss: 0.8248 - val_accuracy: 0.6075
Epoch 234/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3822 - accuracy: 0.7165 - val_loss: 0.7895 - val_accuracy: 0.6028
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3826 - accuracy: 0.6418 - val_loss: 0.8051 - val_accuracy: 0.5935
Epoch 236/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4014 - accuracy: 0.6392 - val_loss: 0.9129 - val_accuracy: 0.6262
Epoch 237/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3772 - accuracy: 0.6778 - val_loss: 0.9118 - val_accuracy: 0.7477
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3551 - accuracy: 0.6830 - val_loss: 0.9077 - val_accuracy: 0.7430
Epoch 239/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3534 - accuracy: 0.7629 - val_loss: 0.9128 - val_accuracy: 0.7477
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4219 - accuracy: 0.7448 - val_loss: 0.9154 - val_accuracy: 0.7477
Epoch 241/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3404 - accuracy: 0.7448 - val_loss: 0.9140 - val_accuracy: 0.7477
Epoch 242/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4409 - accuracy: 0.7448 - val_loss: 0.9074 - val_accuracy: 0.5935
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4017 - accuracy: 0.7242 - val_loss: 0.9096 - val_accuracy: 0.6121
Epoch 244/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4224 - accuracy: 0.6701 - val_loss: 0.8995 - val_accuracy: 0.7430
Epoch 245/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3434 - accuracy: 0.8247 - val_loss: 0.8982 - val_accuracy: 0.7290
Epoch 246/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4298 - accuracy: 0.7088 - val_loss: 0.9005 - val_accuracy: 0.7196
Epoch 247/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3712 - accuracy: 0.7603 - val_loss: 0.8754 - val_accuracy: 0.7290
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4291 - accuracy: 0.7397 - val_loss: 0.8454 - val_accuracy: 0.6308
Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3735 - accuracy: 0.6701 - val_loss: 0.8469 - val_accuracy: 0.6262
Epoch 250/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4143 - accuracy: 0.6959 - val_loss: 0.8478 - val_accuracy: 0.6215
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3241 - accuracy: 0.6804 - val_loss: 0.7947 - val_accuracy: 0.6168
Epoch 252/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4389 - accuracy: 0.7062 - val_loss: 0.8935 - val_accuracy: 0.7383
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4026 - accuracy: 0.7887 - val_loss: 0.9389 - val_accuracy: 0.7336
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3326 - accuracy: 0.8196 - val_loss: 0.9167 - val_accuracy: 0.7336
Epoch 255/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3557 - accuracy: 0.7758 - val_loss: 0.9723 - val_accuracy: 0.7617
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3348 - accuracy: 0.8325 - val_loss: 0.9716 - val_accuracy: 0.7617
Epoch 257/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3474 - accuracy: 0.8402 - val_loss: 0.9963 - val_accuracy: 0.7570
Epoch 258/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3633 - accuracy: 0.8247 - val_loss: 0.9702 - val_accuracy: 0.7617
Epoch 259/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3474 - accuracy: 0.8222 - val_loss: 0.8859 - val_accuracy: 0.7617
Epoch 260/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3722 - accuracy: 0.8067 - val_loss: 0.9102 - val_accuracy: 0.7617

```
accuracy: 0.7664
Epoch 261/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3778 - accuracy: 0.8247 - val_loss: 0.9661 - val_accuracy: 0.7523
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3244 - accuracy: 0.8273 - val_loss: 0.9409 - val_accuracy: 0.7477
Epoch 263/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4295 - accuracy: 0.7835 - val_loss: 0.9450 - val_accuracy: 0.7523
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4510 - accuracy: 0.8247 - val_loss: 0.9206 - val_accuracy: 0.7523
Epoch 265/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3661 - accuracy: 0.8325 - val_loss: 0.8518 - val_accuracy: 0.7523
Epoch 266/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3681 - accuracy: 0.7706 - val_loss: 0.8288 - val_accuracy: 0.7430
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3489 - accuracy: 0.7964 - val_loss: 0.8291 - val_accuracy: 0.7430
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5132 - accuracy: 0.7887 - val_loss: 0.9393 - val_accuracy: 0.7477
Epoch 269/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3887 - accuracy: 0.8247 - val_loss: 0.8894 - val_accuracy: 0.7477
Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3666 - accuracy: 0.8428 - val_loss: 0.9670 - val_accuracy: 0.7430
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4584 - accuracy: 0.8376 - val_loss: 0.9213 - val_accuracy: 0.7477
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4078 - accuracy: 0.7861 - val_loss: 0.8901 - val_accuracy: 0.7383
Epoch 273/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3221 - accuracy: 0.8531 - val_loss: 0.8921 - val_accuracy: 0.7383
Epoch 274/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3697 - accuracy: 0.8222 - val_loss: 0.8220 - val_accuracy: 0.7523
Epoch 275/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3593 - accuracy: 0.8273 - val_loss: 0.8291 - val_accuracy: 0.7570
Epoch 276/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3583 - accuracy: 0.8402 - val_loss: 0.9139 - val_accuracy: 0.7570
Epoch 277/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4165 - accuracy: 0.8041 - val_loss: 0.9168 - val_accuracy: 0.7570
Epoch 278/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3782 - accuracy: 0.8144 - val_loss: 0.8550 - val_accuracy: 0.7664
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4054 - accuracy: 0.8479 - val_loss: 0.9213 - val_accuracy: 0.7617
Epoch 280/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3433 - accuracy: 0.8299 - val_loss: 1.0344 - val_accuracy: 0.7617
Epoch 281/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3672 - accuracy: 0.8351 - val_loss: 0.9522 - val_accuracy: 0.7477
Epoch 282/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3759 - accuracy: 0.8376 - val_loss: 0.8862 - val_accuracy: 0.7523
Epoch 283/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3397 - accuracy: 0.8093 - val_loss: 0.8521 - val_accuracy: 0.7383
Epoch 284/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3548 - accuracy: 0.8273 - val_loss: 0.9451 - val_accuracy: 0.7430
Epoch 285/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3546 - accuracy: 0.8170 - val_loss: 0.9672 - val_accuracy: 0.7523
Epoch 286/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4011 - accuracy: 0.8196 - val_loss: 0.9446 - val_accuracy: 0.7617
Epoch 287/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4560 - accuracy: 0.8351 - val_loss: 0.9409 - val_accuracy: 0.7664
Epoch 288/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3264 - accuracy: 0.8351 - val_loss: 0.9428 - val_accuracy: 0.7617
Epoch 289/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3679 - accuracy: 0.8325 - val_loss: 0.9187 - val_accuracy: 0.7523
Epoch 290/1000
```

4/4 [=====] - 0s 12ms/step - loss: 0.3386 - accuracy: 0.8505 - val_loss: 0.9173 - val_accuracy: 0.7523
 Epoch 291/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3573 - accuracy: 0.8273 - val_loss: 0.9216 - val_accuracy: 0.7570
 Epoch 292/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3437 - accuracy: 0.8531 - val_loss: 0.9163 - val_accuracy: 0.7477
 Epoch 293/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3392 - accuracy: 0.8454 - val_loss: 0.9165 - val_accuracy: 0.7430
 Epoch 294/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3522 - accuracy: 0.8454 - val_loss: 0.9197 - val_accuracy: 0.7477
 Epoch 295/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4643 - accuracy: 0.7964 - val_loss: 1.0143 - val_accuracy: 0.7523
 Epoch 296/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3873 - accuracy: 0.8428 - val_loss: 0.9808 - val_accuracy: 0.7523
 Epoch 297/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3753 - accuracy: 0.8144 - val_loss: 0.9842 - val_accuracy: 0.7523
 Epoch 298/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3301 - accuracy: 0.8479 - val_loss: 0.9637 - val_accuracy: 0.7477
 Epoch 299/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.2979 - accuracy: 0.8505 - val_loss: 0.9266 - val_accuracy: 0.7477
 Epoch 300/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4073 - accuracy: 0.8247 - val_loss: 0.9652 - val_accuracy: 0.7383
 Epoch 301/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4564 - accuracy: 0.8299 - val_loss: 0.9929 - val_accuracy: 0.7383
 Epoch 302/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3352 - accuracy: 0.8454 - val_loss: 1.0173 - val_accuracy: 0.7336
 Epoch 303/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4317 - accuracy: 0.8376 - val_loss: 0.9866 - val_accuracy: 0.7430
 Epoch 304/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3876 - accuracy: 0.7912 - val_loss: 0.9875 - val_accuracy: 0.7430
 Epoch 305/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3458 - accuracy: 0.7990 - val_loss: 0.9316 - val_accuracy: 0.7430
 Epoch 306/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3610 - accuracy: 0.7835 - val_loss: 0.9119 - val_accuracy: 0.5888
 Epoch 307/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4016 - accuracy: 0.6727 - val_loss: 0.9266 - val_accuracy: 0.5981
 Epoch 308/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3570 - accuracy: 0.6701 - val_loss: 0.9623 - val_accuracy: 0.5748
 Epoch 309/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.2743 - accuracy: 0.6562 Restoring model weights from the end of the best epoch: 159.
 4/4 [=====] - 0s 14ms/step - loss: 0.3295 - accuracy: 0.6572 - val_loss: 0.9657 - val_accuracy: 0.5794
 Epoch 309: early stopping
 2/2 [=====] - 0s 4ms/step - loss: 0.9436 - accuracy: 0.7955
 [CV] ENDDense1=50, Dense2=10; total time= 16.4s
 Model: "sequential_41"

Layer (type)	Output Shape	Param #
dense_164 (Dense)	(None, 50)	350
batch_normalization_123 (BatchNormalization)	(None, 50)	200
activation_123 (Activation)	(None, 50)	0
dense_165 (Dense)	(None, 10)	510
batch_normalization_124 (BatchNormalization)	(None, 10)	40
activation_124 (Activation)	(None, 10)	0
dense_166 (Dense)	(None, 10)	110
batch_normalization_125 (BatchNormalization)	(None, 10)	40
activation_125 (Activation)	(None, 10)	0

```
=====
Total params: 1,272
Trainable params: 1,132
Non-trainable params: 140

Epoch 1/1000
4/4 [=====] - 1s 56ms/step - loss: 5.9640 - accuracy: 0.4679 - val_loss: 8.0992 - val_accuracy: 0.4299
Epoch 2/1000
4/4 [=====] - 0s 12ms/step - loss: 4.7439 - accuracy: 0.5116 - val_loss: 7.7404 - val_accuracy: 0.4019
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 4.6942 - accuracy: 0.5244 - val_loss: 6.7071 - val_accuracy: 0.4346
Epoch 4/1000
4/4 [=====] - 0s 12ms/step - loss: 4.4327 - accuracy: 0.4344 - val_loss: 5.5907 - val_accuracy: 0.4252
Epoch 5/1000
4/4 [=====] - 0s 11ms/step - loss: 4.3907 - accuracy: 0.4473 - val_loss: 4.8847 - val_accuracy: 0.4346
Epoch 6/1000
4/4 [=====] - 0s 12ms/step - loss: 4.2728 - accuracy: 0.4447 - val_loss: 4.1252 - val_accuracy: 0.4720
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 4.2696 - accuracy: 0.4833 - val_loss: 3.4655 - val_accuracy: 0.4907
Epoch 8/1000
4/4 [=====] - 0s 11ms/step - loss: 4.0332 - accuracy: 0.4653 - val_loss: 3.0810 - val_accuracy: 0.4673
Epoch 9/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8769 - accuracy: 0.5270 - val_loss: 2.7122 - val_accuracy: 0.4626
Epoch 10/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8141 - accuracy: 0.5219 - val_loss: 2.3460 - val_accuracy: 0.4533
Epoch 11/1000
4/4 [=====] - 0s 12ms/step - loss: 3.6894 - accuracy: 0.5296 - val_loss: 2.2626 - val_accuracy: 0.4393
Epoch 12/1000
4/4 [=====] - 0s 12ms/step - loss: 3.6663 - accuracy: 0.4447 - val_loss: 2.1061 - val_accuracy: 0.4206
Epoch 13/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3800 - accuracy: 0.4447 - val_loss: 1.9964 - val_accuracy: 0.4439
Epoch 14/1000
4/4 [=====] - 0s 12ms/step - loss: 3.1619 - accuracy: 0.4370 - val_loss: 1.9425 - val_accuracy: 0.4486
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1755 - accuracy: 0.4987 - val_loss: 1.8502 - val_accuracy: 0.4486
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9485 - accuracy: 0.5296 - val_loss: 1.8209 - val_accuracy: 0.4486
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8580 - accuracy: 0.5270 - val_loss: 1.7784 - val_accuracy: 0.4393
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8301 - accuracy: 0.5296 - val_loss: 1.7226 - val_accuracy: 0.4439
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5980 - accuracy: 0.5219 - val_loss: 1.6946 - val_accuracy: 0.4439
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6025 - accuracy: 0.5296 - val_loss: 1.6273 - val_accuracy: 0.4486
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3264 - accuracy: 0.5167 - val_loss: 1.5887 - val_accuracy: 0.4393
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3822 - accuracy: 0.5219 - val_loss: 1.5493 - val_accuracy: 0.4393
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3953 - accuracy: 0.5219 - val_loss: 1.5213 - val_accuracy: 0.4393
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3773 - accuracy: 0.4267 - val_loss: 1.4882 - val_accuracy: 0.3785
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2514 - accuracy: 0.4216 - val_loss: 1.4395 - val_accuracy: 0.3925
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3596 - accuracy: 0.4447 - val_loss: 1.4287 - val_accuracy: 0.3972
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1261 - accuracy: 0.4165 - val_loss: 1.4093 - val_accuracy: 0.3972
Epoch 28/1000
```

```
4/4 [=====] - 0s 11ms/step - loss: 2.0847 - accuracy: 0.4165 - val_loss: 1.4010 - val_accuracy: 0.3832
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2509 - accuracy: 0.4139 - val_loss: 1.3393 - val_accuracy: 0.4065
Epoch 30/1000
4/4 [=====] - 0s 11ms/step - loss: 2.0599 - accuracy: 0.4165 - val_loss: 1.3404 - val_accuracy: 0.4019
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1160 - accuracy: 0.4344 - val_loss: 1.3478 - val_accuracy: 0.4159
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1192 - accuracy: 0.4113 - val_loss: 1.3117 - val_accuracy: 0.5888
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8806 - accuracy: 0.4344 - val_loss: 1.3069 - val_accuracy: 0.5981
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8508 - accuracy: 0.4113 - val_loss: 1.3029 - val_accuracy: 0.3972
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9295 - accuracy: 0.4165 - val_loss: 1.2917 - val_accuracy: 0.3879
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8243 - accuracy: 0.4190 - val_loss: 1.2859 - val_accuracy: 0.3832
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8316 - accuracy: 0.4344 - val_loss: 1.2793 - val_accuracy: 0.3925
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8420 - accuracy: 0.4319 - val_loss: 1.2609 - val_accuracy: 0.4019
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9937 - accuracy: 0.4113 - val_loss: 1.2612 - val_accuracy: 0.4065
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8189 - accuracy: 0.4139 - val_loss: 1.2562 - val_accuracy: 0.4112
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8719 - accuracy: 0.4139 - val_loss: 1.2526 - val_accuracy: 0.4065
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7559 - accuracy: 0.4062 - val_loss: 1.2470 - val_accuracy: 0.4252
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6763 - accuracy: 0.4139 - val_loss: 1.2479 - val_accuracy: 0.4206
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6275 - accuracy: 0.4113 - val_loss: 1.1942 - val_accuracy: 0.3738
Epoch 45/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7008 - accuracy: 0.4165 - val_loss: 1.1809 - val_accuracy: 0.4019
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7292 - accuracy: 0.4242 - val_loss: 1.1756 - val_accuracy: 0.3785
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5596 - accuracy: 0.4010 - val_loss: 1.1682 - val_accuracy: 0.3692
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5404 - accuracy: 0.4062 - val_loss: 1.1525 - val_accuracy: 0.3738
Epoch 49/1000
4/4 [=====] - 0s 11ms/step - loss: 1.6164 - accuracy: 0.4010 - val_loss: 1.1443 - val_accuracy: 0.5841
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6532 - accuracy: 0.4062 - val_loss: 1.1360 - val_accuracy: 0.5888
Epoch 51/1000
4/4 [=====] - 0s 11ms/step - loss: 1.3804 - accuracy: 0.3933 - val_loss: 1.1626 - val_accuracy: 0.5981
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5195 - accuracy: 0.4087 - val_loss: 1.1563 - val_accuracy: 0.5981
Epoch 53/1000
4/4 [=====] - 0s 11ms/step - loss: 1.6396 - accuracy: 0.3856 - val_loss: 1.1348 - val_accuracy: 0.5935
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6288 - accuracy: 0.4036 - val_loss: 1.1542 - val_accuracy: 0.5981
Epoch 55/1000
4/4 [=====] - 0s 11ms/step - loss: 1.5503 - accuracy: 0.4062 - val_loss: 1.1445 - val_accuracy: 0.5841
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4379 - accuracy: 0.3728 - val_loss: 1.0962 - val_accuracy: 0.5981
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4626 - accuracy: 0.3753 - val_loss: 1.1166 - val_accuracy: 0.5888
```

Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3854 - accuracy: 0.3805 - val_loss: 1.1386 - val_accuracy: 0.5981
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4717 - accuracy: 0.3805 - val_loss: 1.1333 - val_accuracy: 0.5981
Epoch 60/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3161 - accuracy: 0.3882 - val_loss: 1.1257 - val_accuracy: 0.6028
Epoch 61/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3313 - accuracy: 0.3856 - val_loss: 1.0878 - val_accuracy: 0.6028
Epoch 62/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3971 - accuracy: 0.3959 - val_loss: 1.0836 - val_accuracy: 0.6075
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4639 - accuracy: 0.3625 - val_loss: 1.0756 - val_accuracy: 0.6028
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3361 - accuracy: 0.3702 - val_loss: 1.0307 - val_accuracy: 0.6121
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2711 - accuracy: 0.3830 - val_loss: 1.0536 - val_accuracy: 0.6121
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2513 - accuracy: 0.3779 - val_loss: 1.0477 - val_accuracy: 0.6121
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3597 - accuracy: 0.3779 - val_loss: 1.0399 - val_accuracy: 0.5935
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2298 - accuracy: 0.3805 - val_loss: 1.0320 - val_accuracy: 0.5935
Epoch 69/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1966 - accuracy: 0.3805 - val_loss: 1.0271 - val_accuracy: 0.3364
Epoch 70/1000
4/4 [=====] - 0s 18ms/step - loss: 1.2702 - accuracy: 0.3650 - val_loss: 1.0444 - val_accuracy: 0.5841
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0930 - accuracy: 0.3805 - val_loss: 1.0371 - val_accuracy: 0.3551
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0824 - accuracy: 0.3882 - val_loss: 1.0261 - val_accuracy: 0.3598
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1438 - accuracy: 0.3728 - val_loss: 1.0150 - val_accuracy: 0.3598
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0200 - accuracy: 0.3856 - val_loss: 1.0040 - val_accuracy: 0.6168
Epoch 75/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1337 - accuracy: 0.3650 - val_loss: 0.9661 - val_accuracy: 0.3738
Epoch 76/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0793 - accuracy: 0.4062 - val_loss: 0.9592 - val_accuracy: 0.3738
Epoch 77/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0361 - accuracy: 0.3959 - val_loss: 0.9731 - val_accuracy: 0.3785
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9754 - accuracy: 0.3805 - val_loss: 0.9894 - val_accuracy: 0.3692
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9086 - accuracy: 0.3985 - val_loss: 0.9645 - val_accuracy: 0.3692
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8134 - accuracy: 0.3959 - val_loss: 0.9749 - val_accuracy: 0.3692
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9011 - accuracy: 0.3985 - val_loss: 0.9708 - val_accuracy: 0.3598
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9666 - accuracy: 0.3882 - val_loss: 0.9191 - val_accuracy: 0.3598
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7831 - accuracy: 0.3779 - val_loss: 0.9669 - val_accuracy: 0.3645
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7428 - accuracy: 0.4267 - val_loss: 0.9650 - val_accuracy: 0.3551
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7892 - accuracy: 0.3882 - val_loss: 0.9282 - val_accuracy: 0.3505
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7211 - accuracy: 0.3985 - val_loss: 0.8878 - val_accuracy: 0.3458
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6669 - accuracy: 0.3933 - val_loss: 0.8771 - val_accuracy: 0.3458

```
accuracy: 0.3505
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8122 - accuracy: 0.3779 - val_loss: 0.8692 - val_accuracy: 0.3505
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7148 - accuracy: 0.4036 - val_loss: 0.8542 - val_accuracy: 0.3505
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7465 - accuracy: 0.4139 - val_loss: 0.8425 - val_accuracy: 0.3505
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6745 - accuracy: 0.3985 - val_loss: 0.8323 - val_accuracy: 0.3505
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7261 - accuracy: 0.3625 - val_loss: 0.8264 - val_accuracy: 0.3505
Epoch 93/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6864 - accuracy: 0.3753 - val_loss: 0.8137 - val_accuracy: 0.3458
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6523 - accuracy: 0.3702 - val_loss: 0.8089 - val_accuracy: 0.3458
Epoch 95/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6847 - accuracy: 0.3702 - val_loss: 0.7977 - val_accuracy: 0.3458
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6472 - accuracy: 0.3856 - val_loss: 0.7899 - val_accuracy: 0.3505
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6240 - accuracy: 0.3805 - val_loss: 0.7781 - val_accuracy: 0.3551
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5839 - accuracy: 0.3676 - val_loss: 0.7718 - val_accuracy: 0.3598
Epoch 99/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6432 - accuracy: 0.3625 - val_loss: 0.7763 - val_accuracy: 0.3598
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6387 - accuracy: 0.3650 - val_loss: 0.7689 - val_accuracy: 0.3551
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8272 - accuracy: 0.3753 - val_loss: 0.7601 - val_accuracy: 0.3458
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5944 - accuracy: 0.3805 - val_loss: 0.7601 - val_accuracy: 0.3458
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6731 - accuracy: 0.3779 - val_loss: 0.7560 - val_accuracy: 0.3458
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6400 - accuracy: 0.4062 - val_loss: 0.7541 - val_accuracy: 0.3411
Epoch 105/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5496 - accuracy: 0.3959 - val_loss: 0.7422 - val_accuracy: 0.3271
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6288 - accuracy: 0.3805 - val_loss: 0.7685 - val_accuracy: 0.3224
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6339 - accuracy: 0.3650 - val_loss: 0.6976 - val_accuracy: 0.3318
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5939 - accuracy: 0.3830 - val_loss: 0.6915 - val_accuracy: 0.3318
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6000 - accuracy: 0.3805 - val_loss: 0.6875 - val_accuracy: 0.3271
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5994 - accuracy: 0.3805 - val_loss: 0.6877 - val_accuracy: 0.3318
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4931 - accuracy: 0.3933 - val_loss: 0.6865 - val_accuracy: 0.3364
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5634 - accuracy: 0.4036 - val_loss: 0.6802 - val_accuracy: 0.3318
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5872 - accuracy: 0.3805 - val_loss: 0.6806 - val_accuracy: 0.3364
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5314 - accuracy: 0.3805 - val_loss: 0.6796 - val_accuracy: 0.3364
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4986 - accuracy: 0.3959 - val_loss: 0.6859 - val_accuracy: 0.3411
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6631 - accuracy: 0.3907 - val_loss: 0.6951 - val_accuracy: 0.3318
Epoch 117/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.5619 - accuracy: 0.3907 - val_loss: 0.6883 - val_accuracy: 0.3271
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5545 - accuracy: 0.4010 - val_loss: 0.7156 - val_accuracy: 0.3318
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5969 - accuracy: 0.4113 - val_loss: 0.6856 - val_accuracy: 0.3271
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5688 - accuracy: 0.3728 - val_loss: 0.7111 - val_accuracy: 0.3318
Epoch 121/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5983 - accuracy: 0.3882 - val_loss: 0.7084 - val_accuracy: 0.3318
Epoch 122/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5451 - accuracy: 0.3882 - val_loss: 0.7422 - val_accuracy: 0.3224
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6496 - accuracy: 0.3959 - val_loss: 0.7629 - val_accuracy: 0.3271
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6267 - accuracy: 0.3959 - val_loss: 0.7151 - val_accuracy: 0.3271
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5806 - accuracy: 0.4113 - val_loss: 0.7664 - val_accuracy: 0.3178
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6547 - accuracy: 0.3753 - val_loss: 0.7369 - val_accuracy: 0.3131
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5356 - accuracy: 0.3830 - val_loss: 0.7343 - val_accuracy: 0.3084
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4817 - accuracy: 0.3676 - val_loss: 0.7345 - val_accuracy: 0.3178
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5191 - accuracy: 0.3702 - val_loss: 0.7344 - val_accuracy: 0.3271
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5387 - accuracy: 0.3753 - val_loss: 0.7404 - val_accuracy: 0.3271
Epoch 131/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5504 - accuracy: 0.3650 - val_loss: 0.7298 - val_accuracy: 0.3224
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4932 - accuracy: 0.3728 - val_loss: 0.7280 - val_accuracy: 0.3178
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5061 - accuracy: 0.3702 - val_loss: 0.7270 - val_accuracy: 0.3224
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4808 - accuracy: 0.3856 - val_loss: 0.6855 - val_accuracy: 0.3178
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4907 - accuracy: 0.3779 - val_loss: 0.6836 - val_accuracy: 0.3178
Epoch 136/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5562 - accuracy: 0.3599 - val_loss: 0.7238 - val_accuracy: 0.3271
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4716 - accuracy: 0.3907 - val_loss: 0.7249 - val_accuracy: 0.3318
Epoch 138/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4637 - accuracy: 0.3933 - val_loss: 0.6860 - val_accuracy: 0.3318
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4983 - accuracy: 0.3625 - val_loss: 0.6841 - val_accuracy: 0.3271
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5278 - accuracy: 0.3856 - val_loss: 0.6835 - val_accuracy: 0.3131
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5012 - accuracy: 0.3959 - val_loss: 0.7197 - val_accuracy: 0.3224
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5692 - accuracy: 0.3702 - val_loss: 0.7254 - val_accuracy: 0.3271
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4601 - accuracy: 0.3753 - val_loss: 0.6913 - val_accuracy: 0.3178
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4358 - accuracy: 0.3728 - val_loss: 0.6895 - val_accuracy: 0.3178
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5004 - accuracy: 0.3728 - val_loss: 0.6891 - val_accuracy: 0.3178
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5416 - accuracy: 0.4062 - val_loss: 0.6892 - val_accuracy: 0.3271
```

Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5329 - accuracy: 0.3702 - val_loss: 0.6906 - val_accuracy: 0.3271
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5133 - accuracy: 0.3702 - val_loss: 0.6878 - val_accuracy: 0.3318
Epoch 149/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4688 - accuracy: 0.4010 - val_loss: 0.6873 - val_accuracy: 0.3318
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5938 - accuracy: 0.3933 - val_loss: 0.6835 - val_accuracy: 0.3364
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4880 - accuracy: 0.3702 - val_loss: 0.6797 - val_accuracy: 0.3318
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4484 - accuracy: 0.3907 - val_loss: 0.6774 - val_accuracy: 0.3411
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4680 - accuracy: 0.3676 - val_loss: 0.6781 - val_accuracy: 0.3318
Epoch 154/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4495 - accuracy: 0.3959 - val_loss: 0.7137 - val_accuracy: 0.3458
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3995 - accuracy: 0.3805 - val_loss: 0.7144 - val_accuracy: 0.3411
Epoch 156/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4667 - accuracy: 0.3753 - val_loss: 0.7172 - val_accuracy: 0.3458
Epoch 157/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4877 - accuracy: 0.3933 - val_loss: 0.7183 - val_accuracy: 0.3458
Epoch 158/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4786 - accuracy: 0.3599 - val_loss: 0.7152 - val_accuracy: 0.3458
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4430 - accuracy: 0.3779 - val_loss: 0.6906 - val_accuracy: 0.3411
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4605 - accuracy: 0.3856 - val_loss: 0.6833 - val_accuracy: 0.3411
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4666 - accuracy: 0.3882 - val_loss: 0.6837 - val_accuracy: 0.3411
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4505 - accuracy: 0.3728 - val_loss: 0.6832 - val_accuracy: 0.3318
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4993 - accuracy: 0.3907 - val_loss: 0.6888 - val_accuracy: 0.3458
Epoch 164/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4685 - accuracy: 0.3907 - val_loss: 0.6902 - val_accuracy: 0.3364
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4824 - accuracy: 0.3496 - val_loss: 0.6874 - val_accuracy: 0.3411
Epoch 166/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4736 - accuracy: 0.3907 - val_loss: 0.6889 - val_accuracy: 0.3411
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5411 - accuracy: 0.3959 - val_loss: 0.6901 - val_accuracy: 0.3411
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5329 - accuracy: 0.3985 - val_loss: 0.6793 - val_accuracy: 0.3458
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4412 - accuracy: 0.3728 - val_loss: 0.6691 - val_accuracy: 0.3318
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4415 - accuracy: 0.3650 - val_loss: 0.6710 - val_accuracy: 0.3364
Epoch 171/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5492 - accuracy: 0.3753 - val_loss: 0.6715 - val_accuracy: 0.3224
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3794 - accuracy: 0.3753 - val_loss: 0.6701 - val_accuracy: 0.3271
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5831 - accuracy: 0.3830 - val_loss: 0.6792 - val_accuracy: 0.3271
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4328 - accuracy: 0.3933 - val_loss: 0.6804 - val_accuracy: 0.3318
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4821 - accuracy: 0.3728 - val_loss: 0.6864 - val_accuracy: 0.3411
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4539 - accuracy: 0.3985 - val_loss: 0.6861 - val_accuracy: 0.3411

```
accuracy: 0.3318
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4448 - accuracy: 0.3856 - val_loss: 0.6830 - val_
accuracy: 0.3364
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4306 - accuracy: 0.3856 - val_loss: 0.6789 - val_
accuracy: 0.3271
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4438 - accuracy: 0.3753 - val_loss: 0.6822 - val_
accuracy: 0.3271
Epoch 180/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4907 - accuracy: 0.3805 - val_loss: 0.6816 - val_
accuracy: 0.3364
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3760 - accuracy: 0.3882 - val_loss: 0.6820 - val_
accuracy: 0.3364
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4717 - accuracy: 0.3599 - val_loss: 0.6833 - val_
accuracy: 0.3458
Epoch 183/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5327 - accuracy: 0.3676 - val_loss: 0.6875 - val_
accuracy: 0.3458
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4472 - accuracy: 0.3779 - val_loss: 0.6883 - val_
accuracy: 0.3458
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4195 - accuracy: 0.3882 - val_loss: 0.6871 - val_
accuracy: 0.3411
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4183 - accuracy: 0.3933 - val_loss: 0.6887 - val_
accuracy: 0.3318
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4163 - accuracy: 0.3856 - val_loss: 0.6907 - val_
accuracy: 0.3411
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4557 - accuracy: 0.3856 - val_loss: 0.6356 - val_
accuracy: 0.3411
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4431 - accuracy: 0.3856 - val_loss: 0.6944 - val_
accuracy: 0.4065
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4475 - accuracy: 0.4704 - val_loss: 0.6975 - val_
accuracy: 0.4252
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4245 - accuracy: 0.4602 - val_loss: 0.6988 - val_
accuracy: 0.4252
Epoch 192/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3918 - accuracy: 0.4807 - val_loss: 0.7017 - val_
accuracy: 0.4206
Epoch 193/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4295 - accuracy: 0.4653 - val_loss: 0.6915 - val_
accuracy: 0.4346
Epoch 194/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3679 - accuracy: 0.4756 - val_loss: 0.6951 - val_
accuracy: 0.4346
Epoch 195/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4163 - accuracy: 0.4756 - val_loss: 0.7506 - val_
accuracy: 0.4346
Epoch 196/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3535 - accuracy: 0.4627 - val_loss: 0.7577 - val_
accuracy: 0.4393
Epoch 197/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3847 - accuracy: 0.4961 - val_loss: 0.7432 - val_
accuracy: 0.4393
Epoch 198/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4405 - accuracy: 0.4550 - val_loss: 0.7485 - val_
accuracy: 0.4393
Epoch 199/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4824 - accuracy: 0.4524 - val_loss: 0.7472 - val_
accuracy: 0.4393
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3780 - accuracy: 0.4781 - val_loss: 0.7511 - val_
accuracy: 0.4346
Epoch 201/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4711 - accuracy: 0.4679 - val_loss: 0.7494 - val_
accuracy: 0.4393
Epoch 202/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3692 - accuracy: 0.4653 - val_loss: 0.7511 - val_
accuracy: 0.4393
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4047 - accuracy: 0.4550 - val_loss: 0.7521 - val_
accuracy: 0.4346
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4700 - accuracy: 0.4704 - val_loss: 0.7558 - val_
accuracy: 0.4439
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4106 - accuracy: 0.4781 - val_loss: 0.7573 - val_
accuracy: 0.4486
Epoch 206/1000
```

```

4/4 [=====] - 0s 14ms/step - loss: 0.4508 - accuracy: 0.4653 - val_loss: 0.7568 - val_accuracy: 0.4439
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4056 - accuracy: 0.4910 - val_loss: 0.7550 - val_accuracy: 0.4346
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4026 - accuracy: 0.4627 - val_loss: 0.7524 - val_accuracy: 0.4346
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4061 - accuracy: 0.4679 - val_loss: 0.7596 - val_accuracy: 0.4299
Epoch 210/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4281 - accuracy: 0.4653 - val_loss: 0.7481 - val_accuracy: 0.4393
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3468 - accuracy: 0.4781 - val_loss: 0.7476 - val_accuracy: 0.4439
Epoch 212/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4622 - accuracy: 0.4807 - val_loss: 0.7440 - val_accuracy: 0.4439
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4111 - accuracy: 0.4756 - val_loss: 0.7449 - val_accuracy: 0.4393
Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3498 - accuracy: 0.4653 - val_loss: 0.7557 - val_accuracy: 0.4346
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3461 - accuracy: 0.4859 - val_loss: 0.7550 - val_accuracy: 0.4346
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3322 - accuracy: 0.4807 - val_loss: 0.7499 - val_accuracy: 0.4346
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3995 - accuracy: 0.4730 - val_loss: 0.7506 - val_accuracy: 0.4439
Epoch 218/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3432 - accuracy: 0.4704 - val_loss: 0.7775 - val_accuracy: 0.4579
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4427 - accuracy: 0.4756 - val_loss: 0.7686 - val_accuracy: 0.4439
Epoch 220/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3363 - accuracy: 0.5064 - val_loss: 0.7612 - val_accuracy: 0.4393
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3399 - accuracy: 0.4833 - val_loss: 0.7670 - val_accuracy: 0.4393
Epoch 222/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3875 - accuracy: 0.4781 - val_loss: 0.7532 - val_accuracy: 0.4533
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3539 - accuracy: 0.4781 - val_loss: 0.7504 - val_accuracy: 0.4393
Epoch 224/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3586 - accuracy: 0.5234Restoring model weights from the end of the best epoch: 74.
4/4 [=====] - 0s 14ms/step - loss: 0.3934 - accuracy: 0.4807 - val_loss: 0.7480 - val_accuracy: 0.4439
Epoch 224: early stopping
2/2 [=====] - 0s 4ms/step - loss: 0.9392 - accuracy: 0.7209
[CV] END .....Dense1=50, Dense2=10; total time= 11.6s
Model: "sequential_42"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_168 (Dense)	(None, 50)	350
<hr/>		
batch_normalization_126 (BatchNormalization)	(None, 50)	200
activation_126 (Activation)	(None, 50)	0
dense_169 (Dense)	(None, 10)	510
batch_normalization_127 (BatchNormalization)	(None, 10)	40
activation_127 (Activation)	(None, 10)	0
dense_170 (Dense)	(None, 10)	110
batch_normalization_128 (BatchNormalization)	(None, 10)	40
activation_128 (Activation)	(None, 10)	0
dense_171 (Dense)	(None, 2)	22
<hr/>		

Total params: 1,272
Trainable params: 1,132
Non-trainable params: 140

Epoch 1/1000
4/4 [=====] - 1s 55ms/step - loss: 5.8228 - accuracy: 0.4499 - val_loss: 3.0228 - val_accuracy: 0.6121
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 4.5837 - accuracy: 0.4447 - val_loss: 3.2100 - val_accuracy: 0.5888
Epoch 3/1000
4/4 [=====] - 0s 12ms/step - loss: 4.4309 - accuracy: 0.4704 - val_loss: 3.2137 - val_accuracy: 0.5421
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 4.2238 - accuracy: 0.4679 - val_loss: 3.2828 - val_accuracy: 0.5047
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 4.2862 - accuracy: 0.4653 - val_loss: 3.1932 - val_accuracy: 0.5000
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 4.2983 - accuracy: 0.5270 - val_loss: 3.1043 - val_accuracy: 0.4953
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 4.1342 - accuracy: 0.5013 - val_loss: 2.8710 - val_accuracy: 0.4953
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 4.1018 - accuracy: 0.5141 - val_loss: 2.6979 - val_accuracy: 0.5047
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8385 - accuracy: 0.5219 - val_loss: 2.6297 - val_accuracy: 0.5093
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8798 - accuracy: 0.5219 - val_loss: 2.5382 - val_accuracy: 0.5093
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7282 - accuracy: 0.5193 - val_loss: 2.3674 - val_accuracy: 0.5047
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 3.6961 - accuracy: 0.4910 - val_loss: 2.2135 - val_accuracy: 0.3505
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5528 - accuracy: 0.4524 - val_loss: 2.1301 - val_accuracy: 0.3411
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5700 - accuracy: 0.4602 - val_loss: 2.0271 - val_accuracy: 0.3551
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4815 - accuracy: 0.4319 - val_loss: 1.9405 - val_accuracy: 0.5187
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3905 - accuracy: 0.4781 - val_loss: 1.8931 - val_accuracy: 0.3551
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4617 - accuracy: 0.4833 - val_loss: 1.8788 - val_accuracy: 0.5421
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1801 - accuracy: 0.5270 - val_loss: 1.8592 - val_accuracy: 0.5327
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 3.1413 - accuracy: 0.5116 - val_loss: 1.8418 - val_accuracy: 0.5187
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2272 - accuracy: 0.5116 - val_loss: 1.8507 - val_accuracy: 0.5047
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2123 - accuracy: 0.4936 - val_loss: 1.8084 - val_accuracy: 0.5187
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1036 - accuracy: 0.4704 - val_loss: 1.8040 - val_accuracy: 0.5187
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 3.0845 - accuracy: 0.4987 - val_loss: 1.7592 - val_accuracy: 0.5327
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 3.0532 - accuracy: 0.5090 - val_loss: 1.7428 - val_accuracy: 0.5280
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9844 - accuracy: 0.4936 - val_loss: 1.7259 - val_accuracy: 0.5374
Epoch 26/1000
4/4 [=====] - 0s 14ms/step - loss: 2.9849 - accuracy: 0.4961 - val_loss: 1.7085 - val_accuracy: 0.5327
Epoch 27/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8651 - accuracy: 0.4987 - val_loss: 1.6900 - val_accuracy: 0.5374
Epoch 28/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7574 - accuracy: 0.4936 - val_loss: 1.6779 - val_accuracy: 0.5374
Epoch 29/1000

```
4/4 [=====] - 0s 15ms/step - loss: 2.8974 - accuracy: 0.5193 - val_loss: 1.6786 - val_accuracy: 0.5327
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7010 - accuracy: 0.5141 - val_loss: 1.6602 - val_accuracy: 0.5327
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5465 - accuracy: 0.5219 - val_loss: 1.6402 - val_accuracy: 0.5234
Epoch 32/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5946 - accuracy: 0.4987 - val_loss: 1.6228 - val_accuracy: 0.5234
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4707 - accuracy: 0.4936 - val_loss: 1.6117 - val_accuracy: 0.5280
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4819 - accuracy: 0.4833 - val_loss: 1.6027 - val_accuracy: 0.5234
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4114 - accuracy: 0.5219 - val_loss: 1.5900 - val_accuracy: 0.5421
Epoch 36/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3841 - accuracy: 0.4730 - val_loss: 1.6560 - val_accuracy: 0.5374
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1119 - accuracy: 0.5244 - val_loss: 1.6220 - val_accuracy: 0.5374
Epoch 38/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1136 - accuracy: 0.5090 - val_loss: 1.6123 - val_accuracy: 0.5374
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1033 - accuracy: 0.5090 - val_loss: 1.6294 - val_accuracy: 0.5374
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0406 - accuracy: 0.5167 - val_loss: 1.6142 - val_accuracy: 0.5374
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9844 - accuracy: 0.5244 - val_loss: 1.6046 - val_accuracy: 0.5280
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0754 - accuracy: 0.5219 - val_loss: 1.5917 - val_accuracy: 0.5280
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0524 - accuracy: 0.5270 - val_loss: 1.6135 - val_accuracy: 0.5140
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9561 - accuracy: 0.5193 - val_loss: 1.6019 - val_accuracy: 0.5047
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8760 - accuracy: 0.5424 - val_loss: 1.5903 - val_accuracy: 0.5187
Epoch 46/1000
4/4 [=====] - 0s 11ms/step - loss: 1.9358 - accuracy: 0.5270 - val_loss: 1.5811 - val_accuracy: 0.5093
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8810 - accuracy: 0.5270 - val_loss: 1.5691 - val_accuracy: 0.5140
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7966 - accuracy: 0.5244 - val_loss: 1.5607 - val_accuracy: 0.5234
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8611 - accuracy: 0.4987 - val_loss: 1.5584 - val_accuracy: 0.5187
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7666 - accuracy: 0.4884 - val_loss: 1.5751 - val_accuracy: 0.5280
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7721 - accuracy: 0.4344 - val_loss: 1.5706 - val_accuracy: 0.3692
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7885 - accuracy: 0.4267 - val_loss: 1.5042 - val_accuracy: 0.3738
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7024 - accuracy: 0.4319 - val_loss: 1.4645 - val_accuracy: 0.3645
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7098 - accuracy: 0.4190 - val_loss: 1.4627 - val_accuracy: 0.3645
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6186 - accuracy: 0.4216 - val_loss: 1.5090 - val_accuracy: 0.3692
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6618 - accuracy: 0.4242 - val_loss: 1.3889 - val_accuracy: 0.3645
Epoch 57/1000
4/4 [=====] - 0s 19ms/step - loss: 1.5540 - accuracy: 0.4319 - val_loss: 1.3927 - val_accuracy: 0.3645
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5795 - accuracy: 0.4190 - val_loss: 1.3873 - val_accuracy: 0.3645
```

Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5302 - accuracy: 0.4267 - val_loss: 1.3802 - val_accuracy: 0.3645
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5380 - accuracy: 0.4319 - val_loss: 1.4040 - val_accuracy: 0.3645
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5703 - accuracy: 0.4344 - val_loss: 1.3710 - val_accuracy: 0.3692
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6241 - accuracy: 0.4344 - val_loss: 1.3998 - val_accuracy: 0.3692
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4979 - accuracy: 0.4396 - val_loss: 1.3950 - val_accuracy: 0.3645
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5039 - accuracy: 0.4216 - val_loss: 1.3935 - val_accuracy: 0.3692
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5388 - accuracy: 0.4422 - val_loss: 1.3911 - val_accuracy: 0.3692
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6312 - accuracy: 0.4370 - val_loss: 1.3902 - val_accuracy: 0.3692
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5733 - accuracy: 0.4216 - val_loss: 1.3244 - val_accuracy: 0.3738
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5002 - accuracy: 0.4242 - val_loss: 1.3232 - val_accuracy: 0.3692
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5300 - accuracy: 0.4370 - val_loss: 1.3177 - val_accuracy: 0.3692
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4242 - accuracy: 0.4319 - val_loss: 1.3136 - val_accuracy: 0.3738
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5341 - accuracy: 0.4370 - val_loss: 1.3091 - val_accuracy: 0.3692
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3759 - accuracy: 0.4293 - val_loss: 1.3100 - val_accuracy: 0.3692
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4349 - accuracy: 0.4422 - val_loss: 1.3081 - val_accuracy: 0.3692
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3672 - accuracy: 0.4293 - val_loss: 1.3095 - val_accuracy: 0.3692
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4326 - accuracy: 0.4293 - val_loss: 1.3357 - val_accuracy: 0.3692
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3086 - accuracy: 0.4139 - val_loss: 1.3351 - val_accuracy: 0.3645
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4067 - accuracy: 0.4293 - val_loss: 1.3070 - val_accuracy: 0.3645
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3249 - accuracy: 0.4344 - val_loss: 1.3021 - val_accuracy: 0.3645
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3104 - accuracy: 0.4396 - val_loss: 1.3023 - val_accuracy: 0.3645
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3927 - accuracy: 0.4422 - val_loss: 1.2992 - val_accuracy: 0.3645
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3188 - accuracy: 0.4242 - val_loss: 1.2985 - val_accuracy: 0.3645
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4240 - accuracy: 0.4370 - val_loss: 1.3203 - val_accuracy: 0.3645
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2605 - accuracy: 0.4267 - val_loss: 1.3174 - val_accuracy: 0.3645
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2752 - accuracy: 0.4344 - val_loss: 1.3145 - val_accuracy: 0.3645
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2474 - accuracy: 0.4370 - val_loss: 1.3673 - val_accuracy: 0.3645
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3395 - accuracy: 0.4396 - val_loss: 1.3316 - val_accuracy: 0.3692
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3287 - accuracy: 0.4396 - val_loss: 1.3052 - val_accuracy: 0.3645
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3210 - accuracy: 0.4267 - val_loss: 1.3214 - val_accuracy: 0.3645

```
accuracy: 0.3645
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3113 - accuracy: 0.4293 - val_loss: 1.3469 - val_accuracy: 0.3645
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2586 - accuracy: 0.4216 - val_loss: 1.3148 - val_accuracy: 0.3645
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2203 - accuracy: 0.4473 - val_loss: 1.2565 - val_accuracy: 0.3692
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2268 - accuracy: 0.4319 - val_loss: 1.2282 - val_accuracy: 0.3692
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2617 - accuracy: 0.4319 - val_loss: 1.1950 - val_accuracy: 0.3692
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1489 - accuracy: 0.4396 - val_loss: 1.2238 - val_accuracy: 0.3645
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1790 - accuracy: 0.4370 - val_loss: 1.2196 - val_accuracy: 0.3645
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1253 - accuracy: 0.4344 - val_loss: 1.1877 - val_accuracy: 0.3598
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1505 - accuracy: 0.4062 - val_loss: 1.1810 - val_accuracy: 0.3645
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0804 - accuracy: 0.4242 - val_loss: 1.1980 - val_accuracy: 0.3598
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1536 - accuracy: 0.4293 - val_loss: 1.1955 - val_accuracy: 0.3598
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0209 - accuracy: 0.4139 - val_loss: 1.1897 - val_accuracy: 0.3598
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0497 - accuracy: 0.4165 - val_loss: 1.1233 - val_accuracy: 0.3645
Epoch 102/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0885 - accuracy: 0.4139 - val_loss: 1.0894 - val_accuracy: 0.3598
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1339 - accuracy: 0.4139 - val_loss: 1.0807 - val_accuracy: 0.3598
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0306 - accuracy: 0.4422 - val_loss: 1.0720 - val_accuracy: 0.3598
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9424 - accuracy: 0.3907 - val_loss: 1.0678 - val_accuracy: 0.3692
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9627 - accuracy: 0.4293 - val_loss: 1.0631 - val_accuracy: 0.3692
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9965 - accuracy: 0.4242 - val_loss: 1.0585 - val_accuracy: 0.3598
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8551 - accuracy: 0.4319 - val_loss: 1.0559 - val_accuracy: 0.3645
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9138 - accuracy: 0.4267 - val_loss: 1.0261 - val_accuracy: 0.3645
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0304 - accuracy: 0.4267 - val_loss: 1.0313 - val_accuracy: 0.3692
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9275 - accuracy: 0.4216 - val_loss: 1.0467 - val_accuracy: 0.3598
Epoch 112/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9057 - accuracy: 0.4319 - val_loss: 0.9960 - val_accuracy: 0.3551
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9155 - accuracy: 0.4267 - val_loss: 0.9877 - val_accuracy: 0.3551
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8600 - accuracy: 0.4267 - val_loss: 0.9825 - val_accuracy: 0.3551
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8924 - accuracy: 0.4190 - val_loss: 0.9203 - val_accuracy: 0.3551
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8254 - accuracy: 0.4139 - val_loss: 0.9162 - val_accuracy: 0.3505
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8765 - accuracy: 0.4730 - val_loss: 0.9070 - val_accuracy: 0.4299
Epoch 118/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.8780 - accuracy: 0.4936 - val_loss: 0.8998 - val_accuracy: 0.4346
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7813 - accuracy: 0.4859 - val_loss: 0.8912 - val_accuracy: 0.4252
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9860 - accuracy: 0.5013 - val_loss: 0.8621 - val_accuracy: 0.4252
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8251 - accuracy: 0.5141 - val_loss: 0.8598 - val_accuracy: 0.4299
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9305 - accuracy: 0.4730 - val_loss: 0.8785 - val_accuracy: 0.4206
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8240 - accuracy: 0.4859 - val_loss: 0.8788 - val_accuracy: 0.4252
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8395 - accuracy: 0.4884 - val_loss: 0.8530 - val_accuracy: 0.4346
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8724 - accuracy: 0.5064 - val_loss: 0.7873 - val_accuracy: 0.4393
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8159 - accuracy: 0.4781 - val_loss: 0.7753 - val_accuracy: 0.4346
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7615 - accuracy: 0.5013 - val_loss: 0.7693 - val_accuracy: 0.4393
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8580 - accuracy: 0.5064 - val_loss: 0.7554 - val_accuracy: 0.4393
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9040 - accuracy: 0.4781 - val_loss: 0.7451 - val_accuracy: 0.4393
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7962 - accuracy: 0.4936 - val_loss: 0.7451 - val_accuracy: 0.4393
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7909 - accuracy: 0.4653 - val_loss: 0.7420 - val_accuracy: 0.4346
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7649 - accuracy: 0.4730 - val_loss: 0.7375 - val_accuracy: 0.4346
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7769 - accuracy: 0.4859 - val_loss: 0.7322 - val_accuracy: 0.4439
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7382 - accuracy: 0.4653 - val_loss: 0.7247 - val_accuracy: 0.4346
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7721 - accuracy: 0.4679 - val_loss: 0.7276 - val_accuracy: 0.4346
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7599 - accuracy: 0.4936 - val_loss: 0.7235 - val_accuracy: 0.4346
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8005 - accuracy: 0.4961 - val_loss: 0.7182 - val_accuracy: 0.4299
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6983 - accuracy: 0.4602 - val_loss: 0.7062 - val_accuracy: 0.4486
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7112 - accuracy: 0.5064 - val_loss: 0.7038 - val_accuracy: 0.4486
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6840 - accuracy: 0.5193 - val_loss: 0.6987 - val_accuracy: 0.4439
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7285 - accuracy: 0.4781 - val_loss: 0.6974 - val_accuracy: 0.4533
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7026 - accuracy: 0.4679 - val_loss: 0.6909 - val_accuracy: 0.4533
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6714 - accuracy: 0.5064 - val_loss: 0.7124 - val_accuracy: 0.4533
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7043 - accuracy: 0.4859 - val_loss: 0.6918 - val_accuracy: 0.4439
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6747 - accuracy: 0.4679 - val_loss: 0.7042 - val_accuracy: 0.4393
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6542 - accuracy: 0.4833 - val_loss: 0.7001 - val_accuracy: 0.4346
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6787 - accuracy: 0.4679 - val_loss: 0.6667 - val_accuracy: 0.4252
```

```

Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6226 - accuracy: 0.4627 - val_loss: 0.6651 - val_accuracy: 0.4252
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7002 - accuracy: 0.4833 - val_loss: 0.6649 - val_accuracy: 0.4252
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6588 - accuracy: 0.4602 - val_loss: 0.6646 - val_accuracy: 0.4252
Epoch 151/1000
1/4 [====>.....] - ETA: 0s - loss: 0.6285 - accuracy: 0.4531Restoring model weights from th
e end of the best epoch: 1.
4/4 [=====] - 0s 15ms/step - loss: 0.6238 - accuracy: 0.4422 - val_loss: 0.6623 - val_accuracy: 0.4299
Epoch 151: early stopping
2/2 [=====] - 0s 3ms/step - loss: 2.4512 - accuracy: 0.5349
[CV] END .....Dense1=50, Dense2=10; total time= 8.3s
Model: "sequential_43"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_172 (Dense)	(None, 50)	350
batch_normalization_129 (BatchNormalization)	(None, 50)	200
activation_129 (Activation)	(None, 50)	0
dense_173 (Dense)	(None, 10)	510
batch_normalization_130 (BatchNormalization)	(None, 10)	40
activation_130 (Activation)	(None, 10)	0
dense_174 (Dense)	(None, 10)	110
batch_normalization_131 (BatchNormalization)	(None, 10)	40
activation_131 (Activation)	(None, 10)	0
dense_175 (Dense)	(None, 2)	22
<hr/>		

Total params: 1,272
Trainable params: 1,132
Non-trainable params: 140

```

Epoch 1/1000
4/4 [=====] - 2s 58ms/step - loss: 6.3229 - accuracy: 0.4627 - val_loss: 5.1085 - val_accuracy: 0.6121
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 4.6436 - accuracy: 0.5398 - val_loss: 4.1152 - val_accuracy: 0.6121
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 4.5126 - accuracy: 0.5424 - val_loss: 3.3459 - val_accuracy: 0.6121
Epoch 4/1000
4/4 [=====] - 0s 15ms/step - loss: 4.1576 - accuracy: 0.5758 - val_loss: 3.0354 - val_accuracy: 0.6075
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 4.2303 - accuracy: 0.5450 - val_loss: 3.0517 - val_accuracy: 0.6075
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 3.8688 - accuracy: 0.5887 - val_loss: 2.7952 - val_accuracy: 0.6028
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 4.0039 - accuracy: 0.5758 - val_loss: 2.6548 - val_accuracy: 0.5981
Epoch 8/1000
4/4 [=====] - 0s 15ms/step - loss: 3.8021 - accuracy: 0.5861 - val_loss: 2.5875 - val_accuracy: 0.6028
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6984 - accuracy: 0.5938 - val_loss: 2.4507 - val_accuracy: 0.5981
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8285 - accuracy: 0.5835 - val_loss: 2.3705 - val_accuracy: 0.5000
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7634 - accuracy: 0.5476 - val_loss: 2.3603 - val_accuracy: 0.4533
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6430 - accuracy: 0.5347 - val_loss: 2.3187 - val_accuracy: 0.4533
Epoch 13/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5905 - accuracy: 0.5270 - val_loss: 2.2276 - val_accuracy: 0.4159
Epoch 14/1000

```

```
4/4 [=====] - 0s 12ms/step - loss: 3.5745 - accuracy: 0.5476 - val_loss: 2.1702 - val_accuracy: 0.4159
Epoch 15/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5085 - accuracy: 0.5270 - val_loss: 2.1624 - val_accuracy: 0.3925
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 3.4466 - accuracy: 0.5347 - val_loss: 2.0397 - val_accuracy: 0.3925
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 3.2715 - accuracy: 0.5373 - val_loss: 2.0765 - val_accuracy: 0.4159
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3751 - accuracy: 0.5141 - val_loss: 2.0227 - val_accuracy: 0.4252
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3408 - accuracy: 0.5373 - val_loss: 1.9740 - val_accuracy: 0.4299
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3936 - accuracy: 0.5321 - val_loss: 1.9612 - val_accuracy: 0.4393
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4473 - accuracy: 0.5321 - val_loss: 1.9249 - val_accuracy: 0.4579
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 3.2451 - accuracy: 0.5244 - val_loss: 1.9898 - val_accuracy: 0.4579
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 3.2237 - accuracy: 0.5296 - val_loss: 1.9406 - val_accuracy: 0.4579
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0812 - accuracy: 0.5244 - val_loss: 1.8943 - val_accuracy: 0.4579
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0113 - accuracy: 0.5244 - val_loss: 1.8707 - val_accuracy: 0.4720
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9998 - accuracy: 0.5090 - val_loss: 1.8666 - val_accuracy: 0.4720
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9410 - accuracy: 0.5141 - val_loss: 1.8634 - val_accuracy: 0.4720
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9988 - accuracy: 0.5116 - val_loss: 1.7975 - val_accuracy: 0.4673
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9404 - accuracy: 0.5064 - val_loss: 1.7747 - val_accuracy: 0.4673
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8048 - accuracy: 0.4961 - val_loss: 1.7843 - val_accuracy: 0.4720
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5713 - accuracy: 0.4859 - val_loss: 1.7644 - val_accuracy: 0.4720
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7253 - accuracy: 0.5193 - val_loss: 1.7552 - val_accuracy: 0.4766
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6246 - accuracy: 0.5167 - val_loss: 1.7371 - val_accuracy: 0.4766
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6984 - accuracy: 0.4961 - val_loss: 1.7241 - val_accuracy: 0.4766
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6063 - accuracy: 0.5167 - val_loss: 1.7075 - val_accuracy: 0.4720
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6462 - accuracy: 0.5398 - val_loss: 1.6973 - val_accuracy: 0.4720
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6078 - accuracy: 0.5064 - val_loss: 1.7099 - val_accuracy: 0.4720
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6007 - accuracy: 0.5193 - val_loss: 1.6943 - val_accuracy: 0.4720
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5445 - accuracy: 0.5270 - val_loss: 1.6967 - val_accuracy: 0.4766
Epoch 40/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5929 - accuracy: 0.5527 - val_loss: 1.6894 - val_accuracy: 0.4813
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5486 - accuracy: 0.5656 - val_loss: 1.6697 - val_accuracy: 0.4813
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4691 - accuracy: 0.5733 - val_loss: 1.6564 - val_accuracy: 0.4813
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4786 - accuracy: 0.5219 - val_loss: 1.6392 - val_accuracy: 0.4813
```

Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4440 - accuracy: 0.5527 - val_loss: 1.6272 - val_accuracy: 0.4813
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4550 - accuracy: 0.5656 - val_loss: 1.6063 - val_accuracy: 0.4766
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3163 - accuracy: 0.5219 - val_loss: 1.5933 - val_accuracy: 0.4813
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4825 - accuracy: 0.5193 - val_loss: 1.5866 - val_accuracy: 0.4860
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3958 - accuracy: 0.5244 - val_loss: 1.5866 - val_accuracy: 0.4860
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3300 - accuracy: 0.5270 - val_loss: 1.5778 - val_accuracy: 0.4813
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3741 - accuracy: 0.5193 - val_loss: 1.5719 - val_accuracy: 0.4860
Epoch 51/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2860 - accuracy: 0.5219 - val_loss: 1.5613 - val_accuracy: 0.4813
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4493 - accuracy: 0.5141 - val_loss: 1.5559 - val_accuracy: 0.4766
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2537 - accuracy: 0.4884 - val_loss: 1.5445 - val_accuracy: 0.4673
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2531 - accuracy: 0.5347 - val_loss: 1.5430 - val_accuracy: 0.4766
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3112 - accuracy: 0.4936 - val_loss: 1.5378 - val_accuracy: 0.4673
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3480 - accuracy: 0.5141 - val_loss: 1.5264 - val_accuracy: 0.4626
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2904 - accuracy: 0.4987 - val_loss: 1.5233 - val_accuracy: 0.4720
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2760 - accuracy: 0.5193 - val_loss: 1.5438 - val_accuracy: 0.4720
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2177 - accuracy: 0.5347 - val_loss: 1.5329 - val_accuracy: 0.4673
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2101 - accuracy: 0.5141 - val_loss: 1.5320 - val_accuracy: 0.4766
Epoch 61/1000
4/4 [=====] - 0s 11ms/step - loss: 2.2030 - accuracy: 0.5193 - val_loss: 1.5276 - val_accuracy: 0.4720
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2215 - accuracy: 0.5398 - val_loss: 1.5235 - val_accuracy: 0.4766
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2505 - accuracy: 0.5424 - val_loss: 1.5154 - val_accuracy: 0.4720
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0909 - accuracy: 0.5116 - val_loss: 1.5380 - val_accuracy: 0.4720
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1616 - accuracy: 0.5321 - val_loss: 1.5296 - val_accuracy: 0.4720
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1578 - accuracy: 0.5193 - val_loss: 1.5241 - val_accuracy: 0.4720
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1882 - accuracy: 0.5398 - val_loss: 1.4993 - val_accuracy: 0.4626
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2163 - accuracy: 0.5296 - val_loss: 1.4805 - val_accuracy: 0.4673
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0050 - accuracy: 0.5527 - val_loss: 1.5076 - val_accuracy: 0.4720
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0874 - accuracy: 0.5141 - val_loss: 1.5026 - val_accuracy: 0.4673
Epoch 71/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1628 - accuracy: 0.5347 - val_loss: 1.4989 - val_accuracy: 0.4673
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0171 - accuracy: 0.5193 - val_loss: 1.4882 - val_accuracy: 0.4720
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1204 - accuracy: 0.5604 - val_loss: 1.4815 - val_accuracy: 0.4720

```
accuracy: 0.4720
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1012 - accuracy: 0.5681 - val_loss: 1.5016 - val_
accuracy: 0.4720
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0163 - accuracy: 0.5604 - val_loss: 1.4968 - val_
accuracy: 0.4766
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9718 - accuracy: 0.5501 - val_loss: 1.4895 - val_
accuracy: 0.4720
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9620 - accuracy: 0.5424 - val_loss: 1.4881 - val_
accuracy: 0.4720
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9870 - accuracy: 0.5656 - val_loss: 1.4685 - val_
accuracy: 0.4673
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8515 - accuracy: 0.5527 - val_loss: 1.4587 - val_
accuracy: 0.4673
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8837 - accuracy: 0.5656 - val_loss: 1.4487 - val_
accuracy: 0.4626
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9255 - accuracy: 0.5244 - val_loss: 1.4452 - val_
accuracy: 0.4673
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8454 - accuracy: 0.5604 - val_loss: 1.4844 - val_
accuracy: 0.4486
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8709 - accuracy: 0.5398 - val_loss: 1.4489 - val_
accuracy: 0.4486
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9316 - accuracy: 0.5039 - val_loss: 1.4491 - val_
accuracy: 0.4626
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8640 - accuracy: 0.5476 - val_loss: 1.4677 - val_
accuracy: 0.4673
Epoch 86/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8469 - accuracy: 0.5141 - val_loss: 1.4581 - val_
accuracy: 0.4673
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8091 - accuracy: 0.5373 - val_loss: 1.4782 - val_
accuracy: 0.4579
Epoch 88/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7690 - accuracy: 0.5450 - val_loss: 1.4130 - val_
accuracy: 0.4813
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7724 - accuracy: 0.5476 - val_loss: 1.4438 - val_
accuracy: 0.4393
Epoch 90/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8507 - accuracy: 0.4781 - val_loss: 1.3745 - val_
accuracy: 0.4953
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7094 - accuracy: 0.4961 - val_loss: 1.3683 - val_
accuracy: 0.4907
Epoch 92/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7025 - accuracy: 0.5373 - val_loss: 1.3602 - val_
accuracy: 0.4766
Epoch 93/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6890 - accuracy: 0.4987 - val_loss: 1.4116 - val_
accuracy: 0.4907
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6516 - accuracy: 0.5296 - val_loss: 1.3726 - val_
accuracy: 0.4673
Epoch 95/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6656 - accuracy: 0.5450 - val_loss: 1.3417 - val_
accuracy: 0.4626
Epoch 96/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7516 - accuracy: 0.5219 - val_loss: 1.3369 - val_
accuracy: 0.4626
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6553 - accuracy: 0.5553 - val_loss: 1.3336 - val_
accuracy: 0.4720
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6691 - accuracy: 0.5141 - val_loss: 1.3312 - val_
accuracy: 0.4860
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6822 - accuracy: 0.5296 - val_loss: 1.3240 - val_
accuracy: 0.4953
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7445 - accuracy: 0.5476 - val_loss: 1.3386 - val_
accuracy: 0.5047
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6190 - accuracy: 0.4987 - val_loss: 1.3571 - val_
accuracy: 0.4486
Epoch 102/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5400 - accuracy: 0.5039 - val_loss: 1.3793 - val_
accuracy: 0.4486
Epoch 103/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 1.6397 - accuracy: 0.5090 - val_loss: 1.3456 - val_accuracy: 0.4533
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5249 - accuracy: 0.5167 - val_loss: 1.2713 - val_accuracy: 0.4579
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5811 - accuracy: 0.5167 - val_loss: 1.3273 - val_accuracy: 0.4439
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6546 - accuracy: 0.5039 - val_loss: 1.3258 - val_accuracy: 0.4393
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5917 - accuracy: 0.5013 - val_loss: 1.2968 - val_accuracy: 0.4439
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5793 - accuracy: 0.4987 - val_loss: 1.2780 - val_accuracy: 0.4439
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5238 - accuracy: 0.4961 - val_loss: 1.2723 - val_accuracy: 0.4439
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4581 - accuracy: 0.5064 - val_loss: 1.2672 - val_accuracy: 0.4393
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4499 - accuracy: 0.5064 - val_loss: 1.2465 - val_accuracy: 0.4533
Epoch 112/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3430 - accuracy: 0.4910 - val_loss: 1.2456 - val_accuracy: 0.4439
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4127 - accuracy: 0.4859 - val_loss: 1.2387 - val_accuracy: 0.4439
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4839 - accuracy: 0.4730 - val_loss: 1.2351 - val_accuracy: 0.4486
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4438 - accuracy: 0.4704 - val_loss: 1.2343 - val_accuracy: 0.4393
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3502 - accuracy: 0.5013 - val_loss: 1.2316 - val_accuracy: 0.4486
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4112 - accuracy: 0.4756 - val_loss: 1.2270 - val_accuracy: 0.4673
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4356 - accuracy: 0.4653 - val_loss: 1.2234 - val_accuracy: 0.4720
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3645 - accuracy: 0.5116 - val_loss: 1.1993 - val_accuracy: 0.4626
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3229 - accuracy: 0.4910 - val_loss: 1.2170 - val_accuracy: 0.4626
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4918 - accuracy: 0.4704 - val_loss: 1.1848 - val_accuracy: 0.4720
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3533 - accuracy: 0.4679 - val_loss: 1.2099 - val_accuracy: 0.4720
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2747 - accuracy: 0.5013 - val_loss: 1.1793 - val_accuracy: 0.4673
Epoch 124/1000
4/4 [=====] - 0s 17ms/step - loss: 1.2849 - accuracy: 0.4910 - val_loss: 1.1785 - val_accuracy: 0.4766
Epoch 125/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3385 - accuracy: 0.5244 - val_loss: 1.1789 - val_accuracy: 0.4766
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2911 - accuracy: 0.4807 - val_loss: 1.1741 - val_accuracy: 0.4673
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1474 - accuracy: 0.4781 - val_loss: 1.1696 - val_accuracy: 0.4673
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2002 - accuracy: 0.4730 - val_loss: 1.1669 - val_accuracy: 0.4626
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3354 - accuracy: 0.5193 - val_loss: 1.1935 - val_accuracy: 0.4533
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2300 - accuracy: 0.5141 - val_loss: 1.1920 - val_accuracy: 0.4486
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1490 - accuracy: 0.5219 - val_loss: 1.1847 - val_accuracy: 0.4626
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1885 - accuracy: 0.4910 - val_loss: 1.1836 - val_accuracy: 0.4673
```

Epoch 133/1000
 4/4 [=====] - 0s 13ms/step - loss: 1.2217 - accuracy: 0.5090 - val_loss: 1.2078 - val_accuracy: 0.4720
 Epoch 134/1000
 4/4 [=====] - 0s 13ms/step - loss: 1.1516 - accuracy: 0.5039 - val_loss: 1.2068 - val_accuracy: 0.4673
 Epoch 135/1000
 4/4 [=====] - 0s 13ms/step - loss: 1.0641 - accuracy: 0.5064 - val_loss: 1.2092 - val_accuracy: 0.4626
 Epoch 136/1000
 4/4 [=====] - 0s 12ms/step - loss: 1.1764 - accuracy: 0.5373 - val_loss: 1.2049 - val_accuracy: 0.4813
 Epoch 137/1000
 4/4 [=====] - 0s 12ms/step - loss: 1.1544 - accuracy: 0.5193 - val_loss: 1.2052 - val_accuracy: 0.4766
 Epoch 138/1000
 4/4 [=====] - 0s 12ms/step - loss: 1.1749 - accuracy: 0.5296 - val_loss: 1.2076 - val_accuracy: 0.4720
 Epoch 139/1000
 4/4 [=====] - 0s 12ms/step - loss: 1.1589 - accuracy: 0.5193 - val_loss: 1.2385 - val_accuracy: 0.4720
 Epoch 140/1000
 4/4 [=====] - 0s 12ms/step - loss: 1.1458 - accuracy: 0.5039 - val_loss: 1.2385 - val_accuracy: 0.4720
 Epoch 141/1000
 4/4 [=====] - 0s 13ms/step - loss: 1.1214 - accuracy: 0.5193 - val_loss: 1.1779 - val_accuracy: 0.4720
 Epoch 142/1000
 4/4 [=====] - 0s 12ms/step - loss: 1.1274 - accuracy: 0.5116 - val_loss: 1.2707 - val_accuracy: 0.4626
 Epoch 143/1000
 4/4 [=====] - 0s 12ms/step - loss: 1.1736 - accuracy: 0.5296 - val_loss: 1.2424 - val_accuracy: 0.4720
 Epoch 144/1000
 4/4 [=====] - 0s 12ms/step - loss: 1.1273 - accuracy: 0.5321 - val_loss: 1.1971 - val_accuracy: 0.4720
 Epoch 145/1000
 4/4 [=====] - 0s 12ms/step - loss: 1.1490 - accuracy: 0.5450 - val_loss: 1.2190 - val_accuracy: 0.4579
 Epoch 146/1000
 4/4 [=====] - 0s 12ms/step - loss: 1.1459 - accuracy: 0.5116 - val_loss: 1.2396 - val_accuracy: 0.4673
 Epoch 147/1000
 4/4 [=====] - 0s 12ms/step - loss: 1.2484 - accuracy: 0.5219 - val_loss: 1.2408 - val_accuracy: 0.4907
 Epoch 148/1000
 4/4 [=====] - 0s 12ms/step - loss: 1.1114 - accuracy: 0.5193 - val_loss: 1.2104 - val_accuracy: 0.4766
 Epoch 149/1000
 4/4 [=====] - 0s 11ms/step - loss: 1.0654 - accuracy: 0.5244 - val_loss: 1.2206 - val_accuracy: 0.4673
 Epoch 150/1000
 4/4 [=====] - 0s 12ms/step - loss: 1.1534 - accuracy: 0.5321 - val_loss: 1.2246 - val_accuracy: 0.4766
 Epoch 151/1000
 1/4 [====>.....] - ETA: 0s - loss: 1.0406 - accuracy: 0.5312 Restoring model weights from the end of the best epoch: 1.
 4/4 [=====] - 0s 14ms/step - loss: 1.0970 - accuracy: 0.5193 - val_loss: 1.2461 - val_accuracy: 0.4907
 Epoch 151: early stopping
 2/2 [=====] - 0s 4ms/step - loss: 3.8500 - accuracy: 0.5581
 [CV] ENDDense1=50, Dense2=10; total time= 8.8s
 Model: "sequential_44"

Layer (type)	Output Shape	Param #
dense_176 (Dense)	(None, 50)	350
batch_normalization_132 (BatchNormalization)	(None, 50)	200
activation_132 (Activation)	(None, 50)	0
dense_177 (Dense)	(None, 10)	510
batch_normalization_133 (BatchNormalization)	(None, 10)	40
activation_133 (Activation)	(None, 10)	0
dense_178 (Dense)	(None, 10)	110
batch_normalization_134 (BatchNormalization)	(None, 10)	40
activation_134 (Activation)	(None, 10)	0
dense_179 (Dense)	(None, 2)	22

```
=====
Total params: 1,272
Trainable params: 1,132
Non-trainable params: 140

Epoch 1/1000
4/4 [=====] - 1s 58ms/step - loss: 5.3428 - accuracy: 0.4319 - val_loss: 8.0053 - val_accuracy: 0.4112
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 4.8585 - accuracy: 0.4267 - val_loss: 6.9268 - val_accuracy: 0.4252
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 4.8664 - accuracy: 0.4344 - val_loss: 6.3087 - val_accuracy: 0.4112
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 4.7813 - accuracy: 0.4396 - val_loss: 5.7072 - val_accuracy: 0.4299
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 4.0928 - accuracy: 0.4447 - val_loss: 4.6476 - val_accuracy: 0.4299
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 4.0687 - accuracy: 0.4396 - val_loss: 3.7756 - val_accuracy: 0.4299
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 4.0630 - accuracy: 0.4447 - val_loss: 3.5271 - val_accuracy: 0.4206
Epoch 8/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8391 - accuracy: 0.4422 - val_loss: 3.3031 - val_accuracy: 0.4206
Epoch 9/1000
4/4 [=====] - 0s 12ms/step - loss: 4.0168 - accuracy: 0.4499 - val_loss: 3.1677 - val_accuracy: 0.4206
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8403 - accuracy: 0.4499 - val_loss: 3.0370 - val_accuracy: 0.4206
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7852 - accuracy: 0.4422 - val_loss: 2.8985 - val_accuracy: 0.4159
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6859 - accuracy: 0.4576 - val_loss: 2.7558 - val_accuracy: 0.4252
Epoch 13/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5415 - accuracy: 0.4627 - val_loss: 2.6644 - val_accuracy: 0.4252
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5596 - accuracy: 0.4627 - val_loss: 2.6115 - val_accuracy: 0.4346
Epoch 15/1000
4/4 [=====] - 0s 12ms/step - loss: 3.6035 - accuracy: 0.4807 - val_loss: 2.5591 - val_accuracy: 0.4346
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5957 - accuracy: 0.4704 - val_loss: 2.4687 - val_accuracy: 0.4346
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4515 - accuracy: 0.4730 - val_loss: 2.3870 - val_accuracy: 0.4346
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 3.4552 - accuracy: 0.4756 - val_loss: 2.3507 - val_accuracy: 0.4346
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4809 - accuracy: 0.4679 - val_loss: 2.3001 - val_accuracy: 0.4252
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4405 - accuracy: 0.4653 - val_loss: 2.2341 - val_accuracy: 0.4299
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3333 - accuracy: 0.4807 - val_loss: 2.1512 - val_accuracy: 0.4346
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4178 - accuracy: 0.4910 - val_loss: 2.1262 - val_accuracy: 0.4299
Epoch 23/1000
4/4 [=====] - 0s 14ms/step - loss: 3.3142 - accuracy: 0.4781 - val_loss: 2.1454 - val_accuracy: 0.4439
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2112 - accuracy: 0.4730 - val_loss: 2.0846 - val_accuracy: 0.4346
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 3.1299 - accuracy: 0.4833 - val_loss: 2.0626 - val_accuracy: 0.4252
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1248 - accuracy: 0.4961 - val_loss: 2.0289 - val_accuracy: 0.4299
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0941 - accuracy: 0.4910 - val_loss: 2.0096 - val_accuracy: 0.4299
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9757 - accuracy: 0.4833 - val_loss: 1.9935 - val_accuracy: 0.4393
```

Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8895 - accuracy: 0.4859 - val_loss: 1.9945 - val_accuracy: 0.4393
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9211 - accuracy: 0.4936 - val_loss: 1.9528 - val_accuracy: 0.4393
Epoch 31/1000
4/4 [=====] - 0s 11ms/step - loss: 2.8730 - accuracy: 0.4961 - val_loss: 1.9108 - val_accuracy: 0.4393
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9315 - accuracy: 0.5013 - val_loss: 1.8794 - val_accuracy: 0.4299
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7608 - accuracy: 0.4910 - val_loss: 1.8565 - val_accuracy: 0.4299
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6944 - accuracy: 0.4910 - val_loss: 1.8339 - val_accuracy: 0.4252
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7194 - accuracy: 0.4807 - val_loss: 1.8158 - val_accuracy: 0.4206
Epoch 36/1000
4/4 [=====] - 0s 11ms/step - loss: 2.7061 - accuracy: 0.4807 - val_loss: 1.8019 - val_accuracy: 0.4206
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5732 - accuracy: 0.4884 - val_loss: 1.7796 - val_accuracy: 0.4206
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6453 - accuracy: 0.4781 - val_loss: 1.7593 - val_accuracy: 0.4206
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4909 - accuracy: 0.5064 - val_loss: 1.7099 - val_accuracy: 0.4112
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4296 - accuracy: 0.4704 - val_loss: 1.7043 - val_accuracy: 0.4252
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4024 - accuracy: 0.4859 - val_loss: 1.6961 - val_accuracy: 0.4206
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2914 - accuracy: 0.4910 - val_loss: 1.6928 - val_accuracy: 0.4159
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2273 - accuracy: 0.4756 - val_loss: 1.6894 - val_accuracy: 0.4206
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2505 - accuracy: 0.4910 - val_loss: 1.6843 - val_accuracy: 0.4112
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2553 - accuracy: 0.4987 - val_loss: 1.6768 - val_accuracy: 0.4159
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2125 - accuracy: 0.4884 - val_loss: 1.6688 - val_accuracy: 0.4019
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2341 - accuracy: 0.5630 - val_loss: 1.6605 - val_accuracy: 0.6168
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2234 - accuracy: 0.6041 - val_loss: 1.6489 - val_accuracy: 0.6215
Epoch 49/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2459 - accuracy: 0.5964 - val_loss: 1.6450 - val_accuracy: 0.6262
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2168 - accuracy: 0.5990 - val_loss: 1.6397 - val_accuracy: 0.6308
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1510 - accuracy: 0.5887 - val_loss: 1.6322 - val_accuracy: 0.6355
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1070 - accuracy: 0.6015 - val_loss: 1.6476 - val_accuracy: 0.6308
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1700 - accuracy: 0.5810 - val_loss: 1.6378 - val_accuracy: 0.6168
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1254 - accuracy: 0.6067 - val_loss: 1.6254 - val_accuracy: 0.6168
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1638 - accuracy: 0.6093 - val_loss: 1.6172 - val_accuracy: 0.6262
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0308 - accuracy: 0.6221 - val_loss: 1.6033 - val_accuracy: 0.6355
Epoch 57/1000
4/4 [=====] - 0s 11ms/step - loss: 2.0193 - accuracy: 0.6144 - val_loss: 1.5946 - val_accuracy: 0.6308
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0495 - accuracy: 0.6015 - val_loss: 1.6196 - val_accuracy: 0.6355

```
accuracy: 0.6308
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9785 - accuracy: 0.6170 - val_loss: 1.6116 - val_accuracy: 0.6308
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9396 - accuracy: 0.6118 - val_loss: 1.6017 - val_accuracy: 0.6262
Epoch 61/1000
4/4 [=====] - 0s 11ms/step - loss: 1.9102 - accuracy: 0.6195 - val_loss: 1.5933 - val_accuracy: 0.6262
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8772 - accuracy: 0.6272 - val_loss: 1.5841 - val_accuracy: 0.6215
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8612 - accuracy: 0.6427 - val_loss: 1.5738 - val_accuracy: 0.4019
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8704 - accuracy: 0.6015 - val_loss: 1.5672 - val_accuracy: 0.6402
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8824 - accuracy: 0.5527 - val_loss: 1.5921 - val_accuracy: 0.4019
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7670 - accuracy: 0.5244 - val_loss: 1.5886 - val_accuracy: 0.3925
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6657 - accuracy: 0.4884 - val_loss: 1.5843 - val_accuracy: 0.3925
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7492 - accuracy: 0.4987 - val_loss: 1.6126 - val_accuracy: 0.3925
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6823 - accuracy: 0.4884 - val_loss: 1.6076 - val_accuracy: 0.4019
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7030 - accuracy: 0.4807 - val_loss: 1.6035 - val_accuracy: 0.4019
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7879 - accuracy: 0.5116 - val_loss: 1.5979 - val_accuracy: 0.4019
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6691 - accuracy: 0.4859 - val_loss: 1.5918 - val_accuracy: 0.4065
Epoch 73/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6657 - accuracy: 0.4807 - val_loss: 1.5930 - val_accuracy: 0.6121
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6688 - accuracy: 0.6350 - val_loss: 1.6125 - val_accuracy: 0.3785
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7193 - accuracy: 0.5013 - val_loss: 1.5793 - val_accuracy: 0.3785
Epoch 76/1000
4/4 [=====] - 0s 11ms/step - loss: 1.5567 - accuracy: 0.4910 - val_loss: 1.5739 - val_accuracy: 0.3785
Epoch 77/1000
4/4 [=====] - 0s 11ms/step - loss: 1.5993 - accuracy: 0.4807 - val_loss: 1.5692 - val_accuracy: 0.3785
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5546 - accuracy: 0.5064 - val_loss: 1.5899 - val_accuracy: 0.3832
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4234 - accuracy: 0.5064 - val_loss: 1.5584 - val_accuracy: 0.3832
Epoch 80/1000
4/4 [=====] - 0s 11ms/step - loss: 1.5143 - accuracy: 0.4987 - val_loss: 1.5425 - val_accuracy: 0.3832
Epoch 81/1000
4/4 [=====] - 0s 11ms/step - loss: 1.4161 - accuracy: 0.5013 - val_loss: 1.5376 - val_accuracy: 0.3972
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4808 - accuracy: 0.5167 - val_loss: 1.5392 - val_accuracy: 0.3972
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4640 - accuracy: 0.5270 - val_loss: 1.5276 - val_accuracy: 0.4019
Epoch 84/1000
4/4 [=====] - 0s 11ms/step - loss: 1.4195 - accuracy: 0.4884 - val_loss: 1.5226 - val_accuracy: 0.4019
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4118 - accuracy: 0.5193 - val_loss: 1.5490 - val_accuracy: 0.4019
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3560 - accuracy: 0.5347 - val_loss: 1.6272 - val_accuracy: 0.3972
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3041 - accuracy: 0.5296 - val_loss: 1.6017 - val_accuracy: 0.4019
Epoch 88/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 1.3555 - accuracy: 0.5424 - val_loss: 1.5727 - val_accuracy: 0.3879
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2730 - accuracy: 0.5553 - val_loss: 1.5859 - val_accuracy: 0.3925
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2556 - accuracy: 0.5476 - val_loss: 1.6007 - val_accuracy: 0.4206
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2983 - accuracy: 0.5681 - val_loss: 1.5977 - val_accuracy: 0.4159
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2260 - accuracy: 0.5630 - val_loss: 1.5933 - val_accuracy: 0.4159
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2595 - accuracy: 0.5424 - val_loss: 1.5881 - val_accuracy: 0.4299
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2528 - accuracy: 0.5476 - val_loss: 1.5854 - val_accuracy: 0.4346
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2703 - accuracy: 0.5527 - val_loss: 1.5821 - val_accuracy: 0.4486
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2324 - accuracy: 0.5681 - val_loss: 1.5764 - val_accuracy: 0.4579
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1683 - accuracy: 0.5681 - val_loss: 1.5696 - val_accuracy: 0.4579
Epoch 98/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2165 - accuracy: 0.5758 - val_loss: 1.5645 - val_accuracy: 0.4626
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2559 - accuracy: 0.5887 - val_loss: 1.5530 - val_accuracy: 0.4673
Epoch 100/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2533 - accuracy: 0.5938 - val_loss: 1.5435 - val_accuracy: 0.4766
Epoch 101/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2003 - accuracy: 0.5887 - val_loss: 1.5384 - val_accuracy: 0.5000
Epoch 102/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1420 - accuracy: 0.5810 - val_loss: 1.5307 - val_accuracy: 0.5280
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1862 - accuracy: 0.6170 - val_loss: 1.5255 - val_accuracy: 0.5421
Epoch 104/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1823 - accuracy: 0.5887 - val_loss: 1.5189 - val_accuracy: 0.5561
Epoch 105/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2265 - accuracy: 0.5835 - val_loss: 1.5106 - val_accuracy: 0.5748
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1048 - accuracy: 0.5964 - val_loss: 1.5044 - val_accuracy: 0.5981
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1582 - accuracy: 0.6118 - val_loss: 1.4952 - val_accuracy: 0.6402
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1304 - accuracy: 0.6452 - val_loss: 1.4538 - val_accuracy: 0.6402
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0623 - accuracy: 0.6555 - val_loss: 1.4705 - val_accuracy: 0.6355
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0864 - accuracy: 0.6504 - val_loss: 1.4071 - val_accuracy: 0.6355
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1010 - accuracy: 0.6478 - val_loss: 1.3936 - val_accuracy: 0.6355
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1266 - accuracy: 0.6632 - val_loss: 1.4186 - val_accuracy: 0.6402
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0659 - accuracy: 0.6401 - val_loss: 1.3363 - val_accuracy: 0.6402
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0197 - accuracy: 0.6684 - val_loss: 1.2989 - val_accuracy: 0.6355
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0155 - accuracy: 0.6607 - val_loss: 1.3098 - val_accuracy: 0.6402
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0562 - accuracy: 0.6607 - val_loss: 1.2968 - val_accuracy: 0.6402
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0090 - accuracy: 0.6658 - val_loss: 1.2727 - val_accuracy: 0.6402
```

Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0138 - accuracy: 0.6581 - val_loss: 1.2616 - val_accuracy: 0.6449
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0410 - accuracy: 0.6710 - val_loss: 1.2559 - val_accuracy: 0.6495
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0297 - accuracy: 0.6684 - val_loss: 1.2482 - val_accuracy: 0.6495
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0040 - accuracy: 0.6504 - val_loss: 1.2356 - val_accuracy: 0.6542
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9866 - accuracy: 0.6684 - val_loss: 1.2157 - val_accuracy: 0.6495
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9753 - accuracy: 0.6581 - val_loss: 1.2004 - val_accuracy: 0.6589
Epoch 124/1000
4/4 [=====] - 0s 17ms/step - loss: 1.0724 - accuracy: 0.6658 - val_loss: 1.1883 - val_accuracy: 0.6636
Epoch 125/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9630 - accuracy: 0.6658 - val_loss: 1.2034 - val_accuracy: 0.6729
Epoch 126/1000
4/4 [=====] - 0s 16ms/step - loss: 0.9722 - accuracy: 0.6632 - val_loss: 1.1737 - val_accuracy: 0.6776
Epoch 127/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9804 - accuracy: 0.6401 - val_loss: 1.1246 - val_accuracy: 0.6776
Epoch 128/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9086 - accuracy: 0.6632 - val_loss: 1.1051 - val_accuracy: 0.6729
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9181 - accuracy: 0.6452 - val_loss: 1.0972 - val_accuracy: 0.6776
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9407 - accuracy: 0.6632 - val_loss: 1.0897 - val_accuracy: 0.6822
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9520 - accuracy: 0.6632 - val_loss: 1.0921 - val_accuracy: 0.6729
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9617 - accuracy: 0.6555 - val_loss: 1.0894 - val_accuracy: 0.6869
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0413 - accuracy: 0.6401 - val_loss: 1.0968 - val_accuracy: 0.6822
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8421 - accuracy: 0.6607 - val_loss: 1.0958 - val_accuracy: 0.6776
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8973 - accuracy: 0.6632 - val_loss: 1.1097 - val_accuracy: 0.6822
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8789 - accuracy: 0.6658 - val_loss: 1.0915 - val_accuracy: 0.6869
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8429 - accuracy: 0.6658 - val_loss: 1.1366 - val_accuracy: 0.6916
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8486 - accuracy: 0.6761 - val_loss: 1.1064 - val_accuracy: 0.6916
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9038 - accuracy: 0.6658 - val_loss: 1.1078 - val_accuracy: 0.6963
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8006 - accuracy: 0.6864 - val_loss: 1.1335 - val_accuracy: 0.6963
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8476 - accuracy: 0.6787 - val_loss: 1.1594 - val_accuracy: 0.7056
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8009 - accuracy: 0.6915 - val_loss: 1.1570 - val_accuracy: 0.7056
Epoch 143/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7832 - accuracy: 0.6761 - val_loss: 1.1216 - val_accuracy: 0.7103
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7521 - accuracy: 0.6864 - val_loss: 1.1232 - val_accuracy: 0.7009
Epoch 145/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8025 - accuracy: 0.6864 - val_loss: 1.1188 - val_accuracy: 0.7009
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8804 - accuracy: 0.6992 - val_loss: 1.1126 - val_accuracy: 0.6916
Epoch 147/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7855 - accuracy: 0.6504 - val_loss: 1.1156 - val_accuracy: 0.6916

accuracy: 0.6963
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8174 - accuracy: 0.6684 - val_loss: 1.1136 - val_accuracy: 0.6916
Epoch 149/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7885 - accuracy: 0.6787 - val_loss: 1.1097 - val_accuracy: 0.6822
Epoch 150/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8485 - accuracy: 0.6530 - val_loss: 1.1124 - val_accuracy: 0.6869
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8767 - accuracy: 0.6684 - val_loss: 1.1106 - val_accuracy: 0.6822
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8866 - accuracy: 0.6735 - val_loss: 1.1150 - val_accuracy: 0.6682
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7733 - accuracy: 0.6478 - val_loss: 1.1176 - val_accuracy: 0.6636
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7871 - accuracy: 0.6221 - val_loss: 1.0982 - val_accuracy: 0.6449
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7591 - accuracy: 0.5707 - val_loss: 1.0882 - val_accuracy: 0.6495
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8563 - accuracy: 0.6093 - val_loss: 1.0578 - val_accuracy: 0.6542
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8666 - accuracy: 0.6247 - val_loss: 1.0538 - val_accuracy: 0.6542
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7838 - accuracy: 0.5861 - val_loss: 1.0787 - val_accuracy: 0.6495
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7988 - accuracy: 0.6324 - val_loss: 1.0789 - val_accuracy: 0.6589
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8901 - accuracy: 0.6247 - val_loss: 1.1132 - val_accuracy: 0.6449
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7498 - accuracy: 0.5938 - val_loss: 1.0918 - val_accuracy: 0.6636
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7655 - accuracy: 0.6427 - val_loss: 1.1485 - val_accuracy: 0.6729
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7596 - accuracy: 0.6350 - val_loss: 1.1509 - val_accuracy: 0.6729
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8009 - accuracy: 0.6684 - val_loss: 1.1541 - val_accuracy: 0.6636
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7503 - accuracy: 0.6375 - val_loss: 1.1641 - val_accuracy: 0.6636
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7605 - accuracy: 0.6298 - val_loss: 1.1424 - val_accuracy: 0.6636
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7249 - accuracy: 0.6350 - val_loss: 1.1373 - val_accuracy: 0.6682
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7611 - accuracy: 0.6632 - val_loss: 1.1344 - val_accuracy: 0.6449
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7081 - accuracy: 0.6478 - val_loss: 1.1454 - val_accuracy: 0.6495
Epoch 170/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7034 - accuracy: 0.6375 - val_loss: 1.0825 - val_accuracy: 0.6355
Epoch 171/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7572 - accuracy: 0.6144 - val_loss: 1.0829 - val_accuracy: 0.6308
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7193 - accuracy: 0.6093 - val_loss: 1.0831 - val_accuracy: 0.6449
Epoch 173/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8708 - accuracy: 0.6195 - val_loss: 1.0554 - val_accuracy: 0.6449
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7590 - accuracy: 0.6350 - val_loss: 1.0583 - val_accuracy: 0.6636
Epoch 175/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7709 - accuracy: 0.6504 - val_loss: 1.0769 - val_accuracy: 0.6495
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7826 - accuracy: 0.6864 - val_loss: 1.0764 - val_accuracy: 0.6355
Epoch 177/1000

```
4/4 [=====] - 0s 13ms/step - loss: 0.7573 - accuracy: 0.6478 - val_loss: 1.0094 - val_accuracy: 0.6215
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7664 - accuracy: 0.6272 - val_loss: 1.0142 - val_accuracy: 0.6121
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6732 - accuracy: 0.6375 - val_loss: 1.0112 - val_accuracy: 0.6075
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8232 - accuracy: 0.6067 - val_loss: 1.0053 - val_accuracy: 0.6075
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8496 - accuracy: 0.6555 - val_loss: 1.0052 - val_accuracy: 0.5841
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8231 - accuracy: 0.6221 - val_loss: 1.0058 - val_accuracy: 0.5935
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7016 - accuracy: 0.6067 - val_loss: 1.0023 - val_accuracy: 0.5888
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7940 - accuracy: 0.6170 - val_loss: 0.9880 - val_accuracy: 0.5047
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7339 - accuracy: 0.6041 - val_loss: 0.9885 - val_accuracy: 0.4860
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6986 - accuracy: 0.5681 - val_loss: 0.9855 - val_accuracy: 0.5234
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7685 - accuracy: 0.6041 - val_loss: 0.9838 - val_accuracy: 0.5327
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6692 - accuracy: 0.5964 - val_loss: 0.9868 - val_accuracy: 0.5234
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6720 - accuracy: 0.6401 - val_loss: 0.9844 - val_accuracy: 0.5794
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6875 - accuracy: 0.6272 - val_loss: 0.9835 - val_accuracy: 0.6075
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7829 - accuracy: 0.6632 - val_loss: 0.9848 - val_accuracy: 0.6121
Epoch 192/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7062 - accuracy: 0.6324 - val_loss: 0.9851 - val_accuracy: 0.6168
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7211 - accuracy: 0.6504 - val_loss: 0.9617 - val_accuracy: 0.6308
Epoch 194/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7442 - accuracy: 0.6787 - val_loss: 0.9732 - val_accuracy: 0.6308
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7190 - accuracy: 0.6787 - val_loss: 0.9955 - val_accuracy: 0.5047
Epoch 196/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8117 - accuracy: 0.5990 - val_loss: 0.9653 - val_accuracy: 0.5140
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7559 - accuracy: 0.6581 - val_loss: 0.9646 - val_accuracy: 0.5280
Epoch 198/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7436 - accuracy: 0.6504 - val_loss: 0.9705 - val_accuracy: 0.6121
Epoch 199/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7211 - accuracy: 0.6324 - val_loss: 0.9591 - val_accuracy: 0.5187
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6623 - accuracy: 0.6735 - val_loss: 0.9881 - val_accuracy: 0.5280
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7138 - accuracy: 0.6658 - val_loss: 1.0044 - val_accuracy: 0.5748
Epoch 202/1000
4/4 [=====] - 0s 21ms/step - loss: 0.7584 - accuracy: 0.6658 - val_loss: 0.9020 - val_accuracy: 0.5701
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5979 - accuracy: 0.6632 - val_loss: 0.9701 - val_accuracy: 0.5654
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5652 - accuracy: 0.6530 - val_loss: 1.0034 - val_accuracy: 0.5888
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5893 - accuracy: 0.6710 - val_loss: 0.9387 - val_accuracy: 0.5935
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6155 - accuracy: 0.6581 - val_loss: 0.9423 - val_accuracy: 0.5794
```

```
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5714 - accuracy: 0.6864 - val_loss: 0.9588 - val_accuracy: 0.5561
Epoch 208/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6313 - accuracy: 0.6350 - val_loss: 0.9398 - val_accuracy: 0.5607
Epoch 209/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6261 - accuracy: 0.6375 - val_loss: 0.9297 - val_accuracy: 0.5421
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6438 - accuracy: 0.6478 - val_loss: 1.0351 - val_accuracy: 0.5561
Epoch 211/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5885 - accuracy: 0.6272 - val_loss: 1.0408 - val_accuracy: 0.5421
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6676 - accuracy: 0.6350 - val_loss: 1.0423 - val_accuracy: 0.5093
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6186 - accuracy: 0.6221 - val_loss: 1.0399 - val_accuracy: 0.5093
Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5696 - accuracy: 0.6272 - val_loss: 1.0371 - val_accuracy: 0.5140
Epoch 215/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6029 - accuracy: 0.6298 - val_loss: 1.0081 - val_accuracy: 0.5187
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6637 - accuracy: 0.6350 - val_loss: 1.0380 - val_accuracy: 0.5234
Epoch 217/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5346 - accuracy: 0.6118 - val_loss: 1.0099 - val_accuracy: 0.5327
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6356 - accuracy: 0.6401 - val_loss: 0.9405 - val_accuracy: 0.5374
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6120 - accuracy: 0.6170 - val_loss: 0.9527 - val_accuracy: 0.5187
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5199 - accuracy: 0.6247 - val_loss: 0.9193 - val_accuracy: 0.5234
Epoch 221/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5298 - accuracy: 0.5990 - val_loss: 0.9221 - val_accuracy: 0.5234
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5635 - accuracy: 0.5964 - val_loss: 0.9656 - val_accuracy: 0.4953
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5967 - accuracy: 0.5861 - val_loss: 0.9319 - val_accuracy: 0.4907
Epoch 224/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5469 - accuracy: 0.5707 - val_loss: 0.9665 - val_accuracy: 0.4953
Epoch 225/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5732 - accuracy: 0.5604 - val_loss: 0.9571 - val_accuracy: 0.4953
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4719 - accuracy: 0.5913 - val_loss: 0.9818 - val_accuracy: 0.5047
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5193 - accuracy: 0.5887 - val_loss: 0.9525 - val_accuracy: 0.4673
Epoch 228/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4655 - accuracy: 0.5656 - val_loss: 0.9509 - val_accuracy: 0.4766
Epoch 229/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4760 - accuracy: 0.5758 - val_loss: 0.8889 - val_accuracy: 0.4766
Epoch 230/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4925 - accuracy: 0.5990 - val_loss: 0.8589 - val_accuracy: 0.4907
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4830 - accuracy: 0.6093 - val_loss: 0.8823 - val_accuracy: 0.4953
Epoch 232/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5345 - accuracy: 0.5938 - val_loss: 0.8840 - val_accuracy: 0.5000
Epoch 233/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5446 - accuracy: 0.5784 - val_loss: 0.9098 - val_accuracy: 0.5000
Epoch 234/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5023 - accuracy: 0.6067 - val_loss: 0.9190 - val_accuracy: 0.5000
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4992 - accuracy: 0.6272 - val_loss: 0.9465 - val_accuracy: 0.4860
Epoch 236/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5651 - accuracy: 0.5758 - val_loss: 0.9150 - val_accuracy: 0.5000
```

```
accuracy: 0.4860
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5283 - accuracy: 0.5733 - val_loss: 0.9475 - val_accuracy: 0.4860
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4864 - accuracy: 0.6144 - val_loss: 0.9652 - val_accuracy: 0.5000
Epoch 239/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4890 - accuracy: 0.6144 - val_loss: 0.9072 - val_accuracy: 0.4907
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5457 - accuracy: 0.6093 - val_loss: 0.9171 - val_accuracy: 0.5047
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4734 - accuracy: 0.6118 - val_loss: 0.9117 - val_accuracy: 0.5047
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4350 - accuracy: 0.6118 - val_loss: 0.9111 - val_accuracy: 0.5047
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5580 - accuracy: 0.6093 - val_loss: 0.8769 - val_accuracy: 0.5280
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5454 - accuracy: 0.6195 - val_loss: 0.8748 - val_accuracy: 0.5327
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5403 - accuracy: 0.6272 - val_loss: 0.8750 - val_accuracy: 0.5327
Epoch 246/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4828 - accuracy: 0.5861 - val_loss: 0.8787 - val_accuracy: 0.5187
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5119 - accuracy: 0.5810 - val_loss: 0.8742 - val_accuracy: 0.5187
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4762 - accuracy: 0.5990 - val_loss: 0.8755 - val_accuracy: 0.5234
Epoch 249/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4924 - accuracy: 0.6144 - val_loss: 0.8852 - val_accuracy: 0.5467
Epoch 250/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4282 - accuracy: 0.6452 - val_loss: 0.8861 - val_accuracy: 0.5467
Epoch 251/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4580 - accuracy: 0.6221 - val_loss: 0.8821 - val_accuracy: 0.5421
Epoch 252/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4837 - accuracy: 0.6247 - val_loss: 0.8813 - val_accuracy: 0.5467
Epoch 253/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4669 - accuracy: 0.6041 - val_loss: 0.8531 - val_accuracy: 0.5467
Epoch 254/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4465 - accuracy: 0.6170 - val_loss: 0.8791 - val_accuracy: 0.5187
Epoch 255/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4995 - accuracy: 0.5887 - val_loss: 0.8244 - val_accuracy: 0.5047
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4816 - accuracy: 0.5964 - val_loss: 0.8265 - val_accuracy: 0.5047
Epoch 257/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4553 - accuracy: 0.5784 - val_loss: 0.8485 - val_accuracy: 0.5327
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4261 - accuracy: 0.5990 - val_loss: 0.8443 - val_accuracy: 0.5514
Epoch 259/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4712 - accuracy: 0.6350 - val_loss: 0.8215 - val_accuracy: 0.5561
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4694 - accuracy: 0.6144 - val_loss: 0.8008 - val_accuracy: 0.5561
Epoch 261/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4101 - accuracy: 0.6015 - val_loss: 0.8014 - val_accuracy: 0.5561
Epoch 262/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4907 - accuracy: 0.5938 - val_loss: 0.8007 - val_accuracy: 0.5561
Epoch 263/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5063 - accuracy: 0.6324 - val_loss: 0.8054 - val_accuracy: 0.5748
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4320 - accuracy: 0.6247 - val_loss: 0.7975 - val_accuracy: 0.5888
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5349 - accuracy: 0.6221 - val_loss: 0.7953 - val_accuracy: 0.5794
Epoch 266/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.4498 - accuracy: 0.6427 - val_loss: 0.7658 - val_accuracy: 0.5888
Epoch 267/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4230 - accuracy: 0.6093 - val_loss: 0.7985 - val_accuracy: 0.5935
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4377 - accuracy: 0.6324 - val_loss: 0.8308 - val_accuracy: 0.5981
Epoch 269/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4292 - accuracy: 0.6504 - val_loss: 0.8308 - val_accuracy: 0.5981
Epoch 270/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4383 - accuracy: 0.6067 - val_loss: 0.8036 - val_accuracy: 0.5935
Epoch 271/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4663 - accuracy: 0.6658 - val_loss: 0.8642 - val_accuracy: 0.6075
Epoch 272/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4197 - accuracy: 0.6581 - val_loss: 0.8390 - val_accuracy: 0.5981
Epoch 273/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4711 - accuracy: 0.6427 - val_loss: 0.8335 - val_accuracy: 0.5935
Epoch 274/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4577 - accuracy: 0.6298 - val_loss: 0.8446 - val_accuracy: 0.6075
Epoch 275/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4515 - accuracy: 0.6478 - val_loss: 0.8390 - val_accuracy: 0.6028
Epoch 276/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4091 - accuracy: 0.6427 - val_loss: 0.9243 - val_accuracy: 0.5794
Epoch 277/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4541 - accuracy: 0.6375 - val_loss: 0.9235 - val_accuracy: 0.5981
Epoch 278/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4306 - accuracy: 0.6350 - val_loss: 0.9042 - val_accuracy: 0.5935
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4589 - accuracy: 0.6298 - val_loss: 0.8737 - val_accuracy: 0.5981
Epoch 280/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4069 - accuracy: 0.6324 - val_loss: 0.8889 - val_accuracy: 0.6028
Epoch 281/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4269 - accuracy: 0.6195 - val_loss: 0.8847 - val_accuracy: 0.5794
Epoch 282/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4312 - accuracy: 0.6195 - val_loss: 0.8877 - val_accuracy: 0.5794
Epoch 283/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4358 - accuracy: 0.6272 - val_loss: 0.9117 - val_accuracy: 0.5748
Epoch 284/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4184 - accuracy: 0.6170 - val_loss: 0.9129 - val_accuracy: 0.5794
Epoch 285/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3906 - accuracy: 0.6170 - val_loss: 0.8587 - val_accuracy: 0.5794
Epoch 286/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4487 - accuracy: 0.6221 - val_loss: 0.8937 - val_accuracy: 0.5794
Epoch 287/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3938 - accuracy: 0.6170 - val_loss: 0.8602 - val_accuracy: 0.5888
Epoch 288/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4072 - accuracy: 0.6144 - val_loss: 0.8904 - val_accuracy: 0.5841
Epoch 289/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3979 - accuracy: 0.6221 - val_loss: 0.8598 - val_accuracy: 0.5841
Epoch 290/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4507 - accuracy: 0.6452 - val_loss: 0.8530 - val_accuracy: 0.5981
Epoch 291/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5079 - accuracy: 0.6144 - val_loss: 0.8889 - val_accuracy: 0.5981
Epoch 292/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4720 - accuracy: 0.6350 - val_loss: 0.8739 - val_accuracy: 0.5888
Epoch 293/1000
1/4 [====>.....] - ETA: 0s - loss: 0.4253 - accuracy: 0.6250Restoring model weights from the end of the best epoch: 143.
4/4 [=====] - 0s 14ms/step - loss: 0.4090 - accuracy: 0.6170 - val_loss: 0.8754 - val_accuracy: 0.5794
Epoch 293: early stopping
2/2 [=====] - 0s 3ms/step - loss: 1.1764 - accuracy: 0.7209
[CV] END .....Dense1=50, Dense2=10; total time= 14.6s
Model: "sequential_45"
```

Layer (type)	Output Shape	Param #
dense_180 (Dense)	(None, 50)	350
batch_normalization_135 (BatchNormalization)	(None, 50)	200
activation_135 (Activation)	(None, 50)	0
dense_181 (Dense)	(None, 10)	510
batch_normalization_136 (BatchNormalization)	(None, 10)	40
activation_136 (Activation)	(None, 10)	0
dense_182 (Dense)	(None, 10)	110
batch_normalization_137 (BatchNormalization)	(None, 10)	40
activation_137 (Activation)	(None, 10)	0
dense_183 (Dense)	(None, 2)	22

Total params: 1,272
Trainable params: 1,132
Non-trainable params: 140

Epoch 1/1000
4/4 [=====] - 1s 56ms/step - loss: 4.7435 - accuracy: 0.3650 - val_loss: 5.2128 - val_accuracy: 0.5374
Epoch 2/1000
4/4 [=====] - 0s 12ms/step - loss: 4.1459 - accuracy: 0.4062 - val_loss: 6.0645 - val_accuracy: 0.4299
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 4.0292 - accuracy: 0.4190 - val_loss: 5.9751 - val_accuracy: 0.4206
Epoch 4/1000
4/4 [=====] - 0s 12ms/step - loss: 3.9382 - accuracy: 0.4319 - val_loss: 4.9613 - val_accuracy: 0.4579
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8197 - accuracy: 0.4499 - val_loss: 3.6727 - val_accuracy: 0.5467
Epoch 6/1000
4/4 [=====] - 0s 12ms/step - loss: 3.4463 - accuracy: 0.4422 - val_loss: 3.0438 - val_accuracy: 0.5467
Epoch 7/1000
4/4 [=====] - 0s 12ms/step - loss: 3.2986 - accuracy: 0.4499 - val_loss: 2.7911 - val_accuracy: 0.5421
Epoch 8/1000
4/4 [=====] - 0s 12ms/step - loss: 3.0941 - accuracy: 0.4576 - val_loss: 2.5985 - val_accuracy: 0.5421
Epoch 9/1000
4/4 [=====] - 0s 12ms/step - loss: 3.2621 - accuracy: 0.4602 - val_loss: 2.4800 - val_accuracy: 0.5421
Epoch 10/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8536 - accuracy: 0.4447 - val_loss: 2.2890 - val_accuracy: 0.5421
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8134 - accuracy: 0.4884 - val_loss: 2.1615 - val_accuracy: 0.5514
Epoch 12/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9478 - accuracy: 0.4602 - val_loss: 2.0550 - val_accuracy: 0.5561
Epoch 13/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7705 - accuracy: 0.4833 - val_loss: 2.0315 - val_accuracy: 0.5561
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5626 - accuracy: 0.5270 - val_loss: 1.9974 - val_accuracy: 0.5607
Epoch 15/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6958 - accuracy: 0.4884 - val_loss: 1.9616 - val_accuracy: 0.5607
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6310 - accuracy: 0.5141 - val_loss: 1.9159 - val_accuracy: 0.5607
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4537 - accuracy: 0.5296 - val_loss: 1.8794 - val_accuracy: 0.5607
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4802 - accuracy: 0.5219 - val_loss: 1.8472 - val_accuracy: 0.5607
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4605 - accuracy: 0.5244 - val_loss: 1.7899 - val_accuracy: 0.5607
Epoch 20/1000

```
4/4 [=====] - 0s 13ms/step - loss: 2.2924 - accuracy: 0.5373 - val_loss: 1.7466 - val_accuracy: 0.5654
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3219 - accuracy: 0.5450 - val_loss: 1.7289 - val_accuracy: 0.5654
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2533 - accuracy: 0.5450 - val_loss: 1.7085 - val_accuracy: 0.5654
Epoch 23/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2251 - accuracy: 0.5398 - val_loss: 1.6939 - val_accuracy: 0.5748
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0507 - accuracy: 0.5578 - val_loss: 1.6736 - val_accuracy: 0.5748
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1146 - accuracy: 0.5578 - val_loss: 1.5910 - val_accuracy: 0.5748
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1040 - accuracy: 0.5553 - val_loss: 1.5504 - val_accuracy: 0.5748
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0161 - accuracy: 0.5527 - val_loss: 1.5316 - val_accuracy: 0.5654
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0353 - accuracy: 0.5630 - val_loss: 1.5221 - val_accuracy: 0.5701
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9770 - accuracy: 0.5681 - val_loss: 1.5107 - val_accuracy: 0.5701
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9294 - accuracy: 0.5604 - val_loss: 1.4915 - val_accuracy: 0.5654
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9911 - accuracy: 0.5527 - val_loss: 1.4691 - val_accuracy: 0.5748
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9093 - accuracy: 0.5707 - val_loss: 1.4567 - val_accuracy: 0.5794
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8876 - accuracy: 0.5553 - val_loss: 1.4400 - val_accuracy: 0.5654
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8256 - accuracy: 0.5707 - val_loss: 1.4156 - val_accuracy: 0.5794
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8513 - accuracy: 0.5604 - val_loss: 1.4023 - val_accuracy: 0.5794
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8186 - accuracy: 0.5681 - val_loss: 1.3729 - val_accuracy: 0.5794
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7622 - accuracy: 0.5733 - val_loss: 1.3554 - val_accuracy: 0.5794
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8296 - accuracy: 0.5681 - val_loss: 1.3271 - val_accuracy: 0.5794
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8181 - accuracy: 0.5656 - val_loss: 1.3317 - val_accuracy: 0.5748
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7108 - accuracy: 0.5604 - val_loss: 1.3211 - val_accuracy: 0.5748
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7292 - accuracy: 0.5656 - val_loss: 1.2819 - val_accuracy: 0.5794
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6208 - accuracy: 0.5604 - val_loss: 1.2535 - val_accuracy: 0.5748
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5237 - accuracy: 0.5604 - val_loss: 1.2469 - val_accuracy: 0.5748
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6245 - accuracy: 0.5681 - val_loss: 1.2305 - val_accuracy: 0.5748
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5720 - accuracy: 0.5450 - val_loss: 1.2338 - val_accuracy: 0.5748
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5980 - accuracy: 0.5604 - val_loss: 1.2269 - val_accuracy: 0.5748
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5707 - accuracy: 0.5656 - val_loss: 1.2252 - val_accuracy: 0.5748
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4805 - accuracy: 0.5527 - val_loss: 1.2025 - val_accuracy: 0.5748
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5458 - accuracy: 0.5604 - val_loss: 1.1842 - val_accuracy: 0.5794
```

Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4550 - accuracy: 0.5578 - val_loss: 1.1738 - val_accuracy: 0.5794
Epoch 51/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4860 - accuracy: 0.5578 - val_loss: 1.1653 - val_accuracy: 0.5841
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5453 - accuracy: 0.5450 - val_loss: 1.1468 - val_accuracy: 0.5841
Epoch 53/1000
4/4 [=====] - 0s 11ms/step - loss: 1.4261 - accuracy: 0.5630 - val_loss: 1.1615 - val_accuracy: 0.5794
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5019 - accuracy: 0.5810 - val_loss: 1.1061 - val_accuracy: 0.5888
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4118 - accuracy: 0.5553 - val_loss: 1.0834 - val_accuracy: 0.5935
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3752 - accuracy: 0.5835 - val_loss: 1.0680 - val_accuracy: 0.5981
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4212 - accuracy: 0.5527 - val_loss: 1.1345 - val_accuracy: 0.6308
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3845 - accuracy: 0.5578 - val_loss: 1.1373 - val_accuracy: 0.6402
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3675 - accuracy: 0.5656 - val_loss: 1.0634 - val_accuracy: 0.6402
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2762 - accuracy: 0.5578 - val_loss: 1.0754 - val_accuracy: 0.6449
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2888 - accuracy: 0.5656 - val_loss: 1.1076 - val_accuracy: 0.6682
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2176 - accuracy: 0.5450 - val_loss: 1.0399 - val_accuracy: 0.6682
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2513 - accuracy: 0.5630 - val_loss: 1.0369 - val_accuracy: 0.6636
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2629 - accuracy: 0.5578 - val_loss: 1.0244 - val_accuracy: 0.6682
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2078 - accuracy: 0.5887 - val_loss: 1.0523 - val_accuracy: 0.6589
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1809 - accuracy: 0.5938 - val_loss: 1.0458 - val_accuracy: 0.6449
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1788 - accuracy: 0.5861 - val_loss: 1.0193 - val_accuracy: 0.6492
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1702 - accuracy: 0.5861 - val_loss: 1.0016 - val_accuracy: 0.6589
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2383 - accuracy: 0.6170 - val_loss: 1.0004 - val_accuracy: 0.6589
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1177 - accuracy: 0.6015 - val_loss: 0.9925 - val_accuracy: 0.6589
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1516 - accuracy: 0.6170 - val_loss: 0.9748 - val_accuracy: 0.6776
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1698 - accuracy: 0.6067 - val_loss: 0.9752 - val_accuracy: 0.6729
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0974 - accuracy: 0.6144 - val_loss: 0.9686 - val_accuracy: 0.6682
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1327 - accuracy: 0.6247 - val_loss: 0.9680 - val_accuracy: 0.6636
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1912 - accuracy: 0.5990 - val_loss: 0.9594 - val_accuracy: 0.6682
Epoch 76/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0671 - accuracy: 0.6247 - val_loss: 0.9391 - val_accuracy: 0.6729
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0755 - accuracy: 0.5938 - val_loss: 0.9397 - val_accuracy: 0.6682
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0619 - accuracy: 0.5964 - val_loss: 0.9314 - val_accuracy: 0.6682
Epoch 79/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0701 - accuracy: 0.6478 - val_loss: 0.9218 - val_accuracy: 0.6682

```
accuracy: 0.6682
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1245 - accuracy: 0.6195 - val_loss: 0.9163 - val_accuracy: 0.6729
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0500 - accuracy: 0.6350 - val_loss: 0.9068 - val_accuracy: 0.6682
Epoch 82/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0688 - accuracy: 0.5964 - val_loss: 0.8981 - val_accuracy: 0.6729
Epoch 83/1000
4/4 [=====] - 0s 17ms/step - loss: 1.0641 - accuracy: 0.6170 - val_loss: 0.8955 - val_accuracy: 0.6776
Epoch 84/1000
4/4 [=====] - 0s 17ms/step - loss: 1.1195 - accuracy: 0.6375 - val_loss: 0.8992 - val_accuracy: 0.6636
Epoch 85/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9702 - accuracy: 0.6118 - val_loss: 0.8896 - val_accuracy: 0.6776
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0553 - accuracy: 0.6093 - val_loss: 0.8864 - val_accuracy: 0.6869
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9815 - accuracy: 0.5861 - val_loss: 0.8780 - val_accuracy: 0.6869
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0002 - accuracy: 0.6195 - val_loss: 0.8832 - val_accuracy: 0.6916
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9941 - accuracy: 0.6247 - val_loss: 0.8822 - val_accuracy: 0.6869
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0503 - accuracy: 0.6401 - val_loss: 0.8785 - val_accuracy: 0.6869
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0295 - accuracy: 0.6118 - val_loss: 0.8657 - val_accuracy: 0.6916
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9470 - accuracy: 0.6350 - val_loss: 0.8377 - val_accuracy: 0.6776
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9056 - accuracy: 0.6375 - val_loss: 0.8240 - val_accuracy: 0.6869
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9340 - accuracy: 0.6221 - val_loss: 0.8264 - val_accuracy: 0.6916
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9121 - accuracy: 0.5964 - val_loss: 0.8243 - val_accuracy: 0.6869
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9247 - accuracy: 0.6272 - val_loss: 0.8197 - val_accuracy: 0.6869
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9146 - accuracy: 0.6350 - val_loss: 0.8179 - val_accuracy: 0.6776
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8858 - accuracy: 0.6118 - val_loss: 0.7847 - val_accuracy: 0.6776
Epoch 99/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8911 - accuracy: 0.6195 - val_loss: 0.7542 - val_accuracy: 0.6776
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9688 - accuracy: 0.5913 - val_loss: 0.7113 - val_accuracy: 0.6729
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8799 - accuracy: 0.6324 - val_loss: 0.7058 - val_accuracy: 0.6776
Epoch 102/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9013 - accuracy: 0.6015 - val_loss: 0.7009 - val_accuracy: 0.6822
Epoch 103/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8706 - accuracy: 0.6041 - val_loss: 0.6980 - val_accuracy: 0.6729
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7987 - accuracy: 0.6015 - val_loss: 0.6632 - val_accuracy: 0.6729
Epoch 105/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8983 - accuracy: 0.6324 - val_loss: 0.6635 - val_accuracy: 0.6729
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8870 - accuracy: 0.6272 - val_loss: 0.6594 - val_accuracy: 0.6729
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8274 - accuracy: 0.5964 - val_loss: 0.5934 - val_accuracy: 0.6542
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8280 - accuracy: 0.5167 - val_loss: 0.5670 - val_accuracy: 0.6636
Epoch 109/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.7985 - accuracy: 0.4859 - val_loss: 0.5858 - val_accuracy: 0.6636
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8149 - accuracy: 0.4550 - val_loss: 0.5928 - val_accuracy: 0.6495
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7948 - accuracy: 0.5039 - val_loss: 0.5917 - val_accuracy: 0.6495
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7612 - accuracy: 0.5167 - val_loss: 0.5928 - val_accuracy: 0.6542
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7956 - accuracy: 0.4859 - val_loss: 0.5904 - val_accuracy: 0.6449
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7503 - accuracy: 0.5141 - val_loss: 0.5653 - val_accuracy: 0.5935
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7652 - accuracy: 0.4987 - val_loss: 0.5631 - val_accuracy: 0.5935
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7844 - accuracy: 0.4499 - val_loss: 0.5662 - val_accuracy: 0.5841
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7353 - accuracy: 0.4910 - val_loss: 0.5664 - val_accuracy: 0.6121
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7804 - accuracy: 0.5527 - val_loss: 0.5607 - val_accuracy: 0.6028
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6463 - accuracy: 0.4730 - val_loss: 0.5788 - val_accuracy: 0.6308
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6651 - accuracy: 0.5321 - val_loss: 0.5559 - val_accuracy: 0.6308
Epoch 121/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7504 - accuracy: 0.5398 - val_loss: 0.5544 - val_accuracy: 0.6355
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6545 - accuracy: 0.5167 - val_loss: 0.5521 - val_accuracy: 0.6308
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6915 - accuracy: 0.5553 - val_loss: 0.5810 - val_accuracy: 0.6402
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5911 - accuracy: 0.5296 - val_loss: 0.5829 - val_accuracy: 0.6495
Epoch 125/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6678 - accuracy: 0.5116 - val_loss: 0.5764 - val_accuracy: 0.6589
Epoch 126/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6387 - accuracy: 0.5553 - val_loss: 0.5705 - val_accuracy: 0.6636
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5347 - accuracy: 0.5450 - val_loss: 0.5130 - val_accuracy: 0.6589
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6498 - accuracy: 0.5707 - val_loss: 0.4854 - val_accuracy: 0.6542
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6084 - accuracy: 0.5553 - val_loss: 0.5614 - val_accuracy: 0.6682
Epoch 130/1000
4/4 [=====] - 0s 19ms/step - loss: 0.5792 - accuracy: 0.5424 - val_loss: 0.5956 - val_accuracy: 0.6355
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5267 - accuracy: 0.5913 - val_loss: 0.5724 - val_accuracy: 0.6449
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5067 - accuracy: 0.5733 - val_loss: 0.6188 - val_accuracy: 0.6495
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5166 - accuracy: 0.5476 - val_loss: 0.6240 - val_accuracy: 0.6495
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5305 - accuracy: 0.5733 - val_loss: 0.6561 - val_accuracy: 0.6495
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5255 - accuracy: 0.5450 - val_loss: 0.7114 - val_accuracy: 0.6682
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5789 - accuracy: 0.6272 - val_loss: 0.6785 - val_accuracy: 0.6682
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5720 - accuracy: 0.6067 - val_loss: 0.6497 - val_accuracy: 0.6776
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6138 - accuracy: 0.5938 - val_loss: 0.7006 - val_accuracy: 0.6682
```

Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5043 - accuracy: 0.5784 - val_loss: 0.6433 - val_accuracy: 0.6729
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5610 - accuracy: 0.5758 - val_loss: 0.6240 - val_accuracy: 0.6589
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4453 - accuracy: 0.5450 - val_loss: 0.5952 - val_accuracy: 0.6215
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5560 - accuracy: 0.5887 - val_loss: 0.5363 - val_accuracy: 0.5981
Epoch 143/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4579 - accuracy: 0.5707 - val_loss: 0.6581 - val_accuracy: 0.6121
Epoch 144/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4928 - accuracy: 0.5964 - val_loss: 0.5604 - val_accuracy: 0.6589
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4364 - accuracy: 0.6452 - val_loss: 0.6056 - val_accuracy: 0.6636
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3742 - accuracy: 0.6452 - val_loss: 0.6074 - val_accuracy: 0.6682
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4380 - accuracy: 0.5887 - val_loss: 0.7114 - val_accuracy: 0.6542
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4163 - accuracy: 0.6350 - val_loss: 0.6290 - val_accuracy: 0.6075
Epoch 149/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4810 - accuracy: 0.6298 - val_loss: 0.6546 - val_accuracy: 0.6121
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5625 - accuracy: 0.5656 - val_loss: 0.6559 - val_accuracy: 0.6355
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4846 - accuracy: 0.6350 - val_loss: 0.6633 - val_accuracy: 0.6822
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4208 - accuracy: 0.5733 - val_loss: 0.6700 - val_accuracy: 0.6636
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4223 - accuracy: 0.6298 - val_loss: 0.6807 - val_accuracy: 0.6822
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4269 - accuracy: 0.6041 - val_loss: 0.6417 - val_accuracy: 0.6916
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3774 - accuracy: 0.6607 - val_loss: 0.6402 - val_accuracy: 0.6916
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4362 - accuracy: 0.6710 - val_loss: 0.6529 - val_accuracy: 0.7056
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4457 - accuracy: 0.6555 - val_loss: 0.6854 - val_accuracy: 0.7150
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4872 - accuracy: 0.6992 - val_loss: 0.7058 - val_accuracy: 0.7150
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4415 - accuracy: 0.6504 - val_loss: 0.7061 - val_accuracy: 0.7150
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4467 - accuracy: 0.5887 - val_loss: 0.7617 - val_accuracy: 0.7196
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4307 - accuracy: 0.6452 - val_loss: 0.7881 - val_accuracy: 0.7103
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4731 - accuracy: 0.6478 - val_loss: 0.7927 - val_accuracy: 0.6916
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4305 - accuracy: 0.6530 - val_loss: 0.7886 - val_accuracy: 0.7103
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4284 - accuracy: 0.6478 - val_loss: 0.7571 - val_accuracy: 0.7196
Epoch 165/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4470 - accuracy: 0.7044 - val_loss: 0.7201 - val_accuracy: 0.7056
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3970 - accuracy: 0.6478 - val_loss: 0.7140 - val_accuracy: 0.7103
Epoch 167/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3946 - accuracy: 0.6581 - val_loss: 0.7226 - val_accuracy: 0.6963
Epoch 168/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5160 - accuracy: 0.6787 - val_loss: 0.7149 - val_accuracy: 0.7149

```
accuracy: 0.6869
Epoch 169/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4453 - accuracy: 0.7018 - val_loss: 0.7124 - val_accuracy: 0.6729
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4449 - accuracy: 0.6607 - val_loss: 0.7123 - val_accuracy: 0.6963
Epoch 171/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5021 - accuracy: 0.6452 - val_loss: 0.7125 - val_accuracy: 0.7009
Epoch 172/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4131 - accuracy: 0.6504 - val_loss: 0.7055 - val_accuracy: 0.7103
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4322 - accuracy: 0.6658 - val_loss: 0.7016 - val_accuracy: 0.6729
Epoch 174/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3887 - accuracy: 0.6298 - val_loss: 0.7746 - val_accuracy: 0.6355
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4439 - accuracy: 0.6350 - val_loss: 0.7257 - val_accuracy: 0.6449
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4460 - accuracy: 0.6015 - val_loss: 0.7281 - val_accuracy: 0.6449
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4057 - accuracy: 0.6195 - val_loss: 0.7453 - val_accuracy: 0.6168
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3855 - accuracy: 0.6247 - val_loss: 0.7681 - val_accuracy: 0.6449
Epoch 179/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4317 - accuracy: 0.6658 - val_loss: 0.7674 - val_accuracy: 0.6636
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3915 - accuracy: 0.6221 - val_loss: 0.7640 - val_accuracy: 0.6495
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4021 - accuracy: 0.6787 - val_loss: 0.7610 - val_accuracy: 0.6495
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4407 - accuracy: 0.6735 - val_loss: 0.7635 - val_accuracy: 0.6636
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4802 - accuracy: 0.7044 - val_loss: 0.7648 - val_accuracy: 0.6402
Epoch 184/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4661 - accuracy: 0.6555 - val_loss: 0.7524 - val_accuracy: 0.6215
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4197 - accuracy: 0.7172 - val_loss: 0.7465 - val_accuracy: 0.6542
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3567 - accuracy: 0.7326 - val_loss: 0.7101 - val_accuracy: 0.7196
Epoch 187/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4216 - accuracy: 0.7506 - val_loss: 0.7476 - val_accuracy: 0.7243
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3911 - accuracy: 0.7455 - val_loss: 0.7062 - val_accuracy: 0.7430
Epoch 189/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4339 - accuracy: 0.7584 - val_loss: 0.7222 - val_accuracy: 0.7477
Epoch 190/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3832 - accuracy: 0.7044 - val_loss: 0.7258 - val_accuracy: 0.7477
Epoch 191/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4240 - accuracy: 0.7481 - val_loss: 0.7277 - val_accuracy: 0.7430
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4061 - accuracy: 0.7506 - val_loss: 0.6723 - val_accuracy: 0.7336
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4003 - accuracy: 0.7198 - val_loss: 0.6747 - val_accuracy: 0.7477
Epoch 194/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3511 - accuracy: 0.7866 - val_loss: 0.7017 - val_accuracy: 0.7430
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3897 - accuracy: 0.7532 - val_loss: 0.6704 - val_accuracy: 0.7103
Epoch 196/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4065 - accuracy: 0.7069 - val_loss: 0.6719 - val_accuracy: 0.7290
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3782 - accuracy: 0.6889 - val_loss: 0.6694 - val_accuracy: 0.7290
Epoch 198/1000
```

4/4 [=====] - 0s 11ms/step - loss: 0.3689 - accuracy: 0.6684 - val_loss: 0.6691 - val_accuracy: 0.7336
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3853 - accuracy: 0.6401 - val_loss: 0.6757 - val_accuracy: 0.7290
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4095 - accuracy: 0.6941 - val_loss: 0.7242 - val_accuracy: 0.7430
Epoch 201/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3272 - accuracy: 0.6401 - val_loss: 0.7385 - val_accuracy: 0.7523
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3506 - accuracy: 0.6761 - val_loss: 0.7364 - val_accuracy: 0.7710
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3588 - accuracy: 0.6761 - val_loss: 0.7363 - val_accuracy: 0.7757
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4206 - accuracy: 0.7018 - val_loss: 0.7477 - val_accuracy: 0.7570
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3724 - accuracy: 0.6632 - val_loss: 0.7648 - val_accuracy: 0.7804
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3716 - accuracy: 0.7275 - val_loss: 0.7904 - val_accuracy: 0.7710
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3937 - accuracy: 0.6812 - val_loss: 0.7883 - val_accuracy: 0.7570
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3256 - accuracy: 0.7147 - val_loss: 0.7804 - val_accuracy: 0.7617
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3513 - accuracy: 0.7018 - val_loss: 0.7671 - val_accuracy: 0.7804
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3612 - accuracy: 0.7506 - val_loss: 0.7573 - val_accuracy: 0.7570
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4121 - accuracy: 0.6581 - val_loss: 0.7590 - val_accuracy: 0.7430
Epoch 212/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3410 - accuracy: 0.6838 - val_loss: 0.7787 - val_accuracy: 0.7103
Epoch 213/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3153 - accuracy: 0.6864 - val_loss: 0.7482 - val_accuracy: 0.7056
Epoch 214/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3169 - accuracy: 0.6684 - val_loss: 0.7890 - val_accuracy: 0.6963
Epoch 215/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3569 - accuracy: 0.6427 - val_loss: 0.7818 - val_accuracy: 0.7196
Epoch 216/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3561 - accuracy: 0.6889 - val_loss: 0.7763 - val_accuracy: 0.7243
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3500 - accuracy: 0.6170 - val_loss: 0.7714 - val_accuracy: 0.7196
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4288 - accuracy: 0.7121 - val_loss: 0.7705 - val_accuracy: 0.7150
Epoch 219/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3359 - accuracy: 0.6298 - val_loss: 0.7722 - val_accuracy: 0.7150
Epoch 220/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3578 - accuracy: 0.6530 - val_loss: 0.7735 - val_accuracy: 0.7196
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3966 - accuracy: 0.7147 - val_loss: 0.7766 - val_accuracy: 0.7243
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4216 - accuracy: 0.7147 - val_loss: 0.7195 - val_accuracy: 0.7617
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3127 - accuracy: 0.7352 - val_loss: 0.6967 - val_accuracy: 0.7757
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3498 - accuracy: 0.7249 - val_loss: 0.7144 - val_accuracy: 0.7664
Epoch 225/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3288 - accuracy: 0.7841 - val_loss: 0.7186 - val_accuracy: 0.7757
Epoch 226/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4770 - accuracy: 0.7635 - val_loss: 0.7066 - val_accuracy: 0.7710
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4313 - accuracy: 0.6787 - val_loss: 0.7085 - val_accuracy: 0.7710

Epoch 228/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3854 - accuracy: 0.7378 - val_loss: 0.7359 - val_accuracy: 0.7897
Epoch 229/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3657 - accuracy: 0.7224 - val_loss: 0.7116 - val_accuracy: 0.7757
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3392 - accuracy: 0.7044 - val_loss: 0.7934 - val_accuracy: 0.7710
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4013 - accuracy: 0.7455 - val_loss: 0.7703 - val_accuracy: 0.7804
Epoch 232/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3332 - accuracy: 0.6992 - val_loss: 0.7730 - val_accuracy: 0.7804
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3286 - accuracy: 0.7121 - val_loss: 0.8029 - val_accuracy: 0.7757
Epoch 234/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3227 - accuracy: 0.6967 - val_loss: 0.7585 - val_accuracy: 0.7804
Epoch 235/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3392 - accuracy: 0.6298 - val_loss: 0.7197 - val_accuracy: 0.7804
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3692 - accuracy: 0.6915 - val_loss: 0.7425 - val_accuracy: 0.7757
Epoch 237/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3689 - accuracy: 0.6941 - val_loss: 0.7440 - val_accuracy: 0.7477
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3675 - accuracy: 0.6889 - val_loss: 0.7641 - val_accuracy: 0.7570
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3616 - accuracy: 0.7224 - val_loss: 0.8195 - val_accuracy: 0.7430
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3772 - accuracy: 0.7095 - val_loss: 0.8065 - val_accuracy: 0.7477
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4901 - accuracy: 0.7044 - val_loss: 0.7967 - val_accuracy: 0.7056
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3597 - accuracy: 0.7172 - val_loss: 0.8280 - val_accuracy: 0.7056
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3907 - accuracy: 0.6530 - val_loss: 0.9625 - val_accuracy: 0.6869
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3930 - accuracy: 0.6530 - val_loss: 0.9099 - val_accuracy: 0.6963
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3586 - accuracy: 0.7018 - val_loss: 0.9117 - val_accuracy: 0.6916
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3538 - accuracy: 0.6812 - val_loss: 0.9335 - val_accuracy: 0.6822
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3118 - accuracy: 0.6787 - val_loss: 0.9444 - val_accuracy: 0.6262
Epoch 248/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3480 - accuracy: 0.6889 - val_loss: 1.1100 - val_accuracy: 0.6308
Epoch 249/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3740 - accuracy: 0.6504 - val_loss: 1.0868 - val_accuracy: 0.6121
Epoch 250/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3759 - accuracy: 0.6067 - val_loss: 1.1133 - val_accuracy: 0.5794
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3292 - accuracy: 0.6658 - val_loss: 1.1153 - val_accuracy: 0.6168
Epoch 252/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3828 - accuracy: 0.6555 - val_loss: 1.1481 - val_accuracy: 0.5935
Epoch 253/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3372 - accuracy: 0.6838 - val_loss: 1.1486 - val_accuracy: 0.5888
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3079 - accuracy: 0.7044 - val_loss: 1.1491 - val_accuracy: 0.6121
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3654 - accuracy: 0.6710 - val_loss: 1.1756 - val_accuracy: 0.6215
Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4283 - accuracy: 0.6787 - val_loss: 1.1839 - val_accuracy: 0.6355
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3301 - accuracy: 0.7069 - val_loss: 1.1824 - val_accuracy: 0.6215

```
accuracy: 0.6308
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3481 - accuracy: 0.7352 - val_loss: 1.1737 - val_accuracy: 0.6402
Epoch 259/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3230 - accuracy: 0.7275 - val_loss: 1.1184 - val_accuracy: 0.6542
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3377 - accuracy: 0.6941 - val_loss: 1.1151 - val_accuracy: 0.6636
Epoch 261/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3964 - accuracy: 0.7018 - val_loss: 1.0453 - val_accuracy: 0.6869
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4580 - accuracy: 0.7198 - val_loss: 1.0862 - val_accuracy: 0.6822
Epoch 263/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3494 - accuracy: 0.6915 - val_loss: 1.0544 - val_accuracy: 0.6589
Epoch 264/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3711 - accuracy: 0.6401 - val_loss: 0.9974 - val_accuracy: 0.6589
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3255 - accuracy: 0.6170 - val_loss: 0.9877 - val_accuracy: 0.6636
Epoch 266/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3207 - accuracy: 0.6555 - val_loss: 0.9924 - val_accuracy: 0.6355
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3353 - accuracy: 0.6735 - val_loss: 0.9960 - val_accuracy: 0.6355
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3945 - accuracy: 0.6298 - val_loss: 0.9497 - val_accuracy: 0.6402
Epoch 269/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3280 - accuracy: 0.6504 - val_loss: 0.9668 - val_accuracy: 0.6449
Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3371 - accuracy: 0.6812 - val_loss: 0.9623 - val_accuracy: 0.6542
Epoch 271/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2928 - accuracy: 0.6710 - val_loss: 0.9599 - val_accuracy: 0.6542
Epoch 272/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3538 - accuracy: 0.6787 - val_loss: 0.9571 - val_accuracy: 0.6776
Epoch 273/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3347 - accuracy: 0.7635 - val_loss: 0.8856 - val_accuracy: 0.7056
Epoch 274/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3751 - accuracy: 0.7147 - val_loss: 0.9203 - val_accuracy: 0.7196
Epoch 275/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3478 - accuracy: 0.7352 - val_loss: 0.9360 - val_accuracy: 0.7290
Epoch 276/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3364 - accuracy: 0.6658 - val_loss: 0.8810 - val_accuracy: 0.7290
Epoch 277/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3510 - accuracy: 0.7326 - val_loss: 0.9029 - val_accuracy: 0.7383
Epoch 278/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3445 - accuracy: 0.7584 - val_loss: 0.9039 - val_accuracy: 0.7477
Epoch 279/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3704 - accuracy: 0.7275 - val_loss: 0.9108 - val_accuracy: 0.7196
Epoch 280/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3877 - accuracy: 0.7506 - val_loss: 0.9188 - val_accuracy: 0.7150
Epoch 281/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2838 - accuracy: 0.7558 - val_loss: 0.9533 - val_accuracy: 0.7243
Epoch 282/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4034 - accuracy: 0.7301 - val_loss: 0.9684 - val_accuracy: 0.7196
Epoch 283/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3281 - accuracy: 0.7686 - val_loss: 1.0520 - val_accuracy: 0.7150
Epoch 284/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2966 - accuracy: 0.7584 - val_loss: 1.0325 - val_accuracy: 0.7196
Epoch 285/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3464 - accuracy: 0.7506 - val_loss: 0.8775 - val_accuracy: 0.7056
Epoch 286/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3707 - accuracy: 0.7224 - val_loss: 0.8091 - val_accuracy: 0.7196
Epoch 287/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.3459 - accuracy: 0.7018 - val_loss: 0.8178 - val_accuracy: 0.7103
Epoch 288/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3800 - accuracy: 0.6915 - val_loss: 0.8167 - val_accuracy: 0.7290
Epoch 289/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3539 - accuracy: 0.7352 - val_loss: 0.8258 - val_accuracy: 0.7009
Epoch 290/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3230 - accuracy: 0.7763 - val_loss: 0.8351 - val_accuracy: 0.7009
Epoch 291/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3350 - accuracy: 0.7455 - val_loss: 0.8360 - val_accuracy: 0.7056
Epoch 292/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3177 - accuracy: 0.7481 - val_loss: 0.7854 - val_accuracy: 0.6963
Epoch 293/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3587 - accuracy: 0.7635 - val_loss: 0.8331 - val_accuracy: 0.7056
Epoch 294/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3449 - accuracy: 0.7275 - val_loss: 0.7658 - val_accuracy: 0.6963
Epoch 295/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3273 - accuracy: 0.7121 - val_loss: 0.8676 - val_accuracy: 0.7009
Epoch 296/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3112 - accuracy: 0.7095 - val_loss: 0.9244 - val_accuracy: 0.7383
Epoch 297/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3077 - accuracy: 0.6761 - val_loss: 0.9135 - val_accuracy: 0.7336
Epoch 298/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3188 - accuracy: 0.7429 - val_loss: 0.9374 - val_accuracy: 0.7383
Epoch 299/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3226 - accuracy: 0.6812 - val_loss: 0.9342 - val_accuracy: 0.7383
Epoch 300/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3557 - accuracy: 0.7224 - val_loss: 0.9052 - val_accuracy: 0.7290
Epoch 301/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2858 - accuracy: 0.7738 - val_loss: 0.9003 - val_accuracy: 0.7243
Epoch 302/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3607 - accuracy: 0.7635 - val_loss: 0.9312 - val_accuracy: 0.7290
Epoch 303/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2903 - accuracy: 0.7224 - val_loss: 0.9591 - val_accuracy: 0.7430
Epoch 304/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2977 - accuracy: 0.7249 - val_loss: 0.9037 - val_accuracy: 0.7430
Epoch 305/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3638 - accuracy: 0.7404 - val_loss: 0.8567 - val_accuracy: 0.7523
Epoch 306/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4101 - accuracy: 0.7815 - val_loss: 0.7775 - val_accuracy: 0.7664
Epoch 307/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3284 - accuracy: 0.7918 - val_loss: 0.7721 - val_accuracy: 0.7570
Epoch 308/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3152 - accuracy: 0.8046 - val_loss: 0.7336 - val_accuracy: 0.7523
Epoch 309/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3192 - accuracy: 0.8175 - val_loss: 0.7315 - val_accuracy: 0.7523
Epoch 310/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3700 - accuracy: 0.8175 - val_loss: 0.8143 - val_accuracy: 0.7523
Epoch 311/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3073 - accuracy: 0.8123 - val_loss: 0.8406 - val_accuracy: 0.7477
Epoch 312/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3390 - accuracy: 0.7841 - val_loss: 0.7667 - val_accuracy: 0.7570
Epoch 313/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3661 - accuracy: 0.8149 - val_loss: 0.7906 - val_accuracy: 0.7523
Epoch 314/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3430 - accuracy: 0.7506 - val_loss: 0.8114 - val_accuracy: 0.7477
Epoch 315/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3178 - accuracy: 0.7763 - val_loss: 0.8141 - val_accuracy: 0.7336
Epoch 316/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2863 - accuracy: 0.7686 - val_loss: 0.8371 - val_accuracy: 0.7383
```

Epoch 317/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3272 - accuracy: 0.7506 - val_loss: 0.8723 - val_accuracy: 0.7710
Epoch 318/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3427 - accuracy: 0.7969 - val_loss: 0.8580 - val_accuracy: 0.7570
Epoch 319/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3270 - accuracy: 0.7738 - val_loss: 0.8847 - val_accuracy: 0.7664
Epoch 320/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3170 - accuracy: 0.7249 - val_loss: 0.8908 - val_accuracy: 0.7430
Epoch 321/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2985 - accuracy: 0.7815 - val_loss: 0.8732 - val_accuracy: 0.7290
Epoch 322/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3256 - accuracy: 0.7121 - val_loss: 0.8756 - val_accuracy: 0.7430
Epoch 323/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4002 - accuracy: 0.7044 - val_loss: 0.8674 - val_accuracy: 0.7336
Epoch 324/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2874 - accuracy: 0.7532 - val_loss: 0.8412 - val_accuracy: 0.7383
Epoch 325/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3781 - accuracy: 0.7172 - val_loss: 0.9327 - val_accuracy: 0.7336
Epoch 326/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3047 - accuracy: 0.7121 - val_loss: 0.8963 - val_accuracy: 0.7804
Epoch 327/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3127 - accuracy: 0.7044 - val_loss: 0.8997 - val_accuracy: 0.7757
Epoch 328/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3148 - accuracy: 0.6530 - val_loss: 0.9022 - val_accuracy: 0.7757
Epoch 329/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3491 - accuracy: 0.6864 - val_loss: 0.9254 - val_accuracy: 0.7804
Epoch 330/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3439 - accuracy: 0.7558 - val_loss: 0.8895 - val_accuracy: 0.7664
Epoch 331/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3178 - accuracy: 0.7069 - val_loss: 0.8837 - val_accuracy: 0.7523
Epoch 332/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3985 - accuracy: 0.6684 - val_loss: 0.8840 - val_accuracy: 0.7664
Epoch 333/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3660 - accuracy: 0.6941 - val_loss: 0.8944 - val_accuracy: 0.7617
Epoch 334/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2991 - accuracy: 0.7121 - val_loss: 0.8971 - val_accuracy: 0.7617
Epoch 335/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4468 - accuracy: 0.7198 - val_loss: 0.9633 - val_accuracy: 0.7570
Epoch 336/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3536 - accuracy: 0.7635 - val_loss: 0.9308 - val_accuracy: 0.7523
Epoch 337/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3520 - accuracy: 0.6581 - val_loss: 0.9410 - val_accuracy: 0.7290
Epoch 338/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3072 - accuracy: 0.7712 - val_loss: 0.9374 - val_accuracy: 0.7103
Epoch 339/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3153 - accuracy: 0.7121 - val_loss: 0.9346 - val_accuracy: 0.7150
Epoch 340/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3917 - accuracy: 0.7172 - val_loss: 0.9335 - val_accuracy: 0.6963
Epoch 341/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3349 - accuracy: 0.6375 - val_loss: 0.8334 - val_accuracy: 0.7196
Epoch 342/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2761 - accuracy: 0.7352 - val_loss: 0.9264 - val_accuracy: 0.7430
Epoch 343/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2952 - accuracy: 0.6941 - val_loss: 0.9324 - val_accuracy: 0.7243
Epoch 344/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2975 - accuracy: 0.6684 - val_loss: 0.9547 - val_accuracy: 0.7243
Epoch 345/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3182 - accuracy: 0.6710 - val_loss: 0.9331 - val_accuracy: 0.7150
Epoch 346/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2758 - accuracy: 0.6812 - val_loss: 0.9956 - val_accuracy: 0.7150

accuracy: 0.7383
Epoch 347/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3275 - accuracy: 0.6941 - val_loss: 1.0028 - val_accuracy: 0.7290
Epoch 348/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2857 - accuracy: 0.6812 - val_loss: 0.9895 - val_accuracy: 0.7430
Epoch 349/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3553 - accuracy: 0.7815 - val_loss: 0.9867 - val_accuracy: 0.7477
Epoch 350/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3284 - accuracy: 0.7763 - val_loss: 0.9644 - val_accuracy: 0.7617
Epoch 351/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2796 - accuracy: 0.7198 - val_loss: 0.8470 - val_accuracy: 0.7804
Epoch 352/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2685 - accuracy: 0.7506 - val_loss: 0.8474 - val_accuracy: 0.7664
Epoch 353/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2955 - accuracy: 0.7481 - val_loss: 0.8397 - val_accuracy: 0.7944
Epoch 354/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3610 - accuracy: 0.6761 - val_loss: 0.8440 - val_accuracy: 0.7804
Epoch 355/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3147 - accuracy: 0.7584 - val_loss: 0.8471 - val_accuracy: 0.7757
Epoch 356/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2951 - accuracy: 0.7224 - val_loss: 0.8172 - val_accuracy: 0.7850
Epoch 357/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2959 - accuracy: 0.7506 - val_loss: 0.8208 - val_accuracy: 0.7757
Epoch 358/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2974 - accuracy: 0.6581 - val_loss: 0.8149 - val_accuracy: 0.7804
Epoch 359/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2667 - accuracy: 0.7069 - val_loss: 0.7640 - val_accuracy: 0.7617
Epoch 360/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3950 - accuracy: 0.7172 - val_loss: 0.7883 - val_accuracy: 0.7664
Epoch 361/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3946 - accuracy: 0.6787 - val_loss: 0.7566 - val_accuracy: 0.7664
Epoch 362/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2706 - accuracy: 0.6967 - val_loss: 0.7704 - val_accuracy: 0.7664
Epoch 363/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3278 - accuracy: 0.6812 - val_loss: 0.7711 - val_accuracy: 0.7710
Epoch 364/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2719 - accuracy: 0.6401 - val_loss: 0.7689 - val_accuracy: 0.7710
Epoch 365/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3078 - accuracy: 0.6915 - val_loss: 0.7707 - val_accuracy: 0.7617
Epoch 366/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2724 - accuracy: 0.7018 - val_loss: 0.7803 - val_accuracy: 0.7570
Epoch 367/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3114 - accuracy: 0.6478 - val_loss: 0.8158 - val_accuracy: 0.7664
Epoch 368/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2724 - accuracy: 0.6915 - val_loss: 0.8038 - val_accuracy: 0.7430
Epoch 369/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3068 - accuracy: 0.6889 - val_loss: 0.7999 - val_accuracy: 0.7477
Epoch 370/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3129 - accuracy: 0.6427 - val_loss: 0.8795 - val_accuracy: 0.7991
Epoch 371/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3242 - accuracy: 0.7866 - val_loss: 0.8784 - val_accuracy: 0.7991
Epoch 372/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4092 - accuracy: 0.7892 - val_loss: 0.8522 - val_accuracy: 0.7991
Epoch 373/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3056 - accuracy: 0.7584 - val_loss: 0.8085 - val_accuracy: 0.7757
Epoch 374/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3012 - accuracy: 0.7481 - val_loss: 0.8115 - val_accuracy: 0.7850
Epoch 375/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2593 - accuracy: 0.7326 - val_loss: 0.8119 - val_accuracy: 0.7850
Epoch 376/1000

```
4/4 [=====] - 0s 17ms/step - loss: 0.3009 - accuracy: 0.7455 - val_loss: 0.7837 - val_accuracy: 0.7804
Epoch 377/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4242 - accuracy: 0.7224 - val_loss: 0.7822 - val_accuracy: 0.7664
Epoch 378/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2681 - accuracy: 0.7198 - val_loss: 0.7856 - val_accuracy: 0.7477
Epoch 379/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2670 - accuracy: 0.7198 - val_loss: 0.8134 - val_accuracy: 0.7477
Epoch 380/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2990 - accuracy: 0.7326 - val_loss: 0.7822 - val_accuracy: 0.7336
Epoch 381/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3113 - accuracy: 0.6684 - val_loss: 0.8373 - val_accuracy: 0.7290
Epoch 382/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3330 - accuracy: 0.6684 - val_loss: 0.8694 - val_accuracy: 0.7103
Epoch 383/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3324 - accuracy: 0.6787 - val_loss: 0.8757 - val_accuracy: 0.7056
Epoch 384/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2791 - accuracy: 0.6684 - val_loss: 0.8775 - val_accuracy: 0.7196
Epoch 385/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3253 - accuracy: 0.6658 - val_loss: 0.9032 - val_accuracy: 0.6776
Epoch 386/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3147 - accuracy: 0.6555 - val_loss: 0.9001 - val_accuracy: 0.6729
Epoch 387/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2708 - accuracy: 0.6555 - val_loss: 0.8787 - val_accuracy: 0.6916
Epoch 388/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2685 - accuracy: 0.6838 - val_loss: 0.9050 - val_accuracy: 0.6916
Epoch 389/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3136 - accuracy: 0.6118 - val_loss: 0.8687 - val_accuracy: 0.6355
Epoch 390/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2864 - accuracy: 0.6247 - val_loss: 0.8446 - val_accuracy: 0.6215
Epoch 391/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2573 - accuracy: 0.6093 - val_loss: 0.8979 - val_accuracy: 0.6215
Epoch 392/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3333 - accuracy: 0.6118 - val_loss: 0.8994 - val_accuracy: 0.6589
Epoch 393/1000
4/4 [=====] - 0s 18ms/step - loss: 0.3363 - accuracy: 0.6350 - val_loss: 0.9037 - val_accuracy: 0.6682
Epoch 394/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2679 - accuracy: 0.6170 - val_loss: 1.0120 - val_accuracy: 0.6822
Epoch 395/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3512 - accuracy: 0.6607 - val_loss: 1.0079 - val_accuracy: 0.6776
Epoch 396/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2801 - accuracy: 0.6504 - val_loss: 1.0410 - val_accuracy: 0.6869
Epoch 397/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2769 - accuracy: 0.7481 - val_loss: 1.0067 - val_accuracy: 0.7150
Epoch 398/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3523 - accuracy: 0.6530 - val_loss: 0.9969 - val_accuracy: 0.7009
Epoch 399/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3636 - accuracy: 0.7147 - val_loss: 1.0030 - val_accuracy: 0.7103
Epoch 400/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2894 - accuracy: 0.6761 - val_loss: 1.0105 - val_accuracy: 0.7290
Epoch 401/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2779 - accuracy: 0.6658 - val_loss: 1.0083 - val_accuracy: 0.6589
Epoch 402/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3221 - accuracy: 0.6298 - val_loss: 1.0107 - val_accuracy: 0.6355
Epoch 403/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2725 - accuracy: 0.6093 - val_loss: 0.9761 - val_accuracy: 0.6449
Epoch 404/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3100 - accuracy: 0.5861 - val_loss: 0.9535 - val_accuracy: 0.6589
Epoch 405/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3021 - accuracy: 0.5861 - val_loss: 0.9662 - val_accuracy: 0.6589
```

Epoch 406/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2825 - accuracy: 0.6221 - val_loss: 1.0196 - val_accuracy: 0.6449
Epoch 407/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4069 - accuracy: 0.6093 - val_loss: 0.9678 - val_accuracy: 0.6402
Epoch 408/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2593 - accuracy: 0.5938 - val_loss: 1.0202 - val_accuracy: 0.6215
Epoch 409/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3427 - accuracy: 0.5887 - val_loss: 0.9417 - val_accuracy: 0.6308
Epoch 410/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3199 - accuracy: 0.6015 - val_loss: 0.9354 - val_accuracy: 0.6636
Epoch 411/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3079 - accuracy: 0.6195 - val_loss: 0.9334 - val_accuracy: 0.6542
Epoch 412/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2639 - accuracy: 0.6504 - val_loss: 0.9332 - val_accuracy: 0.6682
Epoch 413/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3358 - accuracy: 0.6555 - val_loss: 0.9601 - val_accuracy: 0.6729
Epoch 414/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2763 - accuracy: 0.6375 - val_loss: 0.9907 - val_accuracy: 0.6589
Epoch 415/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2887 - accuracy: 0.6221 - val_loss: 0.9918 - val_accuracy: 0.6682
Epoch 416/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4049 - accuracy: 0.6504 - val_loss: 0.9679 - val_accuracy: 0.6963
Epoch 417/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3170 - accuracy: 0.6350 - val_loss: 0.9678 - val_accuracy: 0.6869
Epoch 418/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3469 - accuracy: 0.6247 - val_loss: 0.9857 - val_accuracy: 0.7009
Epoch 419/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3163 - accuracy: 0.6298 - val_loss: 0.9859 - val_accuracy: 0.7009
Epoch 420/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2744 - accuracy: 0.6504 - val_loss: 0.9712 - val_accuracy: 0.6869
Epoch 421/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3329 - accuracy: 0.6427 - val_loss: 0.9339 - val_accuracy: 0.6916
Epoch 422/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3398 - accuracy: 0.6992 - val_loss: 0.9083 - val_accuracy: 0.6869
Epoch 423/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3123 - accuracy: 0.6761 - val_loss: 0.8883 - val_accuracy: 0.7009
Epoch 424/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2894 - accuracy: 0.6941 - val_loss: 0.8873 - val_accuracy: 0.7056
Epoch 425/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3138 - accuracy: 0.6632 - val_loss: 0.8884 - val_accuracy: 0.7290
Epoch 426/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2951 - accuracy: 0.7198 - val_loss: 0.9359 - val_accuracy: 0.7196
Epoch 427/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3356 - accuracy: 0.7301 - val_loss: 1.0136 - val_accuracy: 0.7196
Epoch 428/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2741 - accuracy: 0.7404 - val_loss: 1.0390 - val_accuracy: 0.7336
Epoch 429/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3165 - accuracy: 0.7404 - val_loss: 1.0111 - val_accuracy: 0.7196
Epoch 430/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3114 - accuracy: 0.7147 - val_loss: 0.9860 - val_accuracy: 0.6963
Epoch 431/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2858 - accuracy: 0.7147 - val_loss: 0.9559 - val_accuracy: 0.6636
Epoch 432/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3344 - accuracy: 0.6710 - val_loss: 0.9291 - val_accuracy: 0.6729
Epoch 433/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2954 - accuracy: 0.7661 - val_loss: 0.9261 - val_accuracy: 0.6682
Epoch 434/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2666 - accuracy: 0.6350 - val_loss: 0.9458 - val_accuracy: 0.6402
Epoch 435/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2605 - accuracy: 0.6504 - val_loss: 0.9500 - val_accuracy: 0.6402

accuracy: 0.6542
Epoch 436/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2586 - accuracy: 0.6247 - val_loss: 0.9745 - val_accuracy: 0.6729
Epoch 437/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4837 - accuracy: 0.6452 - val_loss: 0.9411 - val_accuracy: 0.7196
Epoch 438/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3364 - accuracy: 0.6889 - val_loss: 0.9065 - val_accuracy: 0.6916
Epoch 439/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3500 - accuracy: 0.6941 - val_loss: 0.9160 - val_accuracy: 0.7243
Epoch 440/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3055 - accuracy: 0.7301 - val_loss: 0.9693 - val_accuracy: 0.7150
Epoch 441/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3579 - accuracy: 0.7352 - val_loss: 0.9199 - val_accuracy: 0.6682
Epoch 442/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3021 - accuracy: 0.7275 - val_loss: 0.9217 - val_accuracy: 0.6776
Epoch 443/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3509 - accuracy: 0.7018 - val_loss: 0.8975 - val_accuracy: 0.7009
Epoch 444/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3495 - accuracy: 0.7044 - val_loss: 0.9251 - val_accuracy: 0.7009
Epoch 445/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2597 - accuracy: 0.7712 - val_loss: 0.8976 - val_accuracy: 0.6869
Epoch 446/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2517 - accuracy: 0.7326 - val_loss: 0.9537 - val_accuracy: 0.6916
Epoch 447/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2912 - accuracy: 0.7481 - val_loss: 0.9517 - val_accuracy: 0.6963
Epoch 448/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2772 - accuracy: 0.7738 - val_loss: 0.9445 - val_accuracy: 0.7056
Epoch 449/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3200 - accuracy: 0.7352 - val_loss: 0.9487 - val_accuracy: 0.6963
Epoch 450/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3140 - accuracy: 0.7378 - val_loss: 0.9458 - val_accuracy: 0.6869
Epoch 451/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3019 - accuracy: 0.6710 - val_loss: 0.9403 - val_accuracy: 0.6776
Epoch 452/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2852 - accuracy: 0.6915 - val_loss: 0.9195 - val_accuracy: 0.6916
Epoch 453/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2821 - accuracy: 0.6941 - val_loss: 0.9538 - val_accuracy: 0.6869
Epoch 454/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3245 - accuracy: 0.6632 - val_loss: 0.9776 - val_accuracy: 0.6682
Epoch 455/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2989 - accuracy: 0.7069 - val_loss: 0.9510 - val_accuracy: 0.6869
Epoch 456/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2728 - accuracy: 0.7069 - val_loss: 0.9715 - val_accuracy: 0.7009
Epoch 457/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3591 - accuracy: 0.7018 - val_loss: 0.9702 - val_accuracy: 0.6963
Epoch 458/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2764 - accuracy: 0.7121 - val_loss: 0.9190 - val_accuracy: 0.6916
Epoch 459/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3104 - accuracy: 0.7326 - val_loss: 0.9116 - val_accuracy: 0.7009
Epoch 460/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2785 - accuracy: 0.7224 - val_loss: 0.9437 - val_accuracy: 0.7056
Epoch 461/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3060 - accuracy: 0.6838 - val_loss: 0.9204 - val_accuracy: 0.7103
Epoch 462/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2919 - accuracy: 0.7172 - val_loss: 0.9376 - val_accuracy: 0.7103
Epoch 463/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3089 - accuracy: 0.6941 - val_loss: 0.9421 - val_accuracy: 0.7150
Epoch 464/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2857 - accuracy: 0.7095 - val_loss: 0.9436 - val_accuracy: 0.7150
Epoch 465/1000

4/4 [=====] - 0s 12ms/step - loss: 0.2816 - accuracy: 0.7095 - val_loss: 0.9365 - val_accuracy: 0.6542
Epoch 466/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3779 - accuracy: 0.6632 - val_loss: 0.9451 - val_accuracy: 0.6308
Epoch 467/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2603 - accuracy: 0.7095 - val_loss: 0.9216 - val_accuracy: 0.6542
Epoch 468/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2575 - accuracy: 0.7095 - val_loss: 0.9188 - val_accuracy: 0.6636
Epoch 469/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3083 - accuracy: 0.7044 - val_loss: 0.9187 - val_accuracy: 0.6869
Epoch 470/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3362 - accuracy: 0.7301 - val_loss: 0.9198 - val_accuracy: 0.6916
Epoch 471/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2812 - accuracy: 0.7069 - val_loss: 0.9476 - val_accuracy: 0.6682
Epoch 472/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4137 - accuracy: 0.7198 - val_loss: 0.9472 - val_accuracy: 0.6963
Epoch 473/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3569 - accuracy: 0.7584 - val_loss: 0.9477 - val_accuracy: 0.6869
Epoch 474/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2786 - accuracy: 0.7352 - val_loss: 0.9502 - val_accuracy: 0.7056
Epoch 475/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3516 - accuracy: 0.7789 - val_loss: 0.9427 - val_accuracy: 0.7290
Epoch 476/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2867 - accuracy: 0.7661 - val_loss: 0.9694 - val_accuracy: 0.7336
Epoch 477/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3111 - accuracy: 0.7943 - val_loss: 0.9528 - val_accuracy: 0.7290
Epoch 478/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3379 - accuracy: 0.8175 - val_loss: 0.9776 - val_accuracy: 0.7430
Epoch 479/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3060 - accuracy: 0.7969 - val_loss: 0.9825 - val_accuracy: 0.7056
Epoch 480/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2720 - accuracy: 0.6838 - val_loss: 1.0075 - val_accuracy: 0.7336
Epoch 481/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2860 - accuracy: 0.7661 - val_loss: 0.9802 - val_accuracy: 0.7430
Epoch 482/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2787 - accuracy: 0.8123 - val_loss: 0.9805 - val_accuracy: 0.7336
Epoch 483/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3311 - accuracy: 0.7584 - val_loss: 1.0074 - val_accuracy: 0.7383
Epoch 484/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3567 - accuracy: 0.7866 - val_loss: 1.0136 - val_accuracy: 0.7430
Epoch 485/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2456 - accuracy: 0.7969 - val_loss: 0.9884 - val_accuracy: 0.7150
Epoch 486/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2845 - accuracy: 0.7532 - val_loss: 0.9581 - val_accuracy: 0.7103
Epoch 487/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2673 - accuracy: 0.6915 - val_loss: 0.9591 - val_accuracy: 0.7056
Epoch 488/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2846 - accuracy: 0.7584 - val_loss: 0.9353 - val_accuracy: 0.6822
Epoch 489/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2948 - accuracy: 0.7558 - val_loss: 1.0173 - val_accuracy: 0.6869
Epoch 490/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2762 - accuracy: 0.7018 - val_loss: 1.0043 - val_accuracy: 0.7009
Epoch 491/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2972 - accuracy: 0.7069 - val_loss: 1.0826 - val_accuracy: 0.7009
Epoch 492/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2668 - accuracy: 0.7352 - val_loss: 1.1103 - val_accuracy: 0.6963
Epoch 493/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2808 - accuracy: 0.8201 - val_loss: 0.9901 - val_accuracy: 0.7056
Epoch 494/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2983 - accuracy: 0.7481 - val_loss: 0.9343 - val_accuracy: 0.7523

Epoch 495/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2944 - accuracy: 0.8098 - val_loss: 1.0207 - val_accuracy: 0.7757
 Epoch 496/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.2846 - accuracy: 0.8278 - val_loss: 0.9936 - val_accuracy: 0.7804
 Epoch 497/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2329 - accuracy: 0.8072 - val_loss: 0.9953 - val_accuracy: 0.7804
 Epoch 498/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3984 - accuracy: 0.7995 - val_loss: 0.9521 - val_accuracy: 0.7850
 Epoch 499/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2567 - accuracy: 0.7892 - val_loss: 0.9511 - val_accuracy: 0.7804
 Epoch 500/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2511 - accuracy: 0.8149 - val_loss: 0.9267 - val_accuracy: 0.7804
 Epoch 501/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3148 - accuracy: 0.7969 - val_loss: 1.0027 - val_accuracy: 0.7664
 Epoch 502/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3516 - accuracy: 0.7301 - val_loss: 0.9961 - val_accuracy: 0.7710
 Epoch 503/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2589 - accuracy: 0.8406 - val_loss: 0.9902 - val_accuracy: 0.7710
 Epoch 504/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2369 - accuracy: 0.8201 - val_loss: 0.9895 - val_accuracy: 0.7757
 Epoch 505/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2781 - accuracy: 0.8021 - val_loss: 1.0190 - val_accuracy: 0.7710
 Epoch 506/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3204 - accuracy: 0.7918 - val_loss: 1.0200 - val_accuracy: 0.7850
 Epoch 507/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2931 - accuracy: 0.7943 - val_loss: 1.1116 - val_accuracy: 0.7710
 Epoch 508/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2787 - accuracy: 0.8175 - val_loss: 1.1105 - val_accuracy: 0.7710
 Epoch 509/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3172 - accuracy: 0.7738 - val_loss: 1.1096 - val_accuracy: 0.7710
 Epoch 510/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.2918 - accuracy: 0.7943 - val_loss: 1.1097 - val_accuracy: 0.7664
 Epoch 511/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2709 - accuracy: 0.7841 - val_loss: 1.1101 - val_accuracy: 0.7710
 Epoch 512/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2366 - accuracy: 0.7866 - val_loss: 1.1095 - val_accuracy: 0.7710
 Epoch 513/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3101 - accuracy: 0.8098 - val_loss: 1.1084 - val_accuracy: 0.7757
 Epoch 514/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2557 - accuracy: 0.7789 - val_loss: 1.1084 - val_accuracy: 0.7710
 Epoch 515/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2707 - accuracy: 0.8201 - val_loss: 1.1300 - val_accuracy: 0.7710
 Epoch 516/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2871 - accuracy: 0.8149 - val_loss: 1.1613 - val_accuracy: 0.7757
 Epoch 517/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3426 - accuracy: 0.7943 - val_loss: 1.1403 - val_accuracy: 0.7757
 Epoch 518/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2415 - accuracy: 0.8175 - val_loss: 1.1400 - val_accuracy: 0.7804
 Epoch 519/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.2643 - accuracy: 0.7866 - val_loss: 1.1375 - val_accuracy: 0.7850
 Epoch 520/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.2370 - accuracy: 0.8750 Restoring model weights from the end of the best epoch: 370.
 4/4 [=====] - 0s 14ms/step - loss: 0.2512 - accuracy: 0.8458 - val_loss: 1.1400 - val_accuracy: 0.7897
 Epoch 520: early stopping
 2/2 [=====] - 0s 5ms/step - loss: 0.7257 - accuracy: 0.7442
 [CV] ENDDense1=50, Dense2=10; total time= 24.9s
 Model: "sequential_46"

Layer (type)	Output Shape	Param #
dense_184 (Dense)	(None, 50)	350

batch_normalization_138 (Batch Normalization)	(None, 50)	200
activation_138 (Activation)	(None, 50)	0
dense_185 (Dense)	(None, 10)	510
batch_normalization_139 (Batch Normalization)	(None, 10)	40
activation_139 (Activation)	(None, 10)	0
dense_186 (Dense)	(None, 10)	110
batch_normalization_140 (Batch Normalization)	(None, 10)	40
activation_140 (Activation)	(None, 10)	0
dense_187 (Dense)	(None, 2)	22
<hr/>		
Total params:	1,272	
Trainable params:	1,132	
Non-trainable params:	140	
<hr/>		
Epoch 1/1000		
4/4 [=====]	- 2s 56ms/step - loss: 4.5924 - accuracy: 0.5681 - val_loss: 4.7490 - val_accuracy: 0.5888	
Epoch 2/1000		
4/4 [=====]	- 0s 14ms/step - loss: 3.0375 - accuracy: 0.4936 - val_loss: 3.3019 - val_accuracy: 0.6589	
Epoch 3/1000		
4/4 [=====]	- 0s 15ms/step - loss: 3.1475 - accuracy: 0.4936 - val_loss: 2.9969 - val_accuracy: 0.6963	
Epoch 4/1000		
4/4 [=====]	- 0s 12ms/step - loss: 2.5668 - accuracy: 0.4884 - val_loss: 2.8233 - val_accuracy: 0.6028	
Epoch 5/1000		
4/4 [=====]	- 0s 13ms/step - loss: 2.4831 - accuracy: 0.6093 - val_loss: 2.6526 - val_accuracy: 0.6822	
Epoch 6/1000		
4/4 [=====]	- 0s 13ms/step - loss: 2.3411 - accuracy: 0.6889 - val_loss: 2.5512 - val_accuracy: 0.6776	
Epoch 7/1000		
4/4 [=====]	- 0s 13ms/step - loss: 2.2865 - accuracy: 0.6041 - val_loss: 2.4333 - val_accuracy: 0.6729	
Epoch 8/1000		
4/4 [=====]	- 0s 14ms/step - loss: 2.2738 - accuracy: 0.6735 - val_loss: 2.3690 - val_accuracy: 0.6776	
Epoch 9/1000		
4/4 [=====]	- 0s 13ms/step - loss: 2.1801 - accuracy: 0.5784 - val_loss: 2.2781 - val_accuracy: 0.4486	
Epoch 10/1000		
4/4 [=====]	- 0s 13ms/step - loss: 2.1217 - accuracy: 0.4961 - val_loss: 2.1833 - val_accuracy: 0.4579	
Epoch 11/1000		
4/4 [=====]	- 0s 14ms/step - loss: 2.1211 - accuracy: 0.4910 - val_loss: 2.1123 - val_accuracy: 0.4579	
Epoch 12/1000		
4/4 [=====]	- 0s 13ms/step - loss: 2.0461 - accuracy: 0.5090 - val_loss: 2.0587 - val_accuracy: 0.4533	
Epoch 13/1000		
4/4 [=====]	- 0s 13ms/step - loss: 1.9888 - accuracy: 0.4936 - val_loss: 2.0241 - val_accuracy: 0.4486	
Epoch 14/1000		
4/4 [=====]	- 0s 14ms/step - loss: 1.8427 - accuracy: 0.4961 - val_loss: 1.9950 - val_accuracy: 0.4486	
Epoch 15/1000		
4/4 [=====]	- 0s 13ms/step - loss: 1.8877 - accuracy: 0.5141 - val_loss: 1.9679 - val_accuracy: 0.4533	
Epoch 16/1000		
4/4 [=====]	- 0s 15ms/step - loss: 1.7290 - accuracy: 0.4987 - val_loss: 1.8866 - val_accuracy: 0.4579	
Epoch 17/1000		
4/4 [=====]	- 0s 13ms/step - loss: 1.8199 - accuracy: 0.5039 - val_loss: 1.8539 - val_accuracy: 0.4579	
Epoch 18/1000		
4/4 [=====]	- 0s 12ms/step - loss: 1.6898 - accuracy: 0.4987 - val_loss: 1.8225 - val_accuracy: 0.4673	
Epoch 19/1000		
4/4 [=====]	- 0s 13ms/step - loss: 1.6864 - accuracy: 0.4884 - val_loss: 1.8018 - val_accuracy: 0.4673	
Epoch 20/1000		
4/4 [=====]	- 0s 12ms/step - loss: 1.6492 - accuracy: 0.4859 - val_loss: 1.7774 - val_accuracy: 0.4579	
Epoch 21/1000		
4/4 [=====]	- 0s 12ms/step - loss: 1.5723 - accuracy: 0.4936 - val_loss: 1.7354 - val_accuracy: 0.6729	

Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4906 - accuracy: 0.6787 - val_loss: 1.6787 - val_accuracy: 0.4626
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4498 - accuracy: 0.4859 - val_loss: 1.6562 - val_accuracy: 0.4533
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4586 - accuracy: 0.5039 - val_loss: 1.6313 - val_accuracy: 0.4533
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4129 - accuracy: 0.4987 - val_loss: 1.6065 - val_accuracy: 0.6542
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3462 - accuracy: 0.5990 - val_loss: 1.5978 - val_accuracy: 0.4393
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3216 - accuracy: 0.4807 - val_loss: 1.5868 - val_accuracy: 0.4439
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2976 - accuracy: 0.4859 - val_loss: 1.5515 - val_accuracy: 0.4486
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3203 - accuracy: 0.5064 - val_loss: 1.5441 - val_accuracy: 0.4439
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2745 - accuracy: 0.5090 - val_loss: 1.5318 - val_accuracy: 0.4533
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2521 - accuracy: 0.4910 - val_loss: 1.5441 - val_accuracy: 0.4533
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2485 - accuracy: 0.5116 - val_loss: 1.5111 - val_accuracy: 0.4533
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1843 - accuracy: 0.5013 - val_loss: 1.4985 - val_accuracy: 0.4533
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2440 - accuracy: 0.4884 - val_loss: 1.4865 - val_accuracy: 0.4533
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2349 - accuracy: 0.4679 - val_loss: 1.4755 - val_accuracy: 0.4533
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1451 - accuracy: 0.5064 - val_loss: 1.4398 - val_accuracy: 0.4533
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1887 - accuracy: 0.4936 - val_loss: 1.4180 - val_accuracy: 0.4579
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1863 - accuracy: 0.4936 - val_loss: 1.4095 - val_accuracy: 0.4533
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1115 - accuracy: 0.4961 - val_loss: 1.4242 - val_accuracy: 0.4579
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1027 - accuracy: 0.4987 - val_loss: 1.4127 - val_accuracy: 0.4579
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1082 - accuracy: 0.4961 - val_loss: 1.4034 - val_accuracy: 0.4626
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0596 - accuracy: 0.4961 - val_loss: 1.3945 - val_accuracy: 0.4579
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0670 - accuracy: 0.4961 - val_loss: 1.3848 - val_accuracy: 0.4579
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1285 - accuracy: 0.4781 - val_loss: 1.3557 - val_accuracy: 0.4626
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0399 - accuracy: 0.4781 - val_loss: 1.3605 - val_accuracy: 0.4673
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0775 - accuracy: 0.5039 - val_loss: 1.3263 - val_accuracy: 0.4626
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0466 - accuracy: 0.4884 - val_loss: 1.3092 - val_accuracy: 0.4626
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0138 - accuracy: 0.4859 - val_loss: 1.2956 - val_accuracy: 0.4579
Epoch 49/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0059 - accuracy: 0.4859 - val_loss: 1.2819 - val_accuracy: 0.4533
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0299 - accuracy: 0.4781 - val_loss: 1.2717 - val_accuracy: 0.4533
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0506 - accuracy: 0.5039 - val_loss: 1.2582 - val_accuracy: 0.4533

```
accuracy: 0.4533
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0000 - accuracy: 0.4884 - val_loss: 1.2456 - val_accuracy: 0.4486
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9474 - accuracy: 0.4910 - val_loss: 1.2358 - val_accuracy: 0.4393
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0472 - accuracy: 0.4807 - val_loss: 1.2243 - val_accuracy: 0.4346
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9368 - accuracy: 0.4859 - val_loss: 1.2099 - val_accuracy: 0.4299
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8773 - accuracy: 0.4807 - val_loss: 1.1932 - val_accuracy: 0.4346
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9019 - accuracy: 0.4961 - val_loss: 1.1826 - val_accuracy: 0.4346
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9240 - accuracy: 0.5141 - val_loss: 1.1658 - val_accuracy: 0.4346
Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8810 - accuracy: 0.5090 - val_loss: 1.1507 - val_accuracy: 0.4346
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7903 - accuracy: 0.5476 - val_loss: 1.1426 - val_accuracy: 0.4299
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8026 - accuracy: 0.6093 - val_loss: 1.1295 - val_accuracy: 0.4299
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7610 - accuracy: 0.5604 - val_loss: 1.0848 - val_accuracy: 0.4346
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7495 - accuracy: 0.6067 - val_loss: 1.0962 - val_accuracy: 0.4252
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7571 - accuracy: 0.6067 - val_loss: 1.0611 - val_accuracy: 0.4299
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7389 - accuracy: 0.6170 - val_loss: 1.0394 - val_accuracy: 0.4393
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7192 - accuracy: 0.6247 - val_loss: 1.0260 - val_accuracy: 0.4346
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7271 - accuracy: 0.6041 - val_loss: 1.0230 - val_accuracy: 0.4346
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7095 - accuracy: 0.6221 - val_loss: 1.0067 - val_accuracy: 0.4346
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7087 - accuracy: 0.6272 - val_loss: 0.9947 - val_accuracy: 0.4346
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6962 - accuracy: 0.5861 - val_loss: 0.9805 - val_accuracy: 0.4346
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6479 - accuracy: 0.6195 - val_loss: 0.9744 - val_accuracy: 0.4393
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6196 - accuracy: 0.6427 - val_loss: 0.9710 - val_accuracy: 0.4393
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6649 - accuracy: 0.6195 - val_loss: 0.9503 - val_accuracy: 0.4393
Epoch 74/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6957 - accuracy: 0.6298 - val_loss: 0.9398 - val_accuracy: 0.4393
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5947 - accuracy: 0.6684 - val_loss: 0.9271 - val_accuracy: 0.4439
Epoch 76/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6057 - accuracy: 0.6530 - val_loss: 0.8943 - val_accuracy: 0.4393
Epoch 77/1000
4/4 [=====] - 0s 21ms/step - loss: 0.6537 - accuracy: 0.6478 - val_loss: 0.9198 - val_accuracy: 0.4486
Epoch 78/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5764 - accuracy: 0.6555 - val_loss: 0.9166 - val_accuracy: 0.4486
Epoch 79/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5898 - accuracy: 0.6581 - val_loss: 0.9120 - val_accuracy: 0.4486
Epoch 80/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5847 - accuracy: 0.6504 - val_loss: 0.9018 - val_accuracy: 0.4533
Epoch 81/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 0.5432 - accuracy: 0.7044 - val_loss: 0.8927 - val_accuracy: 0.4533
Epoch 82/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5847 - accuracy: 0.6761 - val_loss: 0.8839 - val_accuracy: 0.4533
Epoch 83/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5646 - accuracy: 0.6915 - val_loss: 0.8790 - val_accuracy: 0.4486
Epoch 84/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5355 - accuracy: 0.6787 - val_loss: 0.8709 - val_accuracy: 0.4486
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5716 - accuracy: 0.6838 - val_loss: 0.8606 - val_accuracy: 0.4626
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6707 - accuracy: 0.6838 - val_loss: 0.8240 - val_accuracy: 0.4626
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5520 - accuracy: 0.6992 - val_loss: 0.8439 - val_accuracy: 0.4626
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5431 - accuracy: 0.6838 - val_loss: 0.8735 - val_accuracy: 0.4579
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5480 - accuracy: 0.6530 - val_loss: 0.8716 - val_accuracy: 0.4579
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5374 - accuracy: 0.6710 - val_loss: 0.8713 - val_accuracy: 0.4626
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5768 - accuracy: 0.6812 - val_loss: 0.8632 - val_accuracy: 0.4579
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5990 - accuracy: 0.7044 - val_loss: 0.8440 - val_accuracy: 0.4673
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5750 - accuracy: 0.6915 - val_loss: 0.8346 - val_accuracy: 0.4720
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5767 - accuracy: 0.6941 - val_loss: 0.8334 - val_accuracy: 0.4673
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5418 - accuracy: 0.6992 - val_loss: 0.8215 - val_accuracy: 0.4813
Epoch 96/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5367 - accuracy: 0.7018 - val_loss: 0.8117 - val_accuracy: 0.4813
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5473 - accuracy: 0.7018 - val_loss: 0.8060 - val_accuracy: 0.4766
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5400 - accuracy: 0.7429 - val_loss: 0.7479 - val_accuracy: 0.4766
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5771 - accuracy: 0.7121 - val_loss: 0.7618 - val_accuracy: 0.4720
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5759 - accuracy: 0.7224 - val_loss: 0.7646 - val_accuracy: 0.4813
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5052 - accuracy: 0.7275 - val_loss: 0.7532 - val_accuracy: 0.4766
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5265 - accuracy: 0.7275 - val_loss: 0.7475 - val_accuracy: 0.4720
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5099 - accuracy: 0.7378 - val_loss: 0.7035 - val_accuracy: 0.4766
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5218 - accuracy: 0.7301 - val_loss: 0.6975 - val_accuracy: 0.4766
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4319 - accuracy: 0.7455 - val_loss: 0.6893 - val_accuracy: 0.4813
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4733 - accuracy: 0.7224 - val_loss: 0.6809 - val_accuracy: 0.4813
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5515 - accuracy: 0.7275 - val_loss: 0.6733 - val_accuracy: 0.5093
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5259 - accuracy: 0.7378 - val_loss: 0.6700 - val_accuracy: 0.5047
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5431 - accuracy: 0.7609 - val_loss: 0.6909 - val_accuracy: 0.5327
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4899 - accuracy: 0.7763 - val_loss: 0.6550 - val_accuracy: 0.5374
```

Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5745 - accuracy: 0.7763 - val_loss: 0.6510 - val_accuracy: 0.5467
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5545 - accuracy: 0.7558 - val_loss: 0.6733 - val_accuracy: 0.5654
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4999 - accuracy: 0.7712 - val_loss: 0.6489 - val_accuracy: 0.7290
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4597 - accuracy: 0.7738 - val_loss: 0.6454 - val_accuracy: 0.7196
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4447 - accuracy: 0.7866 - val_loss: 0.6402 - val_accuracy: 0.7150
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4803 - accuracy: 0.7738 - val_loss: 0.6385 - val_accuracy: 0.7196
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4466 - accuracy: 0.7763 - val_loss: 0.6372 - val_accuracy: 0.7009
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4702 - accuracy: 0.7584 - val_loss: 0.6342 - val_accuracy: 0.7150
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4494 - accuracy: 0.7686 - val_loss: 0.6375 - val_accuracy: 0.7056
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4710 - accuracy: 0.7584 - val_loss: 0.6343 - val_accuracy: 0.6916
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5080 - accuracy: 0.7455 - val_loss: 0.6360 - val_accuracy: 0.7103
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4747 - accuracy: 0.7789 - val_loss: 0.6369 - val_accuracy: 0.7150
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5460 - accuracy: 0.7635 - val_loss: 0.6376 - val_accuracy: 0.7009
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4416 - accuracy: 0.7763 - val_loss: 0.6261 - val_accuracy: 0.7009
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4662 - accuracy: 0.7429 - val_loss: 0.6288 - val_accuracy: 0.7009
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4850 - accuracy: 0.7686 - val_loss: 0.6354 - val_accuracy: 0.7056
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4794 - accuracy: 0.7609 - val_loss: 0.6374 - val_accuracy: 0.7056
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4407 - accuracy: 0.7661 - val_loss: 0.6345 - val_accuracy: 0.7009
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4854 - accuracy: 0.7635 - val_loss: 0.6429 - val_accuracy: 0.7009
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4713 - accuracy: 0.7712 - val_loss: 0.6661 - val_accuracy: 0.7056
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4915 - accuracy: 0.7763 - val_loss: 0.6933 - val_accuracy: 0.7056
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4342 - accuracy: 0.7918 - val_loss: 0.7192 - val_accuracy: 0.7150
Epoch 133/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4458 - accuracy: 0.7815 - val_loss: 0.7158 - val_accuracy: 0.7196
Epoch 134/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5069 - accuracy: 0.7866 - val_loss: 0.7375 - val_accuracy: 0.7196
Epoch 135/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4411 - accuracy: 0.7892 - val_loss: 0.7381 - val_accuracy: 0.7196
Epoch 136/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5130 - accuracy: 0.7866 - val_loss: 0.7400 - val_accuracy: 0.7103
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4841 - accuracy: 0.7712 - val_loss: 0.7394 - val_accuracy: 0.7196
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4650 - accuracy: 0.8021 - val_loss: 0.7408 - val_accuracy: 0.7103
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4522 - accuracy: 0.7712 - val_loss: 0.7198 - val_accuracy: 0.7056
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4428 - accuracy: 0.7841 - val_loss: 0.7446 - val_accuracy: 0.7196

```
accuracy: 0.7056
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5108 - accuracy: 0.7815 - val_loss: 0.7351 - val_accuracy: 0.7103
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4615 - accuracy: 0.7866 - val_loss: 0.7030 - val_accuracy: 0.7196
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4757 - accuracy: 0.7918 - val_loss: 0.7021 - val_accuracy: 0.7009
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4460 - accuracy: 0.7686 - val_loss: 0.7214 - val_accuracy: 0.7056
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4886 - accuracy: 0.7738 - val_loss: 0.7201 - val_accuracy: 0.7103
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4699 - accuracy: 0.7789 - val_loss: 0.7214 - val_accuracy: 0.7056
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4206 - accuracy: 0.7686 - val_loss: 0.7182 - val_accuracy: 0.7150
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4730 - accuracy: 0.7763 - val_loss: 0.7157 - val_accuracy: 0.7290
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4253 - accuracy: 0.7892 - val_loss: 0.7204 - val_accuracy: 0.6869
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4987 - accuracy: 0.7481 - val_loss: 0.7179 - val_accuracy: 0.6916
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4242 - accuracy: 0.7789 - val_loss: 0.7161 - val_accuracy: 0.7009
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4710 - accuracy: 0.7609 - val_loss: 0.7135 - val_accuracy: 0.7103
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4282 - accuracy: 0.7866 - val_loss: 0.7121 - val_accuracy: 0.7150
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4895 - accuracy: 0.7763 - val_loss: 0.7128 - val_accuracy: 0.7150
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4735 - accuracy: 0.7815 - val_loss: 0.7126 - val_accuracy: 0.7150
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4187 - accuracy: 0.7738 - val_loss: 0.7130 - val_accuracy: 0.7150
Epoch 157/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4053 - accuracy: 0.7635 - val_loss: 0.7154 - val_accuracy: 0.7150
Epoch 158/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4924 - accuracy: 0.7686 - val_loss: 0.7109 - val_accuracy: 0.7103
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5069 - accuracy: 0.7738 - val_loss: 0.7170 - val_accuracy: 0.6963
Epoch 160/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4210 - accuracy: 0.7763 - val_loss: 0.7164 - val_accuracy: 0.7009
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4640 - accuracy: 0.7661 - val_loss: 0.7155 - val_accuracy: 0.7056
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4443 - accuracy: 0.7763 - val_loss: 0.7107 - val_accuracy: 0.7103
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4053 - accuracy: 0.7635 - val_loss: 0.7148 - val_accuracy: 0.7196
Epoch 164/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4050 - accuracy: 0.7558 - val_loss: 0.7350 - val_accuracy: 0.7196
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4390 - accuracy: 0.7686 - val_loss: 0.7346 - val_accuracy: 0.7196
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4155 - accuracy: 0.8046 - val_loss: 0.7301 - val_accuracy: 0.7243
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4044 - accuracy: 0.7661 - val_loss: 0.7034 - val_accuracy: 0.7103
Epoch 168/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4472 - accuracy: 0.7558 - val_loss: 0.7034 - val_accuracy: 0.6963
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4889 - accuracy: 0.7763 - val_loss: 0.7037 - val_accuracy: 0.7056
Epoch 170/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.4203 - accuracy: 0.7763 - val_loss: 0.7366 - val_accuracy: 0.7056
Epoch 171/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4009 - accuracy: 0.7815 - val_loss: 0.7009 - val_accuracy: 0.7056
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3995 - accuracy: 0.7686 - val_loss: 0.7566 - val_accuracy: 0.7009
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4472 - accuracy: 0.7841 - val_loss: 0.7812 - val_accuracy: 0.7150
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4309 - accuracy: 0.7866 - val_loss: 0.8352 - val_accuracy: 0.7196
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4491 - accuracy: 0.7712 - val_loss: 0.8161 - val_accuracy: 0.7056
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3889 - accuracy: 0.7969 - val_loss: 0.8518 - val_accuracy: 0.6963
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4381 - accuracy: 0.7738 - val_loss: 0.8629 - val_accuracy: 0.6963
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4539 - accuracy: 0.7789 - val_loss: 0.8656 - val_accuracy: 0.7009
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4862 - accuracy: 0.7584 - val_loss: 0.7824 - val_accuracy: 0.6963
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4238 - accuracy: 0.7763 - val_loss: 0.7783 - val_accuracy: 0.6869
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3896 - accuracy: 0.7789 - val_loss: 0.7743 - val_accuracy: 0.6963
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4247 - accuracy: 0.7738 - val_loss: 0.8543 - val_accuracy: 0.7103
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4354 - accuracy: 0.7661 - val_loss: 0.8634 - val_accuracy: 0.6963
Epoch 184/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3893 - accuracy: 0.7635 - val_loss: 0.8356 - val_accuracy: 0.7103
Epoch 185/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4438 - accuracy: 0.7866 - val_loss: 0.8112 - val_accuracy: 0.6963
Epoch 186/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3759 - accuracy: 0.7789 - val_loss: 0.7999 - val_accuracy: 0.7009
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4679 - accuracy: 0.7763 - val_loss: 0.8268 - val_accuracy: 0.7056
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3747 - accuracy: 0.7892 - val_loss: 0.8613 - val_accuracy: 0.7009
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3947 - accuracy: 0.8123 - val_loss: 0.9167 - val_accuracy: 0.7103
Epoch 190/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4321 - accuracy: 0.7661 - val_loss: 0.8900 - val_accuracy: 0.7243
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3973 - accuracy: 0.7866 - val_loss: 0.8334 - val_accuracy: 0.7290
Epoch 192/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4440 - accuracy: 0.7609 - val_loss: 0.8030 - val_accuracy: 0.7383
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3997 - accuracy: 0.7532 - val_loss: 0.8329 - val_accuracy: 0.7196
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3861 - accuracy: 0.7584 - val_loss: 0.8182 - val_accuracy: 0.7009
Epoch 195/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4078 - accuracy: 0.7558 - val_loss: 0.7908 - val_accuracy: 0.7009
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4317 - accuracy: 0.7378 - val_loss: 0.7991 - val_accuracy: 0.7243
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3752 - accuracy: 0.7481 - val_loss: 0.8362 - val_accuracy: 0.7103
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3902 - accuracy: 0.7661 - val_loss: 0.8942 - val_accuracy: 0.7150
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4219 - accuracy: 0.7455 - val_loss: 0.9200 - val_accuracy: 0.7290
```

```
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3946 - accuracy: 0.7558 - val_loss: 0.9157 - val_accuracy: 0.7009
Epoch 201/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3514 - accuracy: 0.8021 - val_loss: 0.8905 - val_accuracy: 0.7009
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4057 - accuracy: 0.7095 - val_loss: 0.9374 - val_accuracy: 0.6916
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3899 - accuracy: 0.8021 - val_loss: 0.9071 - val_accuracy: 0.6869
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4258 - accuracy: 0.7558 - val_loss: 0.9299 - val_accuracy: 0.7009
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4455 - accuracy: 0.7943 - val_loss: 0.8215 - val_accuracy: 0.6215
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3532 - accuracy: 0.7455 - val_loss: 0.8794 - val_accuracy: 0.5935
Epoch 207/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3580 - accuracy: 0.6967 - val_loss: 0.8978 - val_accuracy: 0.6822
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3744 - accuracy: 0.7455 - val_loss: 0.8938 - val_accuracy: 0.6916
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4464 - accuracy: 0.7532 - val_loss: 0.8924 - val_accuracy: 0.6963
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3397 - accuracy: 0.7249 - val_loss: 0.8941 - val_accuracy: 0.6916
Epoch 211/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3609 - accuracy: 0.7609 - val_loss: 0.8922 - val_accuracy: 0.6916
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3824 - accuracy: 0.7455 - val_loss: 0.8662 - val_accuracy: 0.7056
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4677 - accuracy: 0.7301 - val_loss: 0.8718 - val_accuracy: 0.7196
Epoch 214/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4051 - accuracy: 0.7532 - val_loss: 0.8742 - val_accuracy: 0.7196
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3984 - accuracy: 0.7301 - val_loss: 0.9235 - val_accuracy: 0.7150
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3470 - accuracy: 0.7635 - val_loss: 0.8880 - val_accuracy: 0.7056
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4560 - accuracy: 0.7558 - val_loss: 0.8632 - val_accuracy: 0.7150
Epoch 218/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4142 - accuracy: 0.7506 - val_loss: 0.8812 - val_accuracy: 0.6963
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4610 - accuracy: 0.8098 - val_loss: 0.8792 - val_accuracy: 0.6963
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3474 - accuracy: 0.7301 - val_loss: 0.9030 - val_accuracy: 0.7103
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3582 - accuracy: 0.7404 - val_loss: 0.8547 - val_accuracy: 0.6776
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3737 - accuracy: 0.8021 - val_loss: 0.8518 - val_accuracy: 0.6776
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3941 - accuracy: 0.7429 - val_loss: 0.7975 - val_accuracy: 0.6869
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3579 - accuracy: 0.7506 - val_loss: 0.8054 - val_accuracy: 0.7056
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3470 - accuracy: 0.7712 - val_loss: 0.8025 - val_accuracy: 0.7056
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4075 - accuracy: 0.7995 - val_loss: 0.7999 - val_accuracy: 0.7056
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3555 - accuracy: 0.7352 - val_loss: 0.8533 - val_accuracy: 0.6355
Epoch 228/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4407 - accuracy: 0.6992 - val_loss: 0.8561 - val_accuracy: 0.7009
Epoch 229/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3717 - accuracy: 0.7481 - val_loss: 0.8831 - val_accuracy: 0.7009
```

```
accuracy: 0.6822
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3541 - accuracy: 0.7249 - val_loss: 0.9101 - val_accuracy: 0.7009
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3914 - accuracy: 0.7609 - val_loss: 0.8738 - val_accuracy: 0.7150
Epoch 232/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3422 - accuracy: 0.7918 - val_loss: 0.9074 - val_accuracy: 0.7243
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3710 - accuracy: 0.7609 - val_loss: 0.8766 - val_accuracy: 0.7150
Epoch 234/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3677 - accuracy: 0.7172 - val_loss: 0.8746 - val_accuracy: 0.7196
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3904 - accuracy: 0.7147 - val_loss: 0.9023 - val_accuracy: 0.7336
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4111 - accuracy: 0.7198 - val_loss: 0.8757 - val_accuracy: 0.7150
Epoch 237/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4139 - accuracy: 0.7044 - val_loss: 0.8619 - val_accuracy: 0.7056
Epoch 238/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3915 - accuracy: 0.7275 - val_loss: 0.8568 - val_accuracy: 0.7009
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3342 - accuracy: 0.6632 - val_loss: 0.7948 - val_accuracy: 0.6776
Epoch 240/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3693 - accuracy: 0.7301 - val_loss: 0.8025 - val_accuracy: 0.6822
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3149 - accuracy: 0.6787 - val_loss: 0.7089 - val_accuracy: 0.6822
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4171 - accuracy: 0.6530 - val_loss: 0.7377 - val_accuracy: 0.6916
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3442 - accuracy: 0.7198 - val_loss: 0.7400 - val_accuracy: 0.6682
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4237 - accuracy: 0.7069 - val_loss: 0.7693 - val_accuracy: 0.6729
Epoch 245/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4137 - accuracy: 0.6889 - val_loss: 0.8318 - val_accuracy: 0.6776
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4527 - accuracy: 0.7969 - val_loss: 0.8592 - val_accuracy: 0.6869
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4270 - accuracy: 0.7404 - val_loss: 0.7548 - val_accuracy: 0.6916
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3439 - accuracy: 0.7841 - val_loss: 0.7243 - val_accuracy: 0.6916
Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3723 - accuracy: 0.7943 - val_loss: 0.7139 - val_accuracy: 0.6869
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3836 - accuracy: 0.7841 - val_loss: 0.7165 - val_accuracy: 0.6729
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3518 - accuracy: 0.7763 - val_loss: 0.7237 - val_accuracy: 0.6262
Epoch 252/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3423 - accuracy: 0.7661 - val_loss: 0.7170 - val_accuracy: 0.6402
Epoch 253/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3260 - accuracy: 0.7661 - val_loss: 0.7196 - val_accuracy: 0.6589
Epoch 254/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3849 - accuracy: 0.7455 - val_loss: 0.7070 - val_accuracy: 0.6729
Epoch 255/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4081 - accuracy: 0.7095 - val_loss: 0.7229 - val_accuracy: 0.6822
Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3577 - accuracy: 0.7301 - val_loss: 0.7070 - val_accuracy: 0.6963
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3411 - accuracy: 0.7712 - val_loss: 0.7657 - val_accuracy: 0.6869
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3716 - accuracy: 0.7455 - val_loss: 0.7336 - val_accuracy: 0.6822
Epoch 259/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3415 - accuracy: 0.7918 - val_loss: 0.7364 - val_accuracy: 0.6776
Epoch 260/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4252 - accuracy: 0.7815 - val_loss: 0.7329 - val_accuracy: 0.6822
Epoch 261/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4416 - accuracy: 0.7943 - val_loss: 0.7294 - val_accuracy: 0.7009
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3277 - accuracy: 0.8123 - val_loss: 0.7298 - val_accuracy: 0.7009
Epoch 263/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3523 - accuracy: 0.8098 - val_loss: 0.7012 - val_accuracy: 0.6916
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3414 - accuracy: 0.8046 - val_loss: 0.6943 - val_accuracy: 0.6916
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3765 - accuracy: 0.7686 - val_loss: 0.6915 - val_accuracy: 0.6916
Epoch 266/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3328 - accuracy: 0.8098 - val_loss: 0.7007 - val_accuracy: 0.6963
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3272 - accuracy: 0.7866 - val_loss: 0.7327 - val_accuracy: 0.7009
Epoch 268/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3369 - accuracy: 0.7918 - val_loss: 0.7575 - val_accuracy: 0.6963
Epoch 269/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4213 - accuracy: 0.7815 - val_loss: 0.7835 - val_accuracy: 0.6963
Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3700 - accuracy: 0.8072 - val_loss: 0.7749 - val_accuracy: 0.6636
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3857 - accuracy: 0.7892 - val_loss: 0.8083 - val_accuracy: 0.6869
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4491 - accuracy: 0.7455 - val_loss: 0.8082 - val_accuracy: 0.6776
Epoch 273/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3396 - accuracy: 0.7995 - val_loss: 0.8105 - val_accuracy: 0.6916
Epoch 274/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4849 - accuracy: 0.7841 - val_loss: 0.8340 - val_accuracy: 0.6916
Epoch 275/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3212 - accuracy: 0.8021 - val_loss: 0.8378 - val_accuracy: 0.6963
Epoch 276/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4382 - accuracy: 0.7995 - val_loss: 0.8331 - val_accuracy: 0.7009
Epoch 277/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3407 - accuracy: 0.7712 - val_loss: 0.8103 - val_accuracy: 0.7103
Epoch 278/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3869 - accuracy: 0.7918 - val_loss: 0.8364 - val_accuracy: 0.7009
Epoch 279/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4291 - accuracy: 0.7841 - val_loss: 0.8348 - val_accuracy: 0.6963
Epoch 280/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3190 - accuracy: 0.8175 - val_loss: 0.8382 - val_accuracy: 0.7056
Epoch 281/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4951 - accuracy: 0.7995 - val_loss: 0.8350 - val_accuracy: 0.7103
Epoch 282/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3178 - accuracy: 0.7969 - val_loss: 0.8377 - val_accuracy: 0.7243
Epoch 283/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5693 - accuracy: 0.7943 - val_loss: 0.8116 - val_accuracy: 0.7336
Epoch 284/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3701 - accuracy: 0.7995 - val_loss: 0.7676 - val_accuracy: 0.7290
Epoch 285/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4010 - accuracy: 0.7943 - val_loss: 0.7732 - val_accuracy: 0.7336
Epoch 286/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3361 - accuracy: 0.8072 - val_loss: 0.8065 - val_accuracy: 0.7430
Epoch 287/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3336 - accuracy: 0.7841 - val_loss: 0.8274 - val_accuracy: 0.7383
Epoch 288/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3377 - accuracy: 0.7995 - val_loss: 0.8238 - val_accuracy: 0.7290
```

Epoch 289/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4072 - accuracy: 0.8021 - val_loss: 0.8488 - val_accuracy: 0.7336
Epoch 290/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4053 - accuracy: 0.8123 - val_loss: 0.8356 - val_accuracy: 0.7196
Epoch 291/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4375 - accuracy: 0.8046 - val_loss: 0.8145 - val_accuracy: 0.7243
Epoch 292/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3890 - accuracy: 0.8021 - val_loss: 0.8064 - val_accuracy: 0.7103
Epoch 293/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4337 - accuracy: 0.7841 - val_loss: 0.8052 - val_accuracy: 0.7196
Epoch 294/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3173 - accuracy: 0.7789 - val_loss: 0.8032 - val_accuracy: 0.7150
Epoch 295/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3359 - accuracy: 0.8046 - val_loss: 0.7819 - val_accuracy: 0.7103
Epoch 296/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3670 - accuracy: 0.7712 - val_loss: 0.7929 - val_accuracy: 0.7243
Epoch 297/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3956 - accuracy: 0.7918 - val_loss: 0.8234 - val_accuracy: 0.7196
Epoch 298/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3529 - accuracy: 0.7866 - val_loss: 0.7844 - val_accuracy: 0.7243
Epoch 299/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2964 - accuracy: 0.8098 - val_loss: 0.8221 - val_accuracy: 0.7196
Epoch 300/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2938 - accuracy: 0.8406 - val_loss: 0.8571 - val_accuracy: 0.7150
Epoch 301/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3625 - accuracy: 0.8175 - val_loss: 0.9107 - val_accuracy: 0.7103
Epoch 302/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3330 - accuracy: 0.8098 - val_loss: 0.8563 - val_accuracy: 0.7243
Epoch 303/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4102 - accuracy: 0.7969 - val_loss: 0.8555 - val_accuracy: 0.7290
Epoch 304/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3137 - accuracy: 0.8098 - val_loss: 0.8566 - val_accuracy: 0.7243
Epoch 305/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3728 - accuracy: 0.8149 - val_loss: 0.9037 - val_accuracy: 0.7243
Epoch 306/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3745 - accuracy: 0.8175 - val_loss: 0.9407 - val_accuracy: 0.7383
Epoch 307/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3599 - accuracy: 0.8098 - val_loss: 0.9116 - val_accuracy: 0.7290
Epoch 308/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2980 - accuracy: 0.8175 - val_loss: 0.8902 - val_accuracy: 0.7477
Epoch 309/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3110 - accuracy: 0.7892 - val_loss: 0.9184 - val_accuracy: 0.7570
Epoch 310/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3249 - accuracy: 0.8072 - val_loss: 0.9725 - val_accuracy: 0.7477
Epoch 311/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3742 - accuracy: 0.7198 - val_loss: 0.9481 - val_accuracy: 0.7383
Epoch 312/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3120 - accuracy: 0.7326 - val_loss: 0.8861 - val_accuracy: 0.7477
Epoch 313/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3550 - accuracy: 0.7635 - val_loss: 0.9232 - val_accuracy: 0.7477
Epoch 314/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3026 - accuracy: 0.7275 - val_loss: 0.9418 - val_accuracy: 0.6308
Epoch 315/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4376 - accuracy: 0.7378 - val_loss: 0.9743 - val_accuracy: 0.7477
Epoch 316/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3532 - accuracy: 0.7224 - val_loss: 1.0135 - val_accuracy: 0.6963
Epoch 317/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2976 - accuracy: 0.7121 - val_loss: 0.9866 - val_accuracy: 0.6589
Epoch 318/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3119 - accuracy: 0.6787 - val_loss: 1.0098 - val_accuracy: 0.6589

```
accuracy: 0.6682
Epoch 319/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3118 - accuracy: 0.6632 - val_loss: 0.9781 - val_accuracy: 0.6495
Epoch 320/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2971 - accuracy: 0.6889 - val_loss: 0.9927 - val_accuracy: 0.6262
Epoch 321/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3408 - accuracy: 0.6375 - val_loss: 1.0387 - val_accuracy: 0.6121
Epoch 322/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2858 - accuracy: 0.6478 - val_loss: 1.0062 - val_accuracy: 0.6121
Epoch 323/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3357 - accuracy: 0.6555 - val_loss: 1.0053 - val_accuracy: 0.6028
Epoch 324/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3002 - accuracy: 0.6427 - val_loss: 1.0298 - val_accuracy: 0.6168
Epoch 325/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6044 - accuracy: 0.6427 - val_loss: 1.0683 - val_accuracy: 0.6075
Epoch 326/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3152 - accuracy: 0.6401 - val_loss: 1.0170 - val_accuracy: 0.6168
Epoch 327/1000
4/4 [=====] - 0s 19ms/step - loss: 0.2939 - accuracy: 0.6221 - val_loss: 1.0067 - val_accuracy: 0.6121
Epoch 328/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3549 - accuracy: 0.6555 - val_loss: 1.0032 - val_accuracy: 0.6121
Epoch 329/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3936 - accuracy: 0.6478 - val_loss: 1.0129 - val_accuracy: 0.5794
Epoch 330/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3017 - accuracy: 0.6221 - val_loss: 1.0091 - val_accuracy: 0.5935
Epoch 331/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2914 - accuracy: 0.7018 - val_loss: 1.0096 - val_accuracy: 0.6028
Epoch 332/1000
4/4 [=====] - 0s 17ms/step - loss: 0.3087 - accuracy: 0.6504 - val_loss: 1.0065 - val_accuracy: 0.5981
Epoch 333/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4519 - accuracy: 0.6632 - val_loss: 1.0076 - val_accuracy: 0.6168
Epoch 334/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3996 - accuracy: 0.6812 - val_loss: 1.0190 - val_accuracy: 0.6308
Epoch 335/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3238 - accuracy: 0.6838 - val_loss: 1.0117 - val_accuracy: 0.6028
Epoch 336/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3586 - accuracy: 0.6581 - val_loss: 0.9902 - val_accuracy: 0.6028
Epoch 337/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3666 - accuracy: 0.6684 - val_loss: 0.9972 - val_accuracy: 0.5935
Epoch 338/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3422 - accuracy: 0.6401 - val_loss: 1.0137 - val_accuracy: 0.5701
Epoch 339/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3564 - accuracy: 0.6324 - val_loss: 1.0130 - val_accuracy: 0.5421
Epoch 340/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3265 - accuracy: 0.6093 - val_loss: 1.0182 - val_accuracy: 0.5514
Epoch 341/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3575 - accuracy: 0.6170 - val_loss: 1.0514 - val_accuracy: 0.5467
Epoch 342/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3471 - accuracy: 0.6144 - val_loss: 1.0196 - val_accuracy: 0.5093
Epoch 343/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3449 - accuracy: 0.6093 - val_loss: 1.0141 - val_accuracy: 0.5047
Epoch 344/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2991 - accuracy: 0.6067 - val_loss: 1.0458 - val_accuracy: 0.5093
Epoch 345/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3600 - accuracy: 0.5990 - val_loss: 1.0776 - val_accuracy: 0.4953
Epoch 346/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3725 - accuracy: 0.6170 - val_loss: 1.0482 - val_accuracy: 0.5047
Epoch 347/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3238 - accuracy: 0.6272 - val_loss: 1.0536 - val_accuracy: 0.5140
Epoch 348/1000
```

4/4 [=====] - 0s 12ms/step - loss: 0.3542 - accuracy: 0.6093 - val_loss: 1.0314 - val_accuracy: 0.5234
Epoch 349/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3535 - accuracy: 0.6144 - val_loss: 1.0457 - val_accuracy: 0.5280
Epoch 350/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3464 - accuracy: 0.6221 - val_loss: 1.0066 - val_accuracy: 0.5327
Epoch 351/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3189 - accuracy: 0.6298 - val_loss: 1.0301 - val_accuracy: 0.5421
Epoch 352/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4125 - accuracy: 0.6170 - val_loss: 1.0203 - val_accuracy: 0.5234
Epoch 353/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3246 - accuracy: 0.6350 - val_loss: 1.0401 - val_accuracy: 0.5514
Epoch 354/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4262 - accuracy: 0.6067 - val_loss: 1.0539 - val_accuracy: 0.5047
Epoch 355/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3699 - accuracy: 0.6118 - val_loss: 1.0867 - val_accuracy: 0.5140
Epoch 356/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3138 - accuracy: 0.6093 - val_loss: 1.0829 - val_accuracy: 0.5187
Epoch 357/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3279 - accuracy: 0.6067 - val_loss: 1.0872 - val_accuracy: 0.5748
Epoch 358/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3356 - accuracy: 0.6324 - val_loss: 1.0911 - val_accuracy: 0.5748
Epoch 359/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3482 - accuracy: 0.6427 - val_loss: 1.1256 - val_accuracy: 0.5654
Epoch 360/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3175 - accuracy: 0.6324 - val_loss: 1.1308 - val_accuracy: 0.5935
Epoch 361/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3312 - accuracy: 0.6401 - val_loss: 1.1258 - val_accuracy: 0.5935
Epoch 362/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3335 - accuracy: 0.6452 - val_loss: 1.0954 - val_accuracy: 0.5981
Epoch 363/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3731 - accuracy: 0.6555 - val_loss: 1.1581 - val_accuracy: 0.6121
Epoch 364/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3053 - accuracy: 0.6632 - val_loss: 1.1136 - val_accuracy: 0.6121
Epoch 365/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3238 - accuracy: 0.6658 - val_loss: 1.0436 - val_accuracy: 0.6168
Epoch 366/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3608 - accuracy: 0.6504 - val_loss: 1.1039 - val_accuracy: 0.6215
Epoch 367/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3050 - accuracy: 0.6710 - val_loss: 1.0258 - val_accuracy: 0.6075
Epoch 368/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3335 - accuracy: 0.6530 - val_loss: 0.9998 - val_accuracy: 0.5794
Epoch 369/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3322 - accuracy: 0.6607 - val_loss: 0.9988 - val_accuracy: 0.5794
Epoch 370/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3275 - accuracy: 0.6555 - val_loss: 0.9975 - val_accuracy: 0.5841
Epoch 371/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3002 - accuracy: 0.6555 - val_loss: 0.9959 - val_accuracy: 0.5607
Epoch 372/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2899 - accuracy: 0.6478 - val_loss: 1.0121 - val_accuracy: 0.5841
Epoch 373/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2861 - accuracy: 0.6401 - val_loss: 1.0183 - val_accuracy: 0.5607
Epoch 374/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3090 - accuracy: 0.6195 - val_loss: 1.0429 - val_accuracy: 0.5327
Epoch 375/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3263 - accuracy: 0.6195 - val_loss: 1.0559 - val_accuracy: 0.5327
Epoch 376/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3599 - accuracy: 0.6298 - val_loss: 1.0670 - val_accuracy: 0.5327
Epoch 377/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3570 - accuracy: 0.6067 - val_loss: 1.0680 - val_accuracy: 0.5374

Epoch 378/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3242 - accuracy: 0.6272 - val_loss: 1.0668 - val_accuracy: 0.5374
Epoch 379/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3306 - accuracy: 0.6324 - val_loss: 1.0391 - val_accuracy: 0.5654
Epoch 380/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3365 - accuracy: 0.6504 - val_loss: 1.0370 - val_accuracy: 0.6121
Epoch 381/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3269 - accuracy: 0.6812 - val_loss: 1.0781 - val_accuracy: 0.6121
Epoch 382/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3212 - accuracy: 0.6658 - val_loss: 1.0781 - val_accuracy: 0.6075
Epoch 383/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2900 - accuracy: 0.6658 - val_loss: 1.0785 - val_accuracy: 0.5935
Epoch 384/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3370 - accuracy: 0.6632 - val_loss: 1.1000 - val_accuracy: 0.5935
Epoch 385/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3148 - accuracy: 0.6658 - val_loss: 1.0756 - val_accuracy: 0.5935
Epoch 386/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3282 - accuracy: 0.6710 - val_loss: 1.0985 - val_accuracy: 0.6075
Epoch 387/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2949 - accuracy: 0.6761 - val_loss: 1.1574 - val_accuracy: 0.6402
Epoch 388/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3383 - accuracy: 0.6658 - val_loss: 1.1506 - val_accuracy: 0.6355
Epoch 389/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3342 - accuracy: 0.6864 - val_loss: 1.0919 - val_accuracy: 0.6449
Epoch 390/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2761 - accuracy: 0.7147 - val_loss: 1.0712 - val_accuracy: 0.6449
Epoch 391/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2967 - accuracy: 0.7326 - val_loss: 1.0690 - val_accuracy: 0.6402
Epoch 392/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3234 - accuracy: 0.6967 - val_loss: 1.0948 - val_accuracy: 0.6262
Epoch 393/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2847 - accuracy: 0.6838 - val_loss: 1.0435 - val_accuracy: 0.7103
Epoch 394/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3238 - accuracy: 0.7506 - val_loss: 1.0434 - val_accuracy: 0.7056
Epoch 395/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3455 - accuracy: 0.7558 - val_loss: 1.1504 - val_accuracy: 0.6822
Epoch 396/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3357 - accuracy: 0.7121 - val_loss: 1.0603 - val_accuracy: 0.6075
Epoch 397/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3385 - accuracy: 0.7044 - val_loss: 1.0033 - val_accuracy: 0.6028
Epoch 398/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3389 - accuracy: 0.7069 - val_loss: 1.1884 - val_accuracy: 0.6916
Epoch 399/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3051 - accuracy: 0.7301 - val_loss: 1.2162 - val_accuracy: 0.7103
Epoch 400/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3123 - accuracy: 0.7172 - val_loss: 1.2303 - val_accuracy: 0.7103
Epoch 401/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3312 - accuracy: 0.6967 - val_loss: 1.2504 - val_accuracy: 0.6822
Epoch 402/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2641 - accuracy: 0.8303 - val_loss: 1.2489 - val_accuracy: 0.6916
Epoch 403/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2730 - accuracy: 0.8226 - val_loss: 1.2478 - val_accuracy: 0.6916
Epoch 404/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2777 - accuracy: 0.7558 - val_loss: 1.2583 - val_accuracy: 0.6916
Epoch 405/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3449 - accuracy: 0.8149 - val_loss: 1.3203 - val_accuracy: 0.6916
Epoch 406/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3381 - accuracy: 0.7738 - val_loss: 1.4342 - val_accuracy: 0.7103
Epoch 407/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2966 - accuracy: 0.8201 - val_loss: 1.4111 - val_accuracy: 0.7103

```
accuracy: 0.6963
Epoch 408/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3941 - accuracy: 0.8201 - val_loss: 1.2725 - val_
accuracy: 0.7103
Epoch 409/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3837 - accuracy: 0.7892 - val_loss: 1.1327 - val_
accuracy: 0.6963
Epoch 410/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3294 - accuracy: 0.7558 - val_loss: 1.0962 - val_
accuracy: 0.6916
Epoch 411/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3816 - accuracy: 0.8355 - val_loss: 1.1201 - val_
accuracy: 0.7056
Epoch 412/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2834 - accuracy: 0.8201 - val_loss: 1.0947 - val_
accuracy: 0.7056
Epoch 413/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2906 - accuracy: 0.8201 - val_loss: 1.1153 - val_
accuracy: 0.7009
Epoch 414/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2822 - accuracy: 0.8355 - val_loss: 1.1214 - val_
accuracy: 0.6963
Epoch 415/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3439 - accuracy: 0.7326 - val_loss: 1.1205 - val_
accuracy: 0.6168
Epoch 416/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3132 - accuracy: 0.7558 - val_loss: 1.1228 - val_
accuracy: 0.6916
Epoch 417/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3357 - accuracy: 0.7275 - val_loss: 1.1676 - val_
accuracy: 0.7056
Epoch 418/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2810 - accuracy: 0.7506 - val_loss: 1.1363 - val_
accuracy: 0.6963
Epoch 419/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3731 - accuracy: 0.7558 - val_loss: 1.1577 - val_
accuracy: 0.5841
Epoch 420/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3808 - accuracy: 0.6941 - val_loss: 1.2912 - val_
accuracy: 0.6028
Epoch 421/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3903 - accuracy: 0.6864 - val_loss: 1.2940 - val_
accuracy: 0.5794
Epoch 422/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3110 - accuracy: 0.7044 - val_loss: 1.3367 - val_
accuracy: 0.6215
Epoch 423/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3492 - accuracy: 0.7044 - val_loss: 1.3329 - val_
accuracy: 0.5748
Epoch 424/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3362 - accuracy: 0.6761 - val_loss: 1.2917 - val_
accuracy: 0.5794
Epoch 425/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3067 - accuracy: 0.6735 - val_loss: 1.2881 - val_
accuracy: 0.5841
Epoch 426/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3625 - accuracy: 0.6915 - val_loss: 1.3049 - val_
accuracy: 0.5888
Epoch 427/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2834 - accuracy: 0.6761 - val_loss: 1.3370 - val_
accuracy: 0.5888
Epoch 428/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3435 - accuracy: 0.6658 - val_loss: 1.3103 - val_
accuracy: 0.5748
Epoch 429/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2888 - accuracy: 0.6684 - val_loss: 1.2251 - val_
accuracy: 0.5748
Epoch 430/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3653 - accuracy: 0.6787 - val_loss: 1.2056 - val_
accuracy: 0.5841
Epoch 431/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2778 - accuracy: 0.6581 - val_loss: 1.2595 - val_
accuracy: 0.5888
Epoch 432/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2837 - accuracy: 0.6812 - val_loss: 1.4035 - val_
accuracy: 0.5935
Epoch 433/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3263 - accuracy: 0.6787 - val_loss: 1.2658 - val_
accuracy: 0.6075
Epoch 434/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3139 - accuracy: 0.6941 - val_loss: 1.2647 - val_
accuracy: 0.6121
Epoch 435/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4142 - accuracy: 0.6504 - val_loss: 1.3155 - val_
accuracy: 0.5794
Epoch 436/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3289 - accuracy: 0.6324 - val_loss: 1.3117 - val_
accuracy: 0.5794
Epoch 437/1000
```

```

4/4 [=====] - 0s 13ms/step - loss: 0.2531 - accuracy: 0.6324 - val_loss: 1.3154 - val_accuracy: 0.5888
Epoch 438/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2950 - accuracy: 0.6247 - val_loss: 1.3453 - val_accuracy: 0.5607
Epoch 439/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2787 - accuracy: 0.5938 - val_loss: 1.3329 - val_accuracy: 0.5888
Epoch 440/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4073 - accuracy: 0.6375 - val_loss: 1.2761 - val_accuracy: 0.5794
Epoch 441/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3278 - accuracy: 0.6452 - val_loss: 1.1760 - val_accuracy: 0.5280
Epoch 442/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2997 - accuracy: 0.5938 - val_loss: 1.1436 - val_accuracy: 0.5654
Epoch 443/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2631 - accuracy: 0.6427 - val_loss: 1.1259 - val_accuracy: 0.5654
Epoch 444/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2948 - accuracy: 0.6170 - val_loss: 1.1923 - val_accuracy: 0.5841
Epoch 445/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2744 - accuracy: 0.6298 - val_loss: 1.1738 - val_accuracy: 0.5701
Epoch 446/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3016 - accuracy: 0.6427 - val_loss: 1.2741 - val_accuracy: 0.5888
Epoch 447/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2552 - accuracy: 0.6401 - val_loss: 1.2241 - val_accuracy: 0.5841
Epoch 448/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2398 - accuracy: 0.6838 - val_loss: 1.1670 - val_accuracy: 0.5748
Epoch 449/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2899 - accuracy: 0.6427 - val_loss: 1.1674 - val_accuracy: 0.5935
Epoch 450/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2899 - accuracy: 0.6735 - val_loss: 1.1623 - val_accuracy: 0.5794
Epoch 451/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3241 - accuracy: 0.6581 - val_loss: 1.2064 - val_accuracy: 0.5748
Epoch 452/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3061 - accuracy: 0.6478 - val_loss: 1.1513 - val_accuracy: 0.5794
Epoch 453/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2440 - accuracy: 0.6632 - val_loss: 1.1521 - val_accuracy: 0.5841
Epoch 454/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2549 - accuracy: 0.6452 - val_loss: 1.1009 - val_accuracy: 0.5794
Epoch 455/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3156 - accuracy: 0.6915 - val_loss: 1.1201 - val_accuracy: 0.5514
Epoch 456/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2356 - accuracy: 0.6735 - val_loss: 1.0963 - val_accuracy: 0.5701
Epoch 457/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2804 - accuracy: 0.6838 - val_loss: 1.1201 - val_accuracy: 0.5654
Epoch 458/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2854 - accuracy: 0.6504 - val_loss: 1.1207 - val_accuracy: 0.5467
Epoch 459/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3400 - accuracy: 0.7422Restoring model weights from the end of the best epoch: 309.
4/4 [=====] - 0s 14ms/step - loss: 0.2955 - accuracy: 0.6787 - val_loss: 1.1236 - val_accuracy: 0.5748
Epoch 459: early stopping
2/2 [=====] - 0s 5ms/step - loss: 0.7847 - accuracy: 0.7209
[CV] END .....Dense1=50, Dense2=10; total time= 23.1s
Model: "sequential_47"

```

Layer (type)	Output Shape	Param #
dense_188 (Dense)	(None, 50)	350
batch_normalization_141 (BatchNormalization)	(None, 50)	200
activation_141 (Activation)	(None, 50)	0
dense_189 (Dense)	(None, 10)	510
batch_normalization_142 (BatchNormalization)	(None, 10)	40

activation_142 (Activation)	(None, 10)	0
dense_190 (Dense)	(None, 10)	110
batch_normalization_143 (BatchNormalization)	(None, 10)	40
activation_143 (Activation)	(None, 10)	0
dense_191 (Dense)	(None, 2)	22

Total params: 1,272
Trainable params: 1,132
Non-trainable params: 140

Epoch 1/1000
4/4 [=====] - 1s 58ms/step - loss: 4.9649 - accuracy: 0.6170 - val_loss: 6.2356 - val_accuracy: 0.6636
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1987 - accuracy: 0.6992 - val_loss: 5.8723 - val_accuracy: 0.6636
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8875 - accuracy: 0.7326 - val_loss: 4.8094 - val_accuracy: 0.6682
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5697 - accuracy: 0.5964 - val_loss: 3.7597 - val_accuracy: 0.6729
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4443 - accuracy: 0.5835 - val_loss: 3.0048 - val_accuracy: 0.7103
Epoch 6/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5526 - accuracy: 0.6195 - val_loss: 2.3622 - val_accuracy: 0.6869
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1598 - accuracy: 0.6118 - val_loss: 2.1819 - val_accuracy: 0.6729
Epoch 8/1000
4/4 [=====] - 0s 11ms/step - loss: 2.1322 - accuracy: 0.5835 - val_loss: 1.9815 - val_accuracy: 0.6729
Epoch 9/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1645 - accuracy: 0.5784 - val_loss: 1.8307 - val_accuracy: 0.6636
Epoch 10/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0653 - accuracy: 0.5938 - val_loss: 1.7418 - val_accuracy: 0.6822
Epoch 11/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9286 - accuracy: 0.6144 - val_loss: 1.6345 - val_accuracy: 0.6636
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8568 - accuracy: 0.6118 - val_loss: 1.5896 - val_accuracy: 0.6589
Epoch 13/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7448 - accuracy: 0.6195 - val_loss: 1.5612 - val_accuracy: 0.6495
Epoch 14/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7863 - accuracy: 0.6247 - val_loss: 1.5298 - val_accuracy: 0.6682
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7487 - accuracy: 0.6375 - val_loss: 1.4590 - val_accuracy: 0.6682
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5829 - accuracy: 0.6427 - val_loss: 1.4315 - val_accuracy: 0.6636
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5548 - accuracy: 0.6992 - val_loss: 1.3960 - val_accuracy: 0.6636
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5635 - accuracy: 0.7095 - val_loss: 1.3869 - val_accuracy: 0.6636
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5600 - accuracy: 0.7095 - val_loss: 1.3576 - val_accuracy: 0.6355
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5203 - accuracy: 0.6889 - val_loss: 1.3435 - val_accuracy: 0.6168
Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5176 - accuracy: 0.6761 - val_loss: 1.3432 - val_accuracy: 0.5981
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4747 - accuracy: 0.7018 - val_loss: 1.3278 - val_accuracy: 0.6589
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3033 - accuracy: 0.7121 - val_loss: 1.3147 - val_accuracy: 0.6589
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3934 - accuracy: 0.6967 - val_loss: 1.2971 - val_accuracy: 0.6636
Epoch 25/1000

```
4/4 [=====] - 0s 12ms/step - loss: 1.2807 - accuracy: 0.7147 - val_loss: 1.2662 - val_accuracy: 0.6636
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3522 - accuracy: 0.6967 - val_loss: 1.2656 - val_accuracy: 0.6589
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3247 - accuracy: 0.7018 - val_loss: 1.2393 - val_accuracy: 0.6636
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2474 - accuracy: 0.7275 - val_loss: 1.2226 - val_accuracy: 0.6495
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2823 - accuracy: 0.6838 - val_loss: 1.2173 - val_accuracy: 0.6449
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2258 - accuracy: 0.7172 - val_loss: 1.1922 - val_accuracy: 0.6449
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1882 - accuracy: 0.7018 - val_loss: 1.1797 - val_accuracy: 0.6449
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0631 - accuracy: 0.7121 - val_loss: 1.1585 - val_accuracy: 0.6449
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1908 - accuracy: 0.6889 - val_loss: 1.1522 - val_accuracy: 0.6402
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0869 - accuracy: 0.6838 - val_loss: 1.1299 - val_accuracy: 0.6355
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2264 - accuracy: 0.6812 - val_loss: 1.1068 - val_accuracy: 0.6355
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0470 - accuracy: 0.6864 - val_loss: 1.0887 - val_accuracy: 0.6449
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0549 - accuracy: 0.7172 - val_loss: 1.0711 - val_accuracy: 0.6449
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1047 - accuracy: 0.7018 - val_loss: 1.0574 - val_accuracy: 0.6308
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0996 - accuracy: 0.6915 - val_loss: 1.0583 - val_accuracy: 0.6308
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0023 - accuracy: 0.6838 - val_loss: 1.0472 - val_accuracy: 0.6308
Epoch 41/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9179 - accuracy: 0.6967 - val_loss: 1.0315 - val_accuracy: 0.6262
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9910 - accuracy: 0.6710 - val_loss: 1.0122 - val_accuracy: 0.6262
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9628 - accuracy: 0.6838 - val_loss: 0.9825 - val_accuracy: 0.6355
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0652 - accuracy: 0.6992 - val_loss: 0.9616 - val_accuracy: 0.6402
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8608 - accuracy: 0.6684 - val_loss: 0.9484 - val_accuracy: 0.6402
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8549 - accuracy: 0.7044 - val_loss: 0.9327 - val_accuracy: 0.6495
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8219 - accuracy: 0.7018 - val_loss: 0.9326 - val_accuracy: 0.6495
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8643 - accuracy: 0.6889 - val_loss: 0.9234 - val_accuracy: 0.6308
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8566 - accuracy: 0.7121 - val_loss: 0.9156 - val_accuracy: 0.6355
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8630 - accuracy: 0.6941 - val_loss: 0.9120 - val_accuracy: 0.6542
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8150 - accuracy: 0.7147 - val_loss: 0.8942 - val_accuracy: 0.6449
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7928 - accuracy: 0.7069 - val_loss: 0.8978 - val_accuracy: 0.6495
Epoch 53/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7874 - accuracy: 0.7147 - val_loss: 0.8937 - val_accuracy: 0.6495
Epoch 54/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8173 - accuracy: 0.7147 - val_loss: 0.8845 - val_accuracy: 0.6495
```

Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7697 - accuracy: 0.7224 - val_loss: 0.8755 - val_accuracy: 0.6402
Epoch 56/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7630 - accuracy: 0.7018 - val_loss: 0.8705 - val_accuracy: 0.6355
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7563 - accuracy: 0.7018 - val_loss: 0.8685 - val_accuracy: 0.6355
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8011 - accuracy: 0.7121 - val_loss: 0.8637 - val_accuracy: 0.6355
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7579 - accuracy: 0.7121 - val_loss: 0.8586 - val_accuracy: 0.6355
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7662 - accuracy: 0.7044 - val_loss: 0.8433 - val_accuracy: 0.6402
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8026 - accuracy: 0.6941 - val_loss: 0.8455 - val_accuracy: 0.6355
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7350 - accuracy: 0.7147 - val_loss: 0.8251 - val_accuracy: 0.6262
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7414 - accuracy: 0.7044 - val_loss: 0.8212 - val_accuracy: 0.6355
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7144 - accuracy: 0.6864 - val_loss: 0.8203 - val_accuracy: 0.6355
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7805 - accuracy: 0.7249 - val_loss: 0.8075 - val_accuracy: 0.6355
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6629 - accuracy: 0.7198 - val_loss: 0.7993 - val_accuracy: 0.6308
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6514 - accuracy: 0.7018 - val_loss: 0.7688 - val_accuracy: 0.6542
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7700 - accuracy: 0.6915 - val_loss: 0.7640 - val_accuracy: 0.6589
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7633 - accuracy: 0.7095 - val_loss: 0.7524 - val_accuracy: 0.6636
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7001 - accuracy: 0.6992 - val_loss: 0.7572 - val_accuracy: 0.6542
Epoch 71/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7796 - accuracy: 0.6889 - val_loss: 0.7553 - val_accuracy: 0.6589
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7685 - accuracy: 0.6915 - val_loss: 0.7537 - val_accuracy: 0.6542
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8148 - accuracy: 0.6941 - val_loss: 0.7725 - val_accuracy: 0.6402
Epoch 74/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7232 - accuracy: 0.6967 - val_loss: 0.7703 - val_accuracy: 0.6402
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8559 - accuracy: 0.6684 - val_loss: 0.7665 - val_accuracy: 0.6402
Epoch 76/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7085 - accuracy: 0.6812 - val_loss: 0.7428 - val_accuracy: 0.6308
Epoch 77/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6388 - accuracy: 0.7121 - val_loss: 0.7670 - val_accuracy: 0.6308
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6246 - accuracy: 0.7044 - val_loss: 0.7627 - val_accuracy: 0.6355
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7415 - accuracy: 0.6658 - val_loss: 0.8047 - val_accuracy: 0.6729
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6477 - accuracy: 0.6889 - val_loss: 0.7968 - val_accuracy: 0.6682
Epoch 81/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6352 - accuracy: 0.6812 - val_loss: 0.7978 - val_accuracy: 0.6075
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6199 - accuracy: 0.6684 - val_loss: 0.7647 - val_accuracy: 0.6355
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6669 - accuracy: 0.6710 - val_loss: 0.7614 - val_accuracy: 0.6542
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6022 - accuracy: 0.6787 - val_loss: 0.7785 - val_accuracy: 0.6075

```
accuracy: 0.6355
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6284 - accuracy: 0.6632 - val_loss: 0.7799 - val_accuracy: 0.6308
Epoch 86/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6455 - accuracy: 0.6864 - val_loss: 0.7865 - val_accuracy: 0.6355
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6716 - accuracy: 0.7121 - val_loss: 0.8069 - val_accuracy: 0.6121
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6167 - accuracy: 0.6967 - val_loss: 0.8031 - val_accuracy: 0.6449
Epoch 89/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5888 - accuracy: 0.6915 - val_loss: 0.8025 - val_accuracy: 0.6449
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6235 - accuracy: 0.7121 - val_loss: 0.8228 - val_accuracy: 0.6402
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6727 - accuracy: 0.6735 - val_loss: 0.8196 - val_accuracy: 0.6355
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5994 - accuracy: 0.7044 - val_loss: 0.8112 - val_accuracy: 0.6355
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6268 - accuracy: 0.7095 - val_loss: 0.8000 - val_accuracy: 0.6449
Epoch 94/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5853 - accuracy: 0.7121 - val_loss: 0.7424 - val_accuracy: 0.6495
Epoch 95/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5265 - accuracy: 0.6787 - val_loss: 0.7609 - val_accuracy: 0.6589
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5307 - accuracy: 0.6967 - val_loss: 0.7580 - val_accuracy: 0.6495
Epoch 97/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5241 - accuracy: 0.6735 - val_loss: 0.7484 - val_accuracy: 0.6495
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6342 - accuracy: 0.6915 - val_loss: 0.7254 - val_accuracy: 0.6589
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5486 - accuracy: 0.7249 - val_loss: 0.7902 - val_accuracy: 0.6589
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5973 - accuracy: 0.7224 - val_loss: 0.7620 - val_accuracy: 0.6542
Epoch 101/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5387 - accuracy: 0.7147 - val_loss: 0.7617 - val_accuracy: 0.6589
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6148 - accuracy: 0.7275 - val_loss: 0.8160 - val_accuracy: 0.6449
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6127 - accuracy: 0.6889 - val_loss: 0.8259 - val_accuracy: 0.6121
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5709 - accuracy: 0.7069 - val_loss: 0.8017 - val_accuracy: 0.6168
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5493 - accuracy: 0.7121 - val_loss: 0.8538 - val_accuracy: 0.6121
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6095 - accuracy: 0.7147 - val_loss: 0.8749 - val_accuracy: 0.6262
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5151 - accuracy: 0.7095 - val_loss: 0.8498 - val_accuracy: 0.6449
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5615 - accuracy: 0.7095 - val_loss: 0.8474 - val_accuracy: 0.6495
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6099 - accuracy: 0.7198 - val_loss: 0.8245 - val_accuracy: 0.6589
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5354 - accuracy: 0.7224 - val_loss: 0.8688 - val_accuracy: 0.6542
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5285 - accuracy: 0.6915 - val_loss: 0.8634 - val_accuracy: 0.6636
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4503 - accuracy: 0.7249 - val_loss: 0.8384 - val_accuracy: 0.6542
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5396 - accuracy: 0.7172 - val_loss: 0.8020 - val_accuracy: 0.6589
Epoch 114/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.5367 - accuracy: 0.7121 - val_loss: 0.8138 - val_accuracy: 0.6542
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5122 - accuracy: 0.7249 - val_loss: 0.8249 - val_accuracy: 0.6636
Epoch 116/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4811 - accuracy: 0.7352 - val_loss: 0.8224 - val_accuracy: 0.6636
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5482 - accuracy: 0.7352 - val_loss: 0.8488 - val_accuracy: 0.6822
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5163 - accuracy: 0.7532 - val_loss: 0.8483 - val_accuracy: 0.6729
Epoch 119/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5255 - accuracy: 0.7147 - val_loss: 0.8461 - val_accuracy: 0.6729
Epoch 120/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4596 - accuracy: 0.7506 - val_loss: 0.8289 - val_accuracy: 0.6636
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5737 - accuracy: 0.7429 - val_loss: 0.8540 - val_accuracy: 0.6729
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5284 - accuracy: 0.7326 - val_loss: 0.8245 - val_accuracy: 0.6682
Epoch 123/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4679 - accuracy: 0.7147 - val_loss: 0.9454 - val_accuracy: 0.6916
Epoch 124/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5559 - accuracy: 0.7069 - val_loss: 1.0108 - val_accuracy: 0.6963
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5235 - accuracy: 0.7326 - val_loss: 0.9570 - val_accuracy: 0.6963
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4988 - accuracy: 0.7301 - val_loss: 0.9909 - val_accuracy: 0.7009
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5584 - accuracy: 0.7198 - val_loss: 1.0356 - val_accuracy: 0.7056
Epoch 128/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6534 - accuracy: 0.7275 - val_loss: 0.9956 - val_accuracy: 0.7196
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5158 - accuracy: 0.7121 - val_loss: 0.9509 - val_accuracy: 0.6916
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5195 - accuracy: 0.7069 - val_loss: 0.9625 - val_accuracy: 0.7009
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5812 - accuracy: 0.7198 - val_loss: 0.9879 - val_accuracy: 0.6963
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5375 - accuracy: 0.7044 - val_loss: 1.0096 - val_accuracy: 0.6916
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5033 - accuracy: 0.7121 - val_loss: 0.9995 - val_accuracy: 0.6495
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5037 - accuracy: 0.7069 - val_loss: 0.9459 - val_accuracy: 0.6495
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4565 - accuracy: 0.7224 - val_loss: 0.9713 - val_accuracy: 0.6542
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4574 - accuracy: 0.7044 - val_loss: 1.0172 - val_accuracy: 0.6636
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4350 - accuracy: 0.7018 - val_loss: 0.9318 - val_accuracy: 0.6682
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4596 - accuracy: 0.6992 - val_loss: 0.9365 - val_accuracy: 0.6542
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4773 - accuracy: 0.7224 - val_loss: 0.9309 - val_accuracy: 0.6449
Epoch 140/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5408 - accuracy: 0.7378 - val_loss: 0.9072 - val_accuracy: 0.6682
Epoch 141/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5227 - accuracy: 0.7301 - val_loss: 0.9427 - val_accuracy: 0.6542
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5382 - accuracy: 0.7095 - val_loss: 0.9105 - val_accuracy: 0.6589
Epoch 143/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4492 - accuracy: 0.7506 - val_loss: 0.9357 - val_accuracy: 0.6636
```

Epoch 144/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4479 - accuracy: 0.7635 - val_loss: 0.8936 - val_accuracy: 0.6495
Epoch 145/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4645 - accuracy: 0.7249 - val_loss: 0.8904 - val_accuracy: 0.6495
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4615 - accuracy: 0.7326 - val_loss: 0.8954 - val_accuracy: 0.6449
Epoch 147/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4868 - accuracy: 0.7172 - val_loss: 0.9665 - val_accuracy: 0.6449
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4987 - accuracy: 0.7301 - val_loss: 0.9636 - val_accuracy: 0.6589
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4976 - accuracy: 0.7352 - val_loss: 0.9543 - val_accuracy: 0.6636
Epoch 150/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4481 - accuracy: 0.7275 - val_loss: 0.9042 - val_accuracy: 0.6355
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5242 - accuracy: 0.7404 - val_loss: 0.9984 - val_accuracy: 0.6215
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4709 - accuracy: 0.7224 - val_loss: 1.0874 - val_accuracy: 0.6215
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4754 - accuracy: 0.7044 - val_loss: 1.0281 - val_accuracy: 0.6308
Epoch 154/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5203 - accuracy: 0.7249 - val_loss: 1.1471 - val_accuracy: 0.6168
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4348 - accuracy: 0.7249 - val_loss: 1.1237 - val_accuracy: 0.6075
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4151 - accuracy: 0.7198 - val_loss: 1.1645 - val_accuracy: 0.6215
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5366 - accuracy: 0.7095 - val_loss: 1.1610 - val_accuracy: 0.6308
Epoch 158/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4666 - accuracy: 0.7378 - val_loss: 1.1552 - val_accuracy: 0.6262
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3874 - accuracy: 0.7224 - val_loss: 1.1877 - val_accuracy: 0.6402
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4969 - accuracy: 0.7172 - val_loss: 1.1903 - val_accuracy: 0.6262
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4459 - accuracy: 0.7378 - val_loss: 1.1781 - val_accuracy: 0.6121
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5255 - accuracy: 0.7378 - val_loss: 1.1386 - val_accuracy: 0.6075
Epoch 163/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4870 - accuracy: 0.7121 - val_loss: 1.0906 - val_accuracy: 0.6262
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4578 - accuracy: 0.7147 - val_loss: 1.0738 - val_accuracy: 0.6449
Epoch 165/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4435 - accuracy: 0.7147 - val_loss: 1.1290 - val_accuracy: 0.6542
Epoch 166/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5448 - accuracy: 0.6915 - val_loss: 1.0542 - val_accuracy: 0.6542
Epoch 167/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5573 - accuracy: 0.7378 - val_loss: 1.0216 - val_accuracy: 0.6682
Epoch 168/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5685 - accuracy: 0.6787 - val_loss: 1.0058 - val_accuracy: 0.6589
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4960 - accuracy: 0.7172 - val_loss: 1.0444 - val_accuracy: 0.6589
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5257 - accuracy: 0.6992 - val_loss: 0.9867 - val_accuracy: 0.6542
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4267 - accuracy: 0.7018 - val_loss: 1.2452 - val_accuracy: 0.6636
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4927 - accuracy: 0.7172 - val_loss: 1.1992 - val_accuracy: 0.6822
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5073 - accuracy: 0.7044 - val_loss: 1.1998 - val_accuracy: 0.6822

```
accuracy: 0.7009
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4072 - accuracy: 0.7224 - val_loss: 1.2504 - val_
accuracy: 0.6916
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4661 - accuracy: 0.6915 - val_loss: 1.2337 - val_
accuracy: 0.7056
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4437 - accuracy: 0.6735 - val_loss: 1.2436 - val_
accuracy: 0.6963
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5003 - accuracy: 0.7018 - val_loss: 1.2038 - val_
accuracy: 0.6916
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4450 - accuracy: 0.7095 - val_loss: 1.2293 - val_
accuracy: 0.6869
Epoch 179/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4172 - accuracy: 0.6864 - val_loss: 1.1740 - val_
accuracy: 0.6822
Epoch 180/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4814 - accuracy: 0.7198 - val_loss: 1.1755 - val_
accuracy: 0.6869
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4154 - accuracy: 0.7224 - val_loss: 1.1091 - val_
accuracy: 0.7009
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4641 - accuracy: 0.6992 - val_loss: 1.0697 - val_
accuracy: 0.7056
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5174 - accuracy: 0.6992 - val_loss: 1.1636 - val_
accuracy: 0.6869
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6011 - accuracy: 0.7224 - val_loss: 1.0684 - val_
accuracy: 0.6916
Epoch 185/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4333 - accuracy: 0.7044 - val_loss: 0.9921 - val_
accuracy: 0.6822
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4965 - accuracy: 0.7172 - val_loss: 1.0793 - val_
accuracy: 0.6916
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4598 - accuracy: 0.7095 - val_loss: 1.1094 - val_
accuracy: 0.6729
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4700 - accuracy: 0.6967 - val_loss: 1.0429 - val_
accuracy: 0.6776
Epoch 189/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4405 - accuracy: 0.7147 - val_loss: 1.0288 - val_
accuracy: 0.6822
Epoch 190/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4256 - accuracy: 0.7249 - val_loss: 1.0397 - val_
accuracy: 0.7009
Epoch 191/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4049 - accuracy: 0.7352 - val_loss: 1.0335 - val_
accuracy: 0.6822
Epoch 192/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4940 - accuracy: 0.7249 - val_loss: 1.0272 - val_
accuracy: 0.6822
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4018 - accuracy: 0.7018 - val_loss: 1.0279 - val_
accuracy: 0.6776
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4028 - accuracy: 0.7044 - val_loss: 1.0614 - val_
accuracy: 0.6729
Epoch 195/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4016 - accuracy: 0.7095 - val_loss: 0.9911 - val_
accuracy: 0.6869
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5479 - accuracy: 0.7147 - val_loss: 0.9953 - val_
accuracy: 0.6729
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4418 - accuracy: 0.6992 - val_loss: 0.9241 - val_
accuracy: 0.6729
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4097 - accuracy: 0.6967 - val_loss: 0.9349 - val_
accuracy: 0.6729
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5227 - accuracy: 0.6581 - val_loss: 0.9807 - val_
accuracy: 0.6682
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5206 - accuracy: 0.6915 - val_loss: 0.9831 - val_
accuracy: 0.6636
Epoch 201/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4302 - accuracy: 0.7018 - val_loss: 1.0300 - val_
accuracy: 0.6776
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4331 - accuracy: 0.7172 - val_loss: 1.0544 - val_
accuracy: 0.6682
Epoch 203/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.4258 - accuracy: 0.6992 - val_loss: 0.9993 - val_accuracy: 0.6729
Epoch 204/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5322 - accuracy: 0.6967 - val_loss: 0.9982 - val_accuracy: 0.6636
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4188 - accuracy: 0.7172 - val_loss: 0.9625 - val_accuracy: 0.6636
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5046 - accuracy: 0.6967 - val_loss: 1.0084 - val_accuracy: 0.6822
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4347 - accuracy: 0.6812 - val_loss: 1.0092 - val_accuracy: 0.7009
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4394 - accuracy: 0.7275 - val_loss: 1.0863 - val_accuracy: 0.6869
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4787 - accuracy: 0.7095 - val_loss: 1.1768 - val_accuracy: 0.6776
Epoch 210/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4290 - accuracy: 0.6787 - val_loss: 1.0494 - val_accuracy: 0.6916
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4429 - accuracy: 0.6889 - val_loss: 1.0054 - val_accuracy: 0.6822
Epoch 212/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4155 - accuracy: 0.7044 - val_loss: 1.0649 - val_accuracy: 0.6869
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4427 - accuracy: 0.7198 - val_loss: 1.0316 - val_accuracy: 0.6869
Epoch 214/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4466 - accuracy: 0.7198 - val_loss: 1.0109 - val_accuracy: 0.6729
Epoch 215/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4353 - accuracy: 0.7378 - val_loss: 1.1830 - val_accuracy: 0.6822
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4073 - accuracy: 0.7301 - val_loss: 1.1097 - val_accuracy: 0.6776
Epoch 217/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4982 - accuracy: 0.6967 - val_loss: 1.1425 - val_accuracy: 0.6542
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4350 - accuracy: 0.6915 - val_loss: 1.1330 - val_accuracy: 0.6729
Epoch 219/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4112 - accuracy: 0.7069 - val_loss: 1.1306 - val_accuracy: 0.6916
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4339 - accuracy: 0.7147 - val_loss: 1.1130 - val_accuracy: 0.6963
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4134 - accuracy: 0.7044 - val_loss: 1.0715 - val_accuracy: 0.6916
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4440 - accuracy: 0.6864 - val_loss: 1.0589 - val_accuracy: 0.6916
Epoch 223/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4651 - accuracy: 0.7069 - val_loss: 1.0278 - val_accuracy: 0.7009
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5060 - accuracy: 0.7147 - val_loss: 1.0255 - val_accuracy: 0.6916
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5730 - accuracy: 0.7198 - val_loss: 1.0555 - val_accuracy: 0.7009
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4970 - accuracy: 0.7121 - val_loss: 1.0233 - val_accuracy: 0.6869
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4811 - accuracy: 0.6889 - val_loss: 1.0045 - val_accuracy: 0.7056
Epoch 228/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4072 - accuracy: 0.7352 - val_loss: 0.9799 - val_accuracy: 0.7009
Epoch 229/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4078 - accuracy: 0.7018 - val_loss: 0.9506 - val_accuracy: 0.7056
Epoch 230/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4027 - accuracy: 0.7249 - val_loss: 1.0111 - val_accuracy: 0.6589
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4808 - accuracy: 0.7069 - val_loss: 0.9597 - val_accuracy: 0.6542
Epoch 232/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4430 - accuracy: 0.7147 - val_loss: 0.9527 - val_accuracy: 0.6636
```

Epoch 233/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4025 - accuracy: 0.7249 - val_loss: 0.9745 - val_accuracy: 0.6682
Epoch 234/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4386 - accuracy: 0.7249 - val_loss: 0.9404 - val_accuracy: 0.6636
Epoch 235/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4248 - accuracy: 0.7069 - val_loss: 0.9458 - val_accuracy: 0.6729
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4260 - accuracy: 0.6941 - val_loss: 0.9707 - val_accuracy: 0.6495
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4529 - accuracy: 0.7172 - val_loss: 0.9440 - val_accuracy: 0.6636
Epoch 238/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4434 - accuracy: 0.7198 - val_loss: 0.9434 - val_accuracy: 0.6636
Epoch 239/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4426 - accuracy: 0.7069 - val_loss: 0.9428 - val_accuracy: 0.6776
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3808 - accuracy: 0.6889 - val_loss: 0.9714 - val_accuracy: 0.6729
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4162 - accuracy: 0.7224 - val_loss: 0.9443 - val_accuracy: 0.6822
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4989 - accuracy: 0.7249 - val_loss: 0.9435 - val_accuracy: 0.6963
Epoch 243/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4482 - accuracy: 0.7095 - val_loss: 0.9752 - val_accuracy: 0.6729
Epoch 244/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4094 - accuracy: 0.7224 - val_loss: 0.9780 - val_accuracy: 0.6822
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4309 - accuracy: 0.6967 - val_loss: 0.9727 - val_accuracy: 0.6729
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4151 - accuracy: 0.7198 - val_loss: 1.0014 - val_accuracy: 0.6589
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4251 - accuracy: 0.6864 - val_loss: 0.9770 - val_accuracy: 0.6682
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4211 - accuracy: 0.7224 - val_loss: 1.0035 - val_accuracy: 0.6449
Epoch 249/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4987 - accuracy: 0.6967 - val_loss: 1.0060 - val_accuracy: 0.6589
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3891 - accuracy: 0.7095 - val_loss: 1.0067 - val_accuracy: 0.6636
Epoch 251/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3844 - accuracy: 0.7069 - val_loss: 1.0097 - val_accuracy: 0.6682
Epoch 252/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4424 - accuracy: 0.6967 - val_loss: 1.0710 - val_accuracy: 0.6402
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4517 - accuracy: 0.7018 - val_loss: 1.0591 - val_accuracy: 0.6215
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4446 - accuracy: 0.7018 - val_loss: 1.1107 - val_accuracy: 0.6262
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4010 - accuracy: 0.6992 - val_loss: 1.1125 - val_accuracy: 0.6402
Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3695 - accuracy: 0.7172 - val_loss: 1.0919 - val_accuracy: 0.6308
Epoch 257/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5096 - accuracy: 0.7224 - val_loss: 1.0834 - val_accuracy: 0.6355
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4301 - accuracy: 0.7147 - val_loss: 1.0851 - val_accuracy: 0.6402
Epoch 259/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4223 - accuracy: 0.7198 - val_loss: 1.0668 - val_accuracy: 0.6963
Epoch 260/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4184 - accuracy: 0.7069 - val_loss: 1.0600 - val_accuracy: 0.7009
Epoch 261/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3927 - accuracy: 0.6967 - val_loss: 1.0463 - val_accuracy: 0.6869
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3948 - accuracy: 0.6915 - val_loss: 1.0365 - val_accuracy: 0.6869

```

accuracy: 0.6963
Epoch 263/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5111 - accuracy: 0.6864 - val_loss: 1.0513 - val_accuracy: 0.7009
Epoch 264/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4306 - accuracy: 0.6915 - val_loss: 1.1113 - val_accuracy: 0.6963
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3928 - accuracy: 0.6941 - val_loss: 1.1393 - val_accuracy: 0.6822
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4029 - accuracy: 0.6967 - val_loss: 1.0497 - val_accuracy: 0.6869
Epoch 267/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3914 - accuracy: 0.7198 - val_loss: 1.1257 - val_accuracy: 0.6869
Epoch 268/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4534 - accuracy: 0.7044 - val_loss: 1.1189 - val_accuracy: 0.6822
Epoch 269/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3883 - accuracy: 0.7301 - val_loss: 1.1640 - val_accuracy: 0.6869
Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3879 - accuracy: 0.7069 - val_loss: 1.0838 - val_accuracy: 0.6822
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4134 - accuracy: 0.7301 - val_loss: 1.0839 - val_accuracy: 0.6822
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4171 - accuracy: 0.7224 - val_loss: 1.0887 - val_accuracy: 0.6776
Epoch 273/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4387 - accuracy: 0.7275 - val_loss: 1.0846 - val_accuracy: 0.7056
Epoch 274/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3946 - accuracy: 0.7121 - val_loss: 1.1196 - val_accuracy: 0.6916
Epoch 275/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3789 - accuracy: 0.7095 - val_loss: 1.1173 - val_accuracy: 0.6963
Epoch 276/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4925 - accuracy: 0.7095 - val_loss: 1.1101 - val_accuracy: 0.6963
Epoch 277/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4162 - accuracy: 0.7172 - val_loss: 1.0512 - val_accuracy: 0.7056
Epoch 278/1000
1/4 [====>.....] - ETA: 0s - loss: 0.5482 - accuracy: 0.7578Restoring model weights from the end of the best epoch: 128.
4/4 [=====] - 0s 15ms/step - loss: 0.4622 - accuracy: 0.7326 - val_loss: 1.0621 - val_accuracy: 0.7150
Epoch 278: early stopping
2/2 [=====] - 0s 4ms/step - loss: 1.1592 - accuracy: 0.6279
[CV] END .....Dense1=50, Dense2=10; total time= 13.8s
Model: "sequential_48"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_192 (Dense)	(None, 50)	350
batch_normalization_144 (BatchNormalization)	(None, 50)	200
activation_144 (Activation)	(None, 50)	0
dense_193 (Dense)	(None, 10)	510
batch_normalization_145 (BatchNormalization)	(None, 10)	40
activation_145 (Activation)	(None, 10)	0
dense_194 (Dense)	(None, 10)	110
batch_normalization_146 (BatchNormalization)	(None, 10)	40
activation_146 (Activation)	(None, 10)	0
dense_195 (Dense)	(None, 2)	22
<hr/>		

Total params: 1,272
Trainable params: 1,132
Non-trainable params: 140

Epoch 1/1000
4/4 [=====] - 1s 55ms/step - loss: 6.3275 - accuracy: 0.5476 - val_loss: 2.1358 - val_accuracy: 0.6215

Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 5.0245 - accuracy: 0.5450 - val_loss: 2.3950 - val_accuracy: 0.6355
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 4.9926 - accuracy: 0.5604 - val_loss: 2.5437 - val_accuracy: 0.6121
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 4.7902 - accuracy: 0.5681 - val_loss: 2.5248 - val_accuracy: 0.5748
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 4.7191 - accuracy: 0.5887 - val_loss: 2.5182 - val_accuracy: 0.5280
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 4.7260 - accuracy: 0.5938 - val_loss: 2.4760 - val_accuracy: 0.5000
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 4.5433 - accuracy: 0.5733 - val_loss: 2.4821 - val_accuracy: 0.4813
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 4.3106 - accuracy: 0.5810 - val_loss: 2.4735 - val_accuracy: 0.4860
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 4.3232 - accuracy: 0.5990 - val_loss: 2.4640 - val_accuracy: 0.4579
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 4.0253 - accuracy: 0.5938 - val_loss: 2.4248 - val_accuracy: 0.4673
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 4.0365 - accuracy: 0.5964 - val_loss: 2.3471 - val_accuracy: 0.4673
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8296 - accuracy: 0.5835 - val_loss: 2.3137 - val_accuracy: 0.4673
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7307 - accuracy: 0.5784 - val_loss: 2.2117 - val_accuracy: 0.4579
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7029 - accuracy: 0.5578 - val_loss: 2.1703 - val_accuracy: 0.4626
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7018 - accuracy: 0.5938 - val_loss: 2.1508 - val_accuracy: 0.4626
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7422 - accuracy: 0.5913 - val_loss: 2.1335 - val_accuracy: 0.4626
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7529 - accuracy: 0.5681 - val_loss: 2.1209 - val_accuracy: 0.4579
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5375 - accuracy: 0.5578 - val_loss: 2.1293 - val_accuracy: 0.4626
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5543 - accuracy: 0.5835 - val_loss: 2.1089 - val_accuracy: 0.4579
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5032 - accuracy: 0.5758 - val_loss: 2.0821 - val_accuracy: 0.4579
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4198 - accuracy: 0.5810 - val_loss: 2.0678 - val_accuracy: 0.4579
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3843 - accuracy: 0.5630 - val_loss: 2.0468 - val_accuracy: 0.4579
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 3.4672 - accuracy: 0.5733 - val_loss: 2.0040 - val_accuracy: 0.4626
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4042 - accuracy: 0.5630 - val_loss: 1.9844 - val_accuracy: 0.4626
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2372 - accuracy: 0.5887 - val_loss: 1.9542 - val_accuracy: 0.4626
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 3.2545 - accuracy: 0.5887 - val_loss: 1.9226 - val_accuracy: 0.4626
Epoch 27/1000
4/4 [=====] - 0s 14ms/step - loss: 3.2413 - accuracy: 0.5784 - val_loss: 1.8865 - val_accuracy: 0.4579
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1325 - accuracy: 0.5938 - val_loss: 1.8535 - val_accuracy: 0.4579
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1155 - accuracy: 0.5913 - val_loss: 1.8364 - val_accuracy: 0.4579
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0224 - accuracy: 0.5990 - val_loss: 1.8004 - val_accuracy: 0.4533
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9972 - accuracy: 0.6015 - val_loss: 1.7819 - val_accuracy: 0.4533

```
accuracy: 0.4579
Epoch 32/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0784 - accuracy: 0.5913 - val_loss: 1.7781 - val_accuracy: 0.4579
Epoch 33/1000
4/4 [=====] - 0s 14ms/step - loss: 2.9073 - accuracy: 0.6041 - val_loss: 1.7592 - val_accuracy: 0.4579
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9199 - accuracy: 0.6195 - val_loss: 1.7455 - val_accuracy: 0.4579
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8255 - accuracy: 0.5938 - val_loss: 1.7388 - val_accuracy: 0.4579
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6247 - accuracy: 0.5964 - val_loss: 1.7032 - val_accuracy: 0.4626
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4864 - accuracy: 0.5964 - val_loss: 1.6805 - val_accuracy: 0.4579
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4755 - accuracy: 0.6041 - val_loss: 1.6549 - val_accuracy: 0.4579
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3357 - accuracy: 0.6170 - val_loss: 1.6304 - val_accuracy: 0.4673
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3995 - accuracy: 0.6093 - val_loss: 1.6044 - val_accuracy: 0.4673
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3002 - accuracy: 0.6093 - val_loss: 1.5901 - val_accuracy: 0.4673
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2755 - accuracy: 0.6093 - val_loss: 1.5828 - val_accuracy: 0.4673
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2601 - accuracy: 0.6041 - val_loss: 1.5349 - val_accuracy: 0.4720
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3716 - accuracy: 0.6221 - val_loss: 1.5480 - val_accuracy: 0.4673
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3230 - accuracy: 0.6247 - val_loss: 1.5043 - val_accuracy: 0.4720
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2757 - accuracy: 0.6298 - val_loss: 1.4971 - val_accuracy: 0.4766
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0808 - accuracy: 0.6221 - val_loss: 1.4714 - val_accuracy: 0.4766
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1563 - accuracy: 0.6118 - val_loss: 1.4519 - val_accuracy: 0.4766
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1015 - accuracy: 0.6195 - val_loss: 1.4346 - val_accuracy: 0.4766
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0373 - accuracy: 0.6170 - val_loss: 1.3886 - val_accuracy: 0.4720
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9619 - accuracy: 0.6452 - val_loss: 1.4087 - val_accuracy: 0.4673
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8405 - accuracy: 0.6272 - val_loss: 1.3670 - val_accuracy: 0.4673
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9315 - accuracy: 0.6324 - val_loss: 1.3518 - val_accuracy: 0.4579
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8210 - accuracy: 0.6247 - val_loss: 1.3394 - val_accuracy: 0.4579
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6978 - accuracy: 0.6452 - val_loss: 1.3232 - val_accuracy: 0.4439
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7361 - accuracy: 0.6375 - val_loss: 1.3027 - val_accuracy: 0.4439
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7730 - accuracy: 0.6452 - val_loss: 1.3033 - val_accuracy: 0.4486
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7423 - accuracy: 0.6247 - val_loss: 1.2906 - val_accuracy: 0.4486
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6768 - accuracy: 0.6221 - val_loss: 1.2803 - val_accuracy: 0.4393
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6495 - accuracy: 0.6401 - val_loss: 1.2736 - val_accuracy: 0.4486
Epoch 61/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 1.6211 - accuracy: 0.6272 - val_loss: 1.3038 - val_accuracy: 0.4626
Epoch 62/1000
4/4 [=====] - 0s 17ms/step - loss: 1.5649 - accuracy: 0.6401 - val_loss: 1.2911 - val_accuracy: 0.4579
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5167 - accuracy: 0.6247 - val_loss: 1.2802 - val_accuracy: 0.4626
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6399 - accuracy: 0.6401 - val_loss: 1.2637 - val_accuracy: 0.4766
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5483 - accuracy: 0.6350 - val_loss: 1.2227 - val_accuracy: 0.4907
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4632 - accuracy: 0.6401 - val_loss: 1.2275 - val_accuracy: 0.5140
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4001 - accuracy: 0.6427 - val_loss: 1.1930 - val_accuracy: 0.5140
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4753 - accuracy: 0.6504 - val_loss: 1.1741 - val_accuracy: 0.5093
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4517 - accuracy: 0.6478 - val_loss: 1.1517 - val_accuracy: 0.5187
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3697 - accuracy: 0.6504 - val_loss: 1.1362 - val_accuracy: 0.5421
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2922 - accuracy: 0.6427 - val_loss: 1.1162 - val_accuracy: 0.5467
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2109 - accuracy: 0.6607 - val_loss: 1.1006 - val_accuracy: 0.5561
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1622 - accuracy: 0.6812 - val_loss: 1.0472 - val_accuracy: 0.5748
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2822 - accuracy: 0.6504 - val_loss: 1.0181 - val_accuracy: 0.5981
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1279 - accuracy: 0.6478 - val_loss: 1.0034 - val_accuracy: 0.6028
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2720 - accuracy: 0.6632 - val_loss: 0.9947 - val_accuracy: 0.6075
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2552 - accuracy: 0.6632 - val_loss: 1.0093 - val_accuracy: 0.5794
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1372 - accuracy: 0.6504 - val_loss: 0.9944 - val_accuracy: 0.5935
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1930 - accuracy: 0.6735 - val_loss: 0.9704 - val_accuracy: 0.6215
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1382 - accuracy: 0.6710 - val_loss: 0.9602 - val_accuracy: 0.6262
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1910 - accuracy: 0.6710 - val_loss: 0.9492 - val_accuracy: 0.6168
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1576 - accuracy: 0.6967 - val_loss: 0.9389 - val_accuracy: 0.6168
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1874 - accuracy: 0.6838 - val_loss: 0.9432 - val_accuracy: 0.6121
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0532 - accuracy: 0.6735 - val_loss: 0.9258 - val_accuracy: 0.6449
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0553 - accuracy: 0.6607 - val_loss: 0.9046 - val_accuracy: 0.6449
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0565 - accuracy: 0.6684 - val_loss: 0.8940 - val_accuracy: 0.6589
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0729 - accuracy: 0.6889 - val_loss: 0.8629 - val_accuracy: 0.6636
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0124 - accuracy: 0.6967 - val_loss: 0.8355 - val_accuracy: 0.6869
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9858 - accuracy: 0.6684 - val_loss: 0.8381 - val_accuracy: 0.6869
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0463 - accuracy: 0.6941 - val_loss: 0.8201 - val_accuracy: 0.7056
```

Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0656 - accuracy: 0.7095 - val_loss: 0.8366 - val_accuracy: 0.7150
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0206 - accuracy: 0.6967 - val_loss: 0.8001 - val_accuracy: 0.7243
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9563 - accuracy: 0.7018 - val_loss: 0.8015 - val_accuracy: 0.7150
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9927 - accuracy: 0.6992 - val_loss: 0.7732 - val_accuracy: 0.7383
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9583 - accuracy: 0.6710 - val_loss: 0.7226 - val_accuracy: 0.6636
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8823 - accuracy: 0.6812 - val_loss: 0.7840 - val_accuracy: 0.7243
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9735 - accuracy: 0.7069 - val_loss: 0.7855 - val_accuracy: 0.6542
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8886 - accuracy: 0.6684 - val_loss: 0.7722 - val_accuracy: 0.6355
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8623 - accuracy: 0.6504 - val_loss: 0.6963 - val_accuracy: 0.6402
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8211 - accuracy: 0.6530 - val_loss: 0.7368 - val_accuracy: 0.6355
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8085 - accuracy: 0.6530 - val_loss: 0.7272 - val_accuracy: 0.6449
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8413 - accuracy: 0.6684 - val_loss: 0.7227 - val_accuracy: 0.6449
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8470 - accuracy: 0.6735 - val_loss: 0.6648 - val_accuracy: 0.6495
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8550 - accuracy: 0.6530 - val_loss: 0.7532 - val_accuracy: 0.6121
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7834 - accuracy: 0.6324 - val_loss: 0.7512 - val_accuracy: 0.6075
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8750 - accuracy: 0.6298 - val_loss: 0.7362 - val_accuracy: 0.6028
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8813 - accuracy: 0.6324 - val_loss: 0.6895 - val_accuracy: 0.6168
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8237 - accuracy: 0.6324 - val_loss: 0.7000 - val_accuracy: 0.6215
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7803 - accuracy: 0.6478 - val_loss: 0.7013 - val_accuracy: 0.6215
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8125 - accuracy: 0.6324 - val_loss: 0.7068 - val_accuracy: 0.6262
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8910 - accuracy: 0.6478 - val_loss: 0.6849 - val_accuracy: 0.6308
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7635 - accuracy: 0.6298 - val_loss: 0.6746 - val_accuracy: 0.6028
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7815 - accuracy: 0.6427 - val_loss: 0.6754 - val_accuracy: 0.6121
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7448 - accuracy: 0.6221 - val_loss: 0.6769 - val_accuracy: 0.6075
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7617 - accuracy: 0.6581 - val_loss: 0.7328 - val_accuracy: 0.6121
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7650 - accuracy: 0.6555 - val_loss: 0.7343 - val_accuracy: 0.6121
Epoch 117/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7362 - accuracy: 0.6452 - val_loss: 0.7391 - val_accuracy: 0.6215
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6971 - accuracy: 0.6504 - val_loss: 0.7341 - val_accuracy: 0.6215
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7729 - accuracy: 0.6452 - val_loss: 0.7915 - val_accuracy: 0.6121
Epoch 120/1000
4/4 [=====] - 0s 16ms/step - loss: 0.7657 - accuracy: 0.6221 - val_loss: 0.8120 - val_accuracy: 0.6121

```
accuracy: 0.6121
Epoch 121/1000
4/4 [=====] - 0s 18ms/step - loss: 0.7662 - accuracy: 0.6195 - val_loss: 0.8193 - val_accuracy: 0.6168
Epoch 122/1000
4/4 [=====] - 0s 16ms/step - loss: 0.7720 - accuracy: 0.6452 - val_loss: 0.8192 - val_accuracy: 0.6168
Epoch 123/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7950 - accuracy: 0.6324 - val_loss: 0.7948 - val_accuracy: 0.6168
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7575 - accuracy: 0.6658 - val_loss: 0.8153 - val_accuracy: 0.6121
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7585 - accuracy: 0.6350 - val_loss: 0.8137 - val_accuracy: 0.6215
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8414 - accuracy: 0.6324 - val_loss: 0.8060 - val_accuracy: 0.6215
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7517 - accuracy: 0.6401 - val_loss: 0.8077 - val_accuracy: 0.6963
Epoch 128/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7889 - accuracy: 0.6658 - val_loss: 0.8320 - val_accuracy: 0.6869
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7422 - accuracy: 0.6761 - val_loss: 0.8489 - val_accuracy: 0.6963
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7049 - accuracy: 0.6658 - val_loss: 0.8466 - val_accuracy: 0.6963
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7410 - accuracy: 0.6967 - val_loss: 0.8359 - val_accuracy: 0.6963
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7002 - accuracy: 0.6787 - val_loss: 0.8353 - val_accuracy: 0.6869
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6903 - accuracy: 0.6787 - val_loss: 0.8329 - val_accuracy: 0.7103
Epoch 134/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7251 - accuracy: 0.6889 - val_loss: 0.8604 - val_accuracy: 0.7056
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6927 - accuracy: 0.6684 - val_loss: 0.8307 - val_accuracy: 0.6916
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6730 - accuracy: 0.6992 - val_loss: 0.8200 - val_accuracy: 0.7056
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6828 - accuracy: 0.6941 - val_loss: 0.8495 - val_accuracy: 0.7103
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7213 - accuracy: 0.6787 - val_loss: 0.7867 - val_accuracy: 0.7196
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7120 - accuracy: 0.6787 - val_loss: 0.7910 - val_accuracy: 0.6916
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6365 - accuracy: 0.6838 - val_loss: 0.8005 - val_accuracy: 0.6822
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6012 - accuracy: 0.6735 - val_loss: 0.7906 - val_accuracy: 0.6542
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5978 - accuracy: 0.6864 - val_loss: 0.8188 - val_accuracy: 0.6262
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6634 - accuracy: 0.6735 - val_loss: 0.8158 - val_accuracy: 0.6495
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6102 - accuracy: 0.6607 - val_loss: 0.7903 - val_accuracy: 0.6495
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6632 - accuracy: 0.6710 - val_loss: 0.7970 - val_accuracy: 0.6215
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5795 - accuracy: 0.6915 - val_loss: 0.7980 - val_accuracy: 0.5701
Epoch 147/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6184 - accuracy: 0.6555 - val_loss: 0.7700 - val_accuracy: 0.5794
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5397 - accuracy: 0.6838 - val_loss: 0.7912 - val_accuracy: 0.6075
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6029 - accuracy: 0.6710 - val_loss: 0.7891 - val_accuracy: 0.6121
Epoch 150/1000
```

4/4 [=====] - 0s 12ms/step - loss: 0.6420 - accuracy: 0.7044 - val_loss: 0.7789 - val_accuracy: 0.6028
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5991 - accuracy: 0.6658 - val_loss: 0.7705 - val_accuracy: 0.6262
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5538 - accuracy: 0.6658 - val_loss: 0.7589 - val_accuracy: 0.6402
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5658 - accuracy: 0.6710 - val_loss: 0.7382 - val_accuracy: 0.6682
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5915 - accuracy: 0.6838 - val_loss: 0.7209 - val_accuracy: 0.6308
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6118 - accuracy: 0.6658 - val_loss: 0.7207 - val_accuracy: 0.6355
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5864 - accuracy: 0.7121 - val_loss: 0.7464 - val_accuracy: 0.6355
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7022 - accuracy: 0.6838 - val_loss: 0.7519 - val_accuracy: 0.6308
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6000 - accuracy: 0.7069 - val_loss: 0.7333 - val_accuracy: 0.6308
Epoch 159/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6473 - accuracy: 0.6452 - val_loss: 0.7636 - val_accuracy: 0.6308
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5609 - accuracy: 0.6735 - val_loss: 0.7312 - val_accuracy: 0.6402
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5153 - accuracy: 0.7018 - val_loss: 0.7251 - val_accuracy: 0.6449
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5189 - accuracy: 0.7018 - val_loss: 0.7344 - val_accuracy: 0.6262
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5634 - accuracy: 0.6658 - val_loss: 0.7230 - val_accuracy: 0.6495
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5146 - accuracy: 0.6812 - val_loss: 0.7182 - val_accuracy: 0.6215
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5848 - accuracy: 0.6915 - val_loss: 0.7105 - val_accuracy: 0.6449
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5367 - accuracy: 0.6607 - val_loss: 0.7240 - val_accuracy: 0.5981
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5602 - accuracy: 0.6658 - val_loss: 0.7227 - val_accuracy: 0.6028
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4940 - accuracy: 0.6478 - val_loss: 0.7199 - val_accuracy: 0.5888
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5999 - accuracy: 0.6684 - val_loss: 0.7238 - val_accuracy: 0.5748
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4710 - accuracy: 0.6581 - val_loss: 0.7222 - val_accuracy: 0.5794
Epoch 171/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5425 - accuracy: 0.6272 - val_loss: 0.7309 - val_accuracy: 0.5514
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5582 - accuracy: 0.6221 - val_loss: 0.7257 - val_accuracy: 0.5561
Epoch 173/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5739 - accuracy: 0.6607 - val_loss: 0.7308 - val_accuracy: 0.5514
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5623 - accuracy: 0.6272 - val_loss: 0.7258 - val_accuracy: 0.5561
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5933 - accuracy: 0.6350 - val_loss: 0.7204 - val_accuracy: 0.5514
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5103 - accuracy: 0.6350 - val_loss: 0.7381 - val_accuracy: 0.5654
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5278 - accuracy: 0.6478 - val_loss: 0.7296 - val_accuracy: 0.5794
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4995 - accuracy: 0.6272 - val_loss: 0.7281 - val_accuracy: 0.5701
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5738 - accuracy: 0.6272 - val_loss: 0.7280 - val_accuracy: 0.5794

Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4642 - accuracy: 0.6478 - val_loss: 0.7175 - val_accuracy: 0.5794
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5298 - accuracy: 0.6247 - val_loss: 0.7140 - val_accuracy: 0.5794
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5246 - accuracy: 0.6735 - val_loss: 0.7635 - val_accuracy: 0.5654
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5527 - accuracy: 0.6375 - val_loss: 0.7541 - val_accuracy: 0.5514
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4795 - accuracy: 0.6504 - val_loss: 0.7716 - val_accuracy: 0.5654
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5718 - accuracy: 0.6452 - val_loss: 0.7780 - val_accuracy: 0.5607
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4778 - accuracy: 0.6812 - val_loss: 0.7702 - val_accuracy: 0.5514
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5172 - accuracy: 0.6607 - val_loss: 0.7827 - val_accuracy: 0.5514
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4514 - accuracy: 0.6272 - val_loss: 0.7769 - val_accuracy: 0.5561
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5739 - accuracy: 0.6581 - val_loss: 0.7553 - val_accuracy: 0.5514
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4972 - accuracy: 0.6247 - val_loss: 0.7590 - val_accuracy: 0.5234
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5476 - accuracy: 0.6478 - val_loss: 0.7624 - val_accuracy: 0.5280
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5339 - accuracy: 0.6504 - val_loss: 0.7573 - val_accuracy: 0.5280
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4848 - accuracy: 0.6350 - val_loss: 0.7496 - val_accuracy: 0.5093
Epoch 194/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5213 - accuracy: 0.6272 - val_loss: 0.7477 - val_accuracy: 0.5280
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5074 - accuracy: 0.6658 - val_loss: 0.7451 - val_accuracy: 0.5093
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5428 - accuracy: 0.6427 - val_loss: 0.7095 - val_accuracy: 0.4813
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5098 - accuracy: 0.6504 - val_loss: 0.7044 - val_accuracy: 0.4953
Epoch 198/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4804 - accuracy: 0.6478 - val_loss: 0.7090 - val_accuracy: 0.5047
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4604 - accuracy: 0.6272 - val_loss: 0.7273 - val_accuracy: 0.5140
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5230 - accuracy: 0.6041 - val_loss: 0.7240 - val_accuracy: 0.5187
Epoch 201/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4711 - accuracy: 0.6298 - val_loss: 0.7480 - val_accuracy: 0.5047
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5377 - accuracy: 0.6427 - val_loss: 0.7427 - val_accuracy: 0.5093
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4702 - accuracy: 0.6504 - val_loss: 0.7441 - val_accuracy: 0.5514
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4862 - accuracy: 0.6710 - val_loss: 0.7722 - val_accuracy: 0.5654
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4558 - accuracy: 0.6555 - val_loss: 0.8201 - val_accuracy: 0.5607
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4785 - accuracy: 0.6298 - val_loss: 0.8288 - val_accuracy: 0.5748
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4481 - accuracy: 0.6812 - val_loss: 0.7723 - val_accuracy: 0.5794
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4574 - accuracy: 0.6607 - val_loss: 0.7631 - val_accuracy: 0.5794
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4447 - accuracy: 0.6452 - val_loss: 0.7569 - val_accuracy: 0.5794

```
accuracy: 0.5374
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4951 - accuracy: 0.6915 - val_loss: 0.7868 - val_accuracy: 0.5654
Epoch 211/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4676 - accuracy: 0.6735 - val_loss: 1.0278 - val_accuracy: 0.5935
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4380 - accuracy: 0.6787 - val_loss: 0.9530 - val_accuracy: 0.5748
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5746 - accuracy: 0.6864 - val_loss: 1.0803 - val_accuracy: 0.5935
Epoch 214/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4738 - accuracy: 0.6812 - val_loss: 1.0559 - val_accuracy: 0.5794
Epoch 215/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4918 - accuracy: 0.6761 - val_loss: 1.0193 - val_accuracy: 0.5794
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4437 - accuracy: 0.6658 - val_loss: 0.9722 - val_accuracy: 0.5935
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5574 - accuracy: 0.6684 - val_loss: 0.9569 - val_accuracy: 0.5935
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4870 - accuracy: 0.6684 - val_loss: 0.9039 - val_accuracy: 0.5888
Epoch 219/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4523 - accuracy: 0.6350 - val_loss: 0.8971 - val_accuracy: 0.5888
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5560 - accuracy: 0.7018 - val_loss: 0.9208 - val_accuracy: 0.5841
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4213 - accuracy: 0.6812 - val_loss: 0.9496 - val_accuracy: 0.5794
Epoch 222/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4298 - accuracy: 0.6735 - val_loss: 0.9511 - val_accuracy: 0.5794
Epoch 223/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4440 - accuracy: 0.6581 - val_loss: 0.9497 - val_accuracy: 0.5794
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4766 - accuracy: 0.6864 - val_loss: 0.9878 - val_accuracy: 0.6075
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4981 - accuracy: 0.6787 - val_loss: 0.9187 - val_accuracy: 0.6028
Epoch 226/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4518 - accuracy: 0.6452 - val_loss: 0.8921 - val_accuracy: 0.6121
Epoch 227/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4368 - accuracy: 0.6504 - val_loss: 0.8581 - val_accuracy: 0.6121
Epoch 228/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4540 - accuracy: 0.6555 - val_loss: 0.9539 - val_accuracy: 0.6121
Epoch 229/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3972 - accuracy: 0.6504 - val_loss: 0.9326 - val_accuracy: 0.6075
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4193 - accuracy: 0.6478 - val_loss: 0.9037 - val_accuracy: 0.6121
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3824 - accuracy: 0.6452 - val_loss: 0.9112 - val_accuracy: 0.6075
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4935 - accuracy: 0.6401 - val_loss: 0.8143 - val_accuracy: 0.5981
Epoch 233/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4706 - accuracy: 0.6607 - val_loss: 0.8432 - val_accuracy: 0.6168
Epoch 234/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4080 - accuracy: 0.6375 - val_loss: 0.8440 - val_accuracy: 0.6168
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4515 - accuracy: 0.6401 - val_loss: 0.9014 - val_accuracy: 0.5935
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4084 - accuracy: 0.6581 - val_loss: 0.9603 - val_accuracy: 0.5981
Epoch 237/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4231 - accuracy: 0.6889 - val_loss: 0.9304 - val_accuracy: 0.6121
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4932 - accuracy: 0.7018 - val_loss: 0.9571 - val_accuracy: 0.6121
Epoch 239/1000
```

```

4/4 [=====] - 0s 13ms/step - loss: 0.4270 - accuracy: 0.6735 - val_loss: 1.0005 - val_accuracy: 0.6308
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4979 - accuracy: 0.6735 - val_loss: 0.8871 - val_accuracy: 0.6308
Epoch 241/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4842 - accuracy: 0.6864 - val_loss: 0.9672 - val_accuracy: 0.6402
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4796 - accuracy: 0.6915 - val_loss: 0.9255 - val_accuracy: 0.6121
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4262 - accuracy: 0.6864 - val_loss: 0.9277 - val_accuracy: 0.6121
Epoch 244/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3115 - accuracy: 0.6250Restoring model weights from the end of the best epoch: 94.
4/4 [=====] - 0s 14ms/step - loss: 0.4279 - accuracy: 0.6581 - val_loss: 0.8667 - val_accuracy: 0.5794
Epoch 244: early stopping
2/2 [=====] - 0s 4ms/step - loss: 0.9058 - accuracy: 0.7209
[CV] END .....Dense1=50, Dense2=10; total time= 12.6s
Model: "sequential_49"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_196 (Dense)	(None, 50)	350
batch_normalization_147 (BatchNormalization)	(None, 50)	200
activation_147 (Activation)	(None, 50)	0
dense_197 (Dense)	(None, 25)	1275
batch_normalization_148 (BatchNormalization)	(None, 25)	100
activation_148 (Activation)	(None, 25)	0
dense_198 (Dense)	(None, 10)	260
batch_normalization_149 (BatchNormalization)	(None, 10)	40
activation_149 (Activation)	(None, 10)	0
dense_199 (Dense)	(None, 2)	22
<hr/>		

Total params: 2,247
Trainable params: 2,077
Non-trainable params: 170

Epoch 1/1000
4/4 [=====] - 2s 58ms/step - loss: 5.3825 - accuracy: 0.4149 - val_loss: 2.6487 - val_accuracy: 0.5421
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8726 - accuracy: 0.3892 - val_loss: 3.2342 - val_accuracy: 0.5234
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 3.7548 - accuracy: 0.3840 - val_loss: 3.4093 - val_accuracy: 0.5000
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5763 - accuracy: 0.4124 - val_loss: 3.4916 - val_accuracy: 0.4860
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4210 - accuracy: 0.4304 - val_loss: 3.3375 - val_accuracy: 0.4533
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2603 - accuracy: 0.3969 - val_loss: 3.0916 - val_accuracy: 0.4112
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1336 - accuracy: 0.3918 - val_loss: 2.6150 - val_accuracy: 0.3925
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0225 - accuracy: 0.4072 - val_loss: 2.3248 - val_accuracy: 0.4206
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0530 - accuracy: 0.3814 - val_loss: 2.1188 - val_accuracy: 0.4159
Epoch 10/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9988 - accuracy: 0.4304 - val_loss: 1.9901 - val_accuracy: 0.4206
Epoch 11/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8425 - accuracy: 0.4304 - val_loss: 1.9799 - val_accuracy: 0.4206
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8431 - accuracy: 0.4201 - val_loss: 1.9223 - val_accuracy: 0.4201

```
accuracy: 0.4206
Epoch 13/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8646 - accuracy: 0.4201 - val_loss: 1.8980 - val_accuracy: 0.4112
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6872 - accuracy: 0.4098 - val_loss: 1.7914 - val_accuracy: 0.4252
Epoch 15/1000
4/4 [=====] - 0s 19ms/step - loss: 2.7295 - accuracy: 0.4124 - val_loss: 1.7032 - val_accuracy: 0.4206
Epoch 16/1000
4/4 [=====] - 0s 15ms/step - loss: 2.6428 - accuracy: 0.4407 - val_loss: 1.6574 - val_accuracy: 0.4159
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5535 - accuracy: 0.4227 - val_loss: 1.6355 - val_accuracy: 0.4346
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5860 - accuracy: 0.4227 - val_loss: 1.5585 - val_accuracy: 0.4252
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3202 - accuracy: 0.3995 - val_loss: 1.5388 - val_accuracy: 0.4346
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5138 - accuracy: 0.4098 - val_loss: 1.5226 - val_accuracy: 0.4393
Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3816 - accuracy: 0.4149 - val_loss: 1.4957 - val_accuracy: 0.4393
Epoch 22/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5687 - accuracy: 0.4459 - val_loss: 1.4879 - val_accuracy: 0.4486
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3719 - accuracy: 0.4072 - val_loss: 1.4681 - val_accuracy: 0.4533
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5036 - accuracy: 0.4278 - val_loss: 1.4311 - val_accuracy: 0.4346
Epoch 25/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2505 - accuracy: 0.4175 - val_loss: 1.3751 - val_accuracy: 0.4393
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2085 - accuracy: 0.4485 - val_loss: 1.3230 - val_accuracy: 0.4346
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1665 - accuracy: 0.4124 - val_loss: 1.2699 - val_accuracy: 0.4346
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8967 - accuracy: 0.4124 - val_loss: 1.2683 - val_accuracy: 0.4346
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0022 - accuracy: 0.4330 - val_loss: 1.2416 - val_accuracy: 0.4346
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9014 - accuracy: 0.4304 - val_loss: 1.2299 - val_accuracy: 0.3925
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8248 - accuracy: 0.4588 - val_loss: 1.2157 - val_accuracy: 0.3925
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5450 - accuracy: 0.4820 - val_loss: 1.1885 - val_accuracy: 0.3738
Epoch 33/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6117 - accuracy: 0.4613 - val_loss: 1.1796 - val_accuracy: 0.3785
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4105 - accuracy: 0.4485 - val_loss: 1.1657 - val_accuracy: 0.3832
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3280 - accuracy: 0.4253 - val_loss: 1.1448 - val_accuracy: 0.3785
Epoch 36/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3811 - accuracy: 0.4407 - val_loss: 1.1284 - val_accuracy: 0.3598
Epoch 37/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3246 - accuracy: 0.4356 - val_loss: 1.1151 - val_accuracy: 0.3551
Epoch 38/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3548 - accuracy: 0.4149 - val_loss: 1.1291 - val_accuracy: 0.3551
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2336 - accuracy: 0.4356 - val_loss: 1.1140 - val_accuracy: 0.3645
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2923 - accuracy: 0.4227 - val_loss: 1.1082 - val_accuracy: 0.3505
Epoch 41/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2304 - accuracy: 0.4407 - val_loss: 1.1102 - val_accuracy: 0.3505
Epoch 42/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 1.1332 - accuracy: 0.3969 - val_loss: 1.1001 - val_accuracy: 0.3598
Epoch 43/1000
4/4 [=====] - 0s 16ms/step - loss: 1.1639 - accuracy: 0.4021 - val_loss: 1.0836 - val_accuracy: 0.3645
Epoch 44/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1681 - accuracy: 0.3969 - val_loss: 1.0502 - val_accuracy: 0.3692
Epoch 45/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1806 - accuracy: 0.4227 - val_loss: 1.0332 - val_accuracy: 0.3645
Epoch 46/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2287 - accuracy: 0.4124 - val_loss: 1.0878 - val_accuracy: 0.3738
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0731 - accuracy: 0.4021 - val_loss: 1.0731 - val_accuracy: 0.3738
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0731 - accuracy: 0.4201 - val_loss: 1.0668 - val_accuracy: 0.3738
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1752 - accuracy: 0.4381 - val_loss: 1.0413 - val_accuracy: 0.4393
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0849 - accuracy: 0.4330 - val_loss: 1.0565 - val_accuracy: 0.4393
Epoch 51/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1428 - accuracy: 0.4330 - val_loss: 1.0514 - val_accuracy: 0.4486
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0356 - accuracy: 0.4072 - val_loss: 1.0847 - val_accuracy: 0.4439
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0556 - accuracy: 0.4072 - val_loss: 1.0436 - val_accuracy: 0.4299
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0076 - accuracy: 0.4330 - val_loss: 1.0485 - val_accuracy: 0.4393
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9278 - accuracy: 0.4098 - val_loss: 1.0455 - val_accuracy: 0.4486
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0554 - accuracy: 0.4304 - val_loss: 1.0309 - val_accuracy: 0.4626
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9490 - accuracy: 0.4149 - val_loss: 1.0241 - val_accuracy: 0.4626
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8225 - accuracy: 0.4072 - val_loss: 1.0604 - val_accuracy: 0.4579
Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9405 - accuracy: 0.4149 - val_loss: 1.0221 - val_accuracy: 0.3879
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8004 - accuracy: 0.4046 - val_loss: 1.0363 - val_accuracy: 0.3832
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8337 - accuracy: 0.4175 - val_loss: 1.0011 - val_accuracy: 0.3879
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8800 - accuracy: 0.3969 - val_loss: 0.9544 - val_accuracy: 0.3598
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8708 - accuracy: 0.3995 - val_loss: 0.9756 - val_accuracy: 0.3645
Epoch 64/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8000 - accuracy: 0.4175 - val_loss: 0.9665 - val_accuracy: 0.3738
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7538 - accuracy: 0.4149 - val_loss: 0.9668 - val_accuracy: 0.3738
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7032 - accuracy: 0.4201 - val_loss: 0.9527 - val_accuracy: 0.3458
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7126 - accuracy: 0.4304 - val_loss: 0.9698 - val_accuracy: 0.3598
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7941 - accuracy: 0.4330 - val_loss: 0.9645 - val_accuracy: 0.3598
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7822 - accuracy: 0.3995 - val_loss: 0.9582 - val_accuracy: 0.3551
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8038 - accuracy: 0.3995 - val_loss: 0.9534 - val_accuracy: 0.3645
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7204 - accuracy: 0.4536 - val_loss: 0.9496 - val_accuracy: 0.3598
```

Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7327 - accuracy: 0.4253 - val_loss: 0.9410 - val_accuracy: 0.3598
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7314 - accuracy: 0.4330 - val_loss: 0.9240 - val_accuracy: 0.3551
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8139 - accuracy: 0.4278 - val_loss: 0.9267 - val_accuracy: 0.3551
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8852 - accuracy: 0.4072 - val_loss: 0.9253 - val_accuracy: 0.3598
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7310 - accuracy: 0.4201 - val_loss: 0.9209 - val_accuracy: 0.3598
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6981 - accuracy: 0.4072 - val_loss: 0.9160 - val_accuracy: 0.3551
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7287 - accuracy: 0.4330 - val_loss: 0.9097 - val_accuracy: 0.3598
Epoch 79/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7143 - accuracy: 0.4072 - val_loss: 0.9063 - val_accuracy: 0.3645
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7207 - accuracy: 0.4227 - val_loss: 0.8988 - val_accuracy: 0.3598
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6733 - accuracy: 0.4175 - val_loss: 0.8867 - val_accuracy: 0.3738
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7232 - accuracy: 0.4149 - val_loss: 0.8806 - val_accuracy: 0.3692
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7261 - accuracy: 0.4072 - val_loss: 0.8933 - val_accuracy: 0.3458
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6322 - accuracy: 0.4278 - val_loss: 0.9087 - val_accuracy: 0.3598
Epoch 85/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6361 - accuracy: 0.4253 - val_loss: 0.8975 - val_accuracy: 0.3411
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6755 - accuracy: 0.4098 - val_loss: 0.8860 - val_accuracy: 0.3505
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6368 - accuracy: 0.3995 - val_loss: 0.8980 - val_accuracy: 0.3551
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6799 - accuracy: 0.4459 - val_loss: 0.8848 - val_accuracy: 0.3411
Epoch 89/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6262 - accuracy: 0.4124 - val_loss: 0.8783 - val_accuracy: 0.3551
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6672 - accuracy: 0.4046 - val_loss: 0.8681 - val_accuracy: 0.3645
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6245 - accuracy: 0.4356 - val_loss: 0.8572 - val_accuracy: 0.3692
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5833 - accuracy: 0.4021 - val_loss: 0.8478 - val_accuracy: 0.3692
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6690 - accuracy: 0.4098 - val_loss: 0.8518 - val_accuracy: 0.3598
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5986 - accuracy: 0.4201 - val_loss: 0.8677 - val_accuracy: 0.3645
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5608 - accuracy: 0.4278 - val_loss: 0.8563 - val_accuracy: 0.3598
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6254 - accuracy: 0.4330 - val_loss: 0.8441 - val_accuracy: 0.3832
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5678 - accuracy: 0.4485 - val_loss: 0.8758 - val_accuracy: 0.3738
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5493 - accuracy: 0.4459 - val_loss: 0.8370 - val_accuracy: 0.3738
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6587 - accuracy: 0.4510 - val_loss: 0.8279 - val_accuracy: 0.3785
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5558 - accuracy: 0.4459 - val_loss: 0.8310 - val_accuracy: 0.3785
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5616 - accuracy: 0.4278 - val_loss: 0.8304 - val_accuracy: 0.3785

```
accuracy: 0.3598
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6263 - accuracy: 0.4253 - val_loss: 0.8166 - val_
accuracy: 0.3598
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5322 - accuracy: 0.4562 - val_loss: 0.8106 - val_
accuracy: 0.3692
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4846 - accuracy: 0.4149 - val_loss: 0.7902 - val_
accuracy: 0.3692
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5457 - accuracy: 0.4304 - val_loss: 0.7803 - val_
accuracy: 0.3692
Epoch 106/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5614 - accuracy: 0.4510 - val_loss: 0.7722 - val_
accuracy: 0.3692
Epoch 107/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5279 - accuracy: 0.4330 - val_loss: 0.7658 - val_
accuracy: 0.3692
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5546 - accuracy: 0.4433 - val_loss: 0.7269 - val_
accuracy: 0.3785
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5244 - accuracy: 0.4459 - val_loss: 0.7482 - val_
accuracy: 0.3738
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6084 - accuracy: 0.4304 - val_loss: 0.7442 - val_
accuracy: 0.3738
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4683 - accuracy: 0.4149 - val_loss: 0.7514 - val_
accuracy: 0.3972
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4658 - accuracy: 0.4407 - val_loss: 0.7491 - val_
accuracy: 0.3925
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5156 - accuracy: 0.4381 - val_loss: 0.7219 - val_
accuracy: 0.3925
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4931 - accuracy: 0.4330 - val_loss: 0.7108 - val_
accuracy: 0.3972
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6295 - accuracy: 0.4381 - val_loss: 0.7069 - val_
accuracy: 0.3925
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5107 - accuracy: 0.4253 - val_loss: 0.7494 - val_
accuracy: 0.3925
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5063 - accuracy: 0.4381 - val_loss: 0.7495 - val_
accuracy: 0.3972
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4748 - accuracy: 0.4253 - val_loss: 0.7429 - val_
accuracy: 0.3972
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5735 - accuracy: 0.4149 - val_loss: 0.7370 - val_
accuracy: 0.3879
Epoch 120/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4874 - accuracy: 0.4278 - val_loss: 0.7343 - val_
accuracy: 0.3879
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5158 - accuracy: 0.4330 - val_loss: 0.7263 - val_
accuracy: 0.3879
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5164 - accuracy: 0.4278 - val_loss: 0.7188 - val_
accuracy: 0.3832
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5218 - accuracy: 0.4407 - val_loss: 0.7189 - val_
accuracy: 0.3879
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5233 - accuracy: 0.4201 - val_loss: 0.7204 - val_
accuracy: 0.3785
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4817 - accuracy: 0.4253 - val_loss: 0.7097 - val_
accuracy: 0.3925
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4794 - accuracy: 0.3969 - val_loss: 0.7272 - val_
accuracy: 0.3925
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5422 - accuracy: 0.4330 - val_loss: 0.7229 - val_
accuracy: 0.3925
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5207 - accuracy: 0.4356 - val_loss: 0.7231 - val_
accuracy: 0.3879
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4438 - accuracy: 0.4304 - val_loss: 0.7227 - val_
accuracy: 0.3879
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4773 - accuracy: 0.4175 - val_loss: 0.7465 - val_
accuracy: 0.3832
Epoch 131/1000
```

```

4/4 [=====] - 0s 12ms/step - loss: 0.5310 - accuracy: 0.4691 - val_loss: 0.7426 - val_accuracy: 0.3832
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4899 - accuracy: 0.4253 - val_loss: 0.7697 - val_accuracy: 0.3879
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4783 - accuracy: 0.4253 - val_loss: 0.7666 - val_accuracy: 0.3879
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5138 - accuracy: 0.4175 - val_loss: 0.7706 - val_accuracy: 0.3832
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4806 - accuracy: 0.4253 - val_loss: 0.7690 - val_accuracy: 0.3879
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4982 - accuracy: 0.4072 - val_loss: 0.7484 - val_accuracy: 0.3832
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5038 - accuracy: 0.4278 - val_loss: 0.7691 - val_accuracy: 0.3832
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5054 - accuracy: 0.4227 - val_loss: 0.7679 - val_accuracy: 0.3785
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4871 - accuracy: 0.4433 - val_loss: 0.7435 - val_accuracy: 0.3832
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5254 - accuracy: 0.4356 - val_loss: 0.7413 - val_accuracy: 0.3925
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5254 - accuracy: 0.4304 - val_loss: 0.7413 - val_accuracy: 0.3879
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4740 - accuracy: 0.4330 - val_loss: 0.7388 - val_accuracy: 0.3879
Epoch 143/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4498 - accuracy: 0.4278 - val_loss: 0.7183 - val_accuracy: 0.3832
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5072 - accuracy: 0.4253 - val_loss: 0.7093 - val_accuracy: 0.3692
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5386 - accuracy: 0.4149 - val_loss: 0.7078 - val_accuracy: 0.3645
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5040 - accuracy: 0.4227 - val_loss: 0.7092 - val_accuracy: 0.3692
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5052 - accuracy: 0.4510 - val_loss: 0.7391 - val_accuracy: 0.3785
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4304 - accuracy: 0.4175 - val_loss: 0.7635 - val_accuracy: 0.3551
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5088 - accuracy: 0.4278 - val_loss: 0.7611 - val_accuracy: 0.3645
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4183 - accuracy: 0.4175 - val_loss: 0.7362 - val_accuracy: 0.3738
Epoch 151/1000
1/4 [====>.....] - ETA: 0s - loss: 0.4444 - accuracy: 0.3828Restoring model weights from the end of the best epoch: 1.
4/4 [=====] - 0s 16ms/step - loss: 0.4290 - accuracy: 0.4330 - val_loss: 0.7306 - val_accuracy: 0.3738
Epoch 151: early stopping
2/2 [=====] - 0s 5ms/step - loss: 3.1815 - accuracy: 0.5000
[CV] END .....Dense1=50, Dense2=25; total time= 8.8s
Model: "sequential_50"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_200 (Dense)	(None, 50)	350
<hr/>		
batch_normalization_150 (BatchNormalization)	(None, 50)	200
activation_150 (Activation)	(None, 50)	0
dense_201 (Dense)	(None, 25)	1275
batch_normalization_151 (BatchNormalization)	(None, 25)	100
activation_151 (Activation)	(None, 25)	0
dense_202 (Dense)	(None, 10)	260
batch_normalization_152 (BatchNormalization)	(None, 10)	40

activation_152 (Activation)	(None, 10)	0
dense_203 (Dense)	(None, 2)	22

=====

Total params: 2,247
Trainable params: 2,077
Non-trainable params: 170

Epoch 1/1000
4/4 [=====] - 1s 67ms/step - loss: 5.2020 - accuracy: 0.5155 - val_loss: 3.9092 - val_accuracy: 0.4159
Epoch 2/1000
4/4 [=====] - 0s 16ms/step - loss: 4.0195 - accuracy: 0.4948 - val_loss: 4.2629 - val_accuracy: 0.4252
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5469 - accuracy: 0.5490 - val_loss: 3.9205 - val_accuracy: 0.4346
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4888 - accuracy: 0.5722 - val_loss: 3.3493 - val_accuracy: 0.5280
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 3.3656 - accuracy: 0.5722 - val_loss: 2.9269 - val_accuracy: 0.5748
Epoch 6/1000
4/4 [=====] - 0s 16ms/step - loss: 3.1653 - accuracy: 0.6031 - val_loss: 2.7828 - val_accuracy: 0.5888
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1584 - accuracy: 0.5979 - val_loss: 2.6240 - val_accuracy: 0.6075
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1676 - accuracy: 0.5851 - val_loss: 2.4873 - val_accuracy: 0.5748
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0152 - accuracy: 0.5696 - val_loss: 2.3015 - val_accuracy: 0.5935
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9701 - accuracy: 0.6108 - val_loss: 2.0409 - val_accuracy: 0.5935
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0873 - accuracy: 0.5593 - val_loss: 1.9469 - val_accuracy: 0.5794
Epoch 12/1000
4/4 [=====] - 0s 15ms/step - loss: 2.8392 - accuracy: 0.5515 - val_loss: 1.8981 - val_accuracy: 0.6121
Epoch 13/1000
4/4 [=====] - 0s 15ms/step - loss: 2.7414 - accuracy: 0.5696 - val_loss: 1.8458 - val_accuracy: 0.6215
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6729 - accuracy: 0.5876 - val_loss: 1.7565 - val_accuracy: 0.6822
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6931 - accuracy: 0.5876 - val_loss: 1.7239 - val_accuracy: 0.6776
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7226 - accuracy: 0.5567 - val_loss: 1.7013 - val_accuracy: 0.6542
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4643 - accuracy: 0.5876 - val_loss: 1.6675 - val_accuracy: 0.6402
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6318 - accuracy: 0.5747 - val_loss: 1.6418 - val_accuracy: 0.6589
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5443 - accuracy: 0.5928 - val_loss: 1.6004 - val_accuracy: 0.6682
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3098 - accuracy: 0.5799 - val_loss: 1.5817 - val_accuracy: 0.6682
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1923 - accuracy: 0.5928 - val_loss: 1.5501 - val_accuracy: 0.6542
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2350 - accuracy: 0.6186 - val_loss: 1.5087 - val_accuracy: 0.6589
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9935 - accuracy: 0.6108 - val_loss: 1.4668 - val_accuracy: 0.6822
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1858 - accuracy: 0.5593 - val_loss: 1.4515 - val_accuracy: 0.6916
Epoch 25/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9864 - accuracy: 0.5722 - val_loss: 1.3731 - val_accuracy: 0.6963
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9524 - accuracy: 0.6186 - val_loss: 1.3786 - val_accuracy: 0.7150
Epoch 27/1000

```
4/4 [=====] - 0s 12ms/step - loss: 1.7309 - accuracy: 0.6392 - val_loss: 1.3314 - val_accuracy: 0.6869
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7158 - accuracy: 0.6314 - val_loss: 1.3070 - val_accuracy: 0.7009
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5872 - accuracy: 0.6082 - val_loss: 1.2933 - val_accuracy: 0.7103
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4271 - accuracy: 0.6263 - val_loss: 1.2711 - val_accuracy: 0.7290
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3746 - accuracy: 0.6366 - val_loss: 1.2271 - val_accuracy: 0.7196
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3890 - accuracy: 0.5876 - val_loss: 1.2795 - val_accuracy: 0.7196
Epoch 33/1000
4/4 [=====] - 0s 17ms/step - loss: 1.3546 - accuracy: 0.6263 - val_loss: 1.2489 - val_accuracy: 0.7336
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2888 - accuracy: 0.6160 - val_loss: 1.1802 - val_accuracy: 0.7336
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2566 - accuracy: 0.5954 - val_loss: 1.2367 - val_accuracy: 0.7290
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1451 - accuracy: 0.6005 - val_loss: 1.1923 - val_accuracy: 0.7336
Epoch 37/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2412 - accuracy: 0.6546 - val_loss: 1.2074 - val_accuracy: 0.7383
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1918 - accuracy: 0.6340 - val_loss: 1.2020 - val_accuracy: 0.7243
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3564 - accuracy: 0.6340 - val_loss: 1.1548 - val_accuracy: 0.7383
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1992 - accuracy: 0.6263 - val_loss: 1.1307 - val_accuracy: 0.7196
Epoch 41/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2690 - accuracy: 0.6186 - val_loss: 1.1159 - val_accuracy: 0.7196
Epoch 42/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1264 - accuracy: 0.6314 - val_loss: 1.1126 - val_accuracy: 0.6963
Epoch 43/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1002 - accuracy: 0.6160 - val_loss: 1.1053 - val_accuracy: 0.6542
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0086 - accuracy: 0.6469 - val_loss: 1.1099 - val_accuracy: 0.6449
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0473 - accuracy: 0.6005 - val_loss: 1.0893 - val_accuracy: 0.6402
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9686 - accuracy: 0.6057 - val_loss: 1.0864 - val_accuracy: 0.6262
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0221 - accuracy: 0.6134 - val_loss: 1.1126 - val_accuracy: 0.6262
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0856 - accuracy: 0.5979 - val_loss: 1.0963 - val_accuracy: 0.6121
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9237 - accuracy: 0.6289 - val_loss: 1.1273 - val_accuracy: 0.6636
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8355 - accuracy: 0.6263 - val_loss: 1.0715 - val_accuracy: 0.6495
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8295 - accuracy: 0.6289 - val_loss: 0.9737 - val_accuracy: 0.6308
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7681 - accuracy: 0.6289 - val_loss: 0.9928 - val_accuracy: 0.6308
Epoch 53/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8554 - accuracy: 0.6289 - val_loss: 0.9543 - val_accuracy: 0.6028
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7632 - accuracy: 0.6314 - val_loss: 0.9446 - val_accuracy: 0.5981
Epoch 55/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8207 - accuracy: 0.6237 - val_loss: 0.9340 - val_accuracy: 0.6028
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8672 - accuracy: 0.6598 - val_loss: 0.9344 - val_accuracy: 0.5935
```

Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8855 - accuracy: 0.6469 - val_loss: 0.8868 - val_accuracy: 0.5935
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8403 - accuracy: 0.6649 - val_loss: 0.8687 - val_accuracy: 0.5888
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8901 - accuracy: 0.6134 - val_loss: 0.8554 - val_accuracy: 0.6028
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8293 - accuracy: 0.6263 - val_loss: 0.8721 - val_accuracy: 0.5841
Epoch 61/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8529 - accuracy: 0.5851 - val_loss: 0.8623 - val_accuracy: 0.5888
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7901 - accuracy: 0.5876 - val_loss: 0.8552 - val_accuracy: 0.6075
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9324 - accuracy: 0.6237 - val_loss: 0.8463 - val_accuracy: 0.5935
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7897 - accuracy: 0.6134 - val_loss: 0.8390 - val_accuracy: 0.5841
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8705 - accuracy: 0.6366 - val_loss: 0.8205 - val_accuracy: 0.5888
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7920 - accuracy: 0.6366 - val_loss: 0.8077 - val_accuracy: 0.5748
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7441 - accuracy: 0.6289 - val_loss: 0.7869 - val_accuracy: 0.5607
Epoch 68/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7921 - accuracy: 0.6521 - val_loss: 0.7777 - val_accuracy: 0.5701
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7603 - accuracy: 0.6057 - val_loss: 0.7741 - val_accuracy: 0.5514
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7916 - accuracy: 0.6134 - val_loss: 0.7992 - val_accuracy: 0.5561
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7304 - accuracy: 0.5954 - val_loss: 0.7622 - val_accuracy: 0.5514
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6908 - accuracy: 0.6418 - val_loss: 0.7559 - val_accuracy: 0.5607
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7617 - accuracy: 0.6546 - val_loss: 0.7361 - val_accuracy: 0.5607
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6633 - accuracy: 0.6289 - val_loss: 0.6996 - val_accuracy: 0.5514
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7178 - accuracy: 0.6469 - val_loss: 0.6871 - val_accuracy: 0.5607
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6627 - accuracy: 0.6753 - val_loss: 0.6867 - val_accuracy: 0.5561
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7073 - accuracy: 0.6469 - val_loss: 0.6714 - val_accuracy: 0.5748
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6875 - accuracy: 0.6753 - val_loss: 0.6765 - val_accuracy: 0.5327
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6549 - accuracy: 0.6572 - val_loss: 0.6476 - val_accuracy: 0.5327
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6259 - accuracy: 0.6443 - val_loss: 0.6497 - val_accuracy: 0.5280
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6992 - accuracy: 0.6443 - val_loss: 0.6214 - val_accuracy: 0.5280
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6358 - accuracy: 0.6546 - val_loss: 0.6415 - val_accuracy: 0.5187
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7747 - accuracy: 0.6598 - val_loss: 0.6685 - val_accuracy: 0.5280
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6634 - accuracy: 0.6495 - val_loss: 0.6681 - val_accuracy: 0.5374
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6096 - accuracy: 0.6753 - val_loss: 0.6607 - val_accuracy: 0.5327
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6799 - accuracy: 0.6778 - val_loss: 0.6781 - val_accuracy: 0.5327

```
accuracy: 0.5327
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6218 - accuracy: 0.6572 - val_loss: 0.6741 - val_accuracy: 0.5327
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6006 - accuracy: 0.6624 - val_loss: 0.6089 - val_accuracy: 0.5234
Epoch 89/1000
4/4 [=====] - 0s 17ms/step - loss: 0.6625 - accuracy: 0.6546 - val_loss: 0.6152 - val_accuracy: 0.5280
Epoch 90/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7505 - accuracy: 0.6495 - val_loss: 0.6030 - val_accuracy: 0.5234
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6595 - accuracy: 0.6572 - val_loss: 0.6015 - val_accuracy: 0.5374
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5963 - accuracy: 0.6598 - val_loss: 0.6226 - val_accuracy: 0.5561
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5801 - accuracy: 0.6959 - val_loss: 0.7306 - val_accuracy: 0.5374
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5705 - accuracy: 0.6933 - val_loss: 0.6845 - val_accuracy: 0.5421
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6382 - accuracy: 0.6753 - val_loss: 0.6755 - val_accuracy: 0.5467
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5712 - accuracy: 0.6856 - val_loss: 0.6806 - val_accuracy: 0.5280
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6161 - accuracy: 0.6546 - val_loss: 0.7054 - val_accuracy: 0.5327
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6274 - accuracy: 0.6495 - val_loss: 0.6362 - val_accuracy: 0.5467
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6251 - accuracy: 0.6985 - val_loss: 0.6191 - val_accuracy: 0.5514
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5890 - accuracy: 0.6933 - val_loss: 0.6424 - val_accuracy: 0.5748
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6545 - accuracy: 0.6753 - val_loss: 0.6466 - val_accuracy: 0.5701
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6286 - accuracy: 0.6933 - val_loss: 0.6753 - val_accuracy: 0.5607
Epoch 103/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6524 - accuracy: 0.6959 - val_loss: 0.7690 - val_accuracy: 0.5561
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6035 - accuracy: 0.6830 - val_loss: 0.8507 - val_accuracy: 0.5421
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5720 - accuracy: 0.6701 - val_loss: 0.7539 - val_accuracy: 0.5514
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4984 - accuracy: 0.6727 - val_loss: 0.7842 - val_accuracy: 0.5421
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6360 - accuracy: 0.6624 - val_loss: 0.7430 - val_accuracy: 0.5514
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5646 - accuracy: 0.6933 - val_loss: 0.7175 - val_accuracy: 0.5514
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5623 - accuracy: 0.6804 - val_loss: 0.7509 - val_accuracy: 0.5701
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4981 - accuracy: 0.6649 - val_loss: 0.7740 - val_accuracy: 0.5794
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4955 - accuracy: 0.6830 - val_loss: 0.7721 - val_accuracy: 0.5794
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5240 - accuracy: 0.6649 - val_loss: 0.7813 - val_accuracy: 0.5841
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4990 - accuracy: 0.6830 - val_loss: 0.9021 - val_accuracy: 0.5607
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5508 - accuracy: 0.6856 - val_loss: 0.8744 - val_accuracy: 0.5654
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5056 - accuracy: 0.7010 - val_loss: 0.9018 - val_accuracy: 0.5701
Epoch 116/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.5347 - accuracy: 0.6985 - val_loss: 0.9560 - val_accuracy: 0.5561
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5400 - accuracy: 0.6881 - val_loss: 0.9531 - val_accuracy: 0.5514
Epoch 118/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4706 - accuracy: 0.6753 - val_loss: 0.9296 - val_accuracy: 0.5421
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5086 - accuracy: 0.6804 - val_loss: 0.8967 - val_accuracy: 0.5467
Epoch 120/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4968 - accuracy: 0.6804 - val_loss: 0.8778 - val_accuracy: 0.5561
Epoch 121/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4949 - accuracy: 0.7062 - val_loss: 0.8476 - val_accuracy: 0.5467
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5470 - accuracy: 0.7242 - val_loss: 0.9091 - val_accuracy: 0.5421
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4748 - accuracy: 0.6907 - val_loss: 0.8940 - val_accuracy: 0.5561
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4706 - accuracy: 0.7165 - val_loss: 0.8962 - val_accuracy: 0.5561
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5159 - accuracy: 0.6985 - val_loss: 0.9106 - val_accuracy: 0.5607
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5117 - accuracy: 0.6959 - val_loss: 0.9547 - val_accuracy: 0.5607
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4525 - accuracy: 0.6830 - val_loss: 0.9473 - val_accuracy: 0.5654
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4554 - accuracy: 0.7165 - val_loss: 0.9420 - val_accuracy: 0.5654
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5101 - accuracy: 0.6907 - val_loss: 0.9091 - val_accuracy: 0.5701
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4193 - accuracy: 0.7010 - val_loss: 0.8733 - val_accuracy: 0.5654
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3993 - accuracy: 0.7423 - val_loss: 0.8696 - val_accuracy: 0.5654
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4026 - accuracy: 0.7062 - val_loss: 0.8696 - val_accuracy: 0.5794
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3785 - accuracy: 0.7088 - val_loss: 0.8679 - val_accuracy: 0.5794
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4357 - accuracy: 0.7010 - val_loss: 0.8183 - val_accuracy: 0.5841
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3752 - accuracy: 0.7320 - val_loss: 0.8587 - val_accuracy: 0.6028
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4132 - accuracy: 0.7397 - val_loss: 0.8927 - val_accuracy: 0.6028
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3726 - accuracy: 0.7474 - val_loss: 0.8896 - val_accuracy: 0.5888
Epoch 138/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3972 - accuracy: 0.7165 - val_loss: 0.8654 - val_accuracy: 0.6028
Epoch 139/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3599 - accuracy: 0.7036 - val_loss: 0.8036 - val_accuracy: 0.5935
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3011 - accuracy: 0.6830 - val_loss: 0.8032 - val_accuracy: 0.5841
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3900 - accuracy: 0.7474 - val_loss: 0.7719 - val_accuracy: 0.6075
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3366 - accuracy: 0.6985 - val_loss: 0.8219 - val_accuracy: 0.5935
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4125 - accuracy: 0.6881 - val_loss: 0.7933 - val_accuracy: 0.5935
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5222 - accuracy: 0.6804 - val_loss: 0.7906 - val_accuracy: 0.6215
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4076 - accuracy: 0.7062 - val_loss: 0.7695 - val_accuracy: 0.6121
```

Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3173 - accuracy: 0.6933 - val_loss: 0.7979 - val_accuracy: 0.6028
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3893 - accuracy: 0.6933 - val_loss: 0.7945 - val_accuracy: 0.6215
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3741 - accuracy: 0.7036 - val_loss: 0.7917 - val_accuracy: 0.6121
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3164 - accuracy: 0.7113 - val_loss: 0.7936 - val_accuracy: 0.6075
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3607 - accuracy: 0.7216 - val_loss: 0.8355 - val_accuracy: 0.6075
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3447 - accuracy: 0.7268 - val_loss: 0.8398 - val_accuracy: 0.5841
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3900 - accuracy: 0.7036 - val_loss: 0.8362 - val_accuracy: 0.6075
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3503 - accuracy: 0.7294 - val_loss: 0.8303 - val_accuracy: 0.6121
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4348 - accuracy: 0.7216 - val_loss: 0.8161 - val_accuracy: 0.5888
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3263 - accuracy: 0.7113 - val_loss: 0.8689 - val_accuracy: 0.6028
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3505 - accuracy: 0.7062 - val_loss: 0.8700 - val_accuracy: 0.6075
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3381 - accuracy: 0.7397 - val_loss: 0.8151 - val_accuracy: 0.6262
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3375 - accuracy: 0.7397 - val_loss: 0.7828 - val_accuracy: 0.6121
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4254 - accuracy: 0.7036 - val_loss: 0.8849 - val_accuracy: 0.5748
Epoch 160/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4180 - accuracy: 0.7294 - val_loss: 0.9647 - val_accuracy: 0.5701
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2969 - accuracy: 0.7088 - val_loss: 0.9616 - val_accuracy: 0.5935
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3369 - accuracy: 0.7010 - val_loss: 0.8718 - val_accuracy: 0.6121
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3111 - accuracy: 0.7139 - val_loss: 0.9250 - val_accuracy: 0.6075
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3145 - accuracy: 0.7191 - val_loss: 0.9234 - val_accuracy: 0.6121
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2753 - accuracy: 0.7165 - val_loss: 0.9495 - val_accuracy: 0.6028
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3609 - accuracy: 0.7242 - val_loss: 0.9461 - val_accuracy: 0.6215
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3176 - accuracy: 0.7294 - val_loss: 1.0172 - val_accuracy: 0.6542
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3854 - accuracy: 0.7139 - val_loss: 1.0261 - val_accuracy: 0.6542
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3276 - accuracy: 0.7397 - val_loss: 0.8971 - val_accuracy: 0.6682
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4407 - accuracy: 0.7655 - val_loss: 0.9811 - val_accuracy: 0.6636
Epoch 171/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3727 - accuracy: 0.7784 - val_loss: 0.8988 - val_accuracy: 0.6729
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3737 - accuracy: 0.7397 - val_loss: 0.8940 - val_accuracy: 0.6869
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4227 - accuracy: 0.7268 - val_loss: 0.9210 - val_accuracy: 0.6542
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3382 - accuracy: 0.7294 - val_loss: 0.9577 - val_accuracy: 0.6869
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2916 - accuracy: 0.7448 - val_loss: 1.0061 - val_accuracy: 0.6869

```

accuracy: 0.6682
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3938 - accuracy: 0.7448 - val_loss: 1.0180 - val_
accuracy: 0.6449
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3069 - accuracy: 0.7345 - val_loss: 1.0464 - val_
accuracy: 0.6449
Epoch 178/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2927 - accuracy: 0.7242 - val_loss: 1.0349 - val_
accuracy: 0.6355
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4152 - accuracy: 0.6959 - val_loss: 1.0810 - val_
accuracy: 0.6542
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3541 - accuracy: 0.7474 - val_loss: 1.1279 - val_
accuracy: 0.6449
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3432 - accuracy: 0.7577 - val_loss: 1.0983 - val_
accuracy: 0.6355
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3274 - accuracy: 0.7448 - val_loss: 0.9592 - val_
accuracy: 0.6262
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3004 - accuracy: 0.7577 - val_loss: 0.9158 - val_
accuracy: 0.6402
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4477 - accuracy: 0.7036 - val_loss: 0.9473 - val_
accuracy: 0.6215
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2851 - accuracy: 0.7423 - val_loss: 0.9370 - val_
accuracy: 0.6495
Epoch 186/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3427 - accuracy: 0.7371 - val_loss: 0.9099 - val_
accuracy: 0.6495
Epoch 187/1000
1/4 [====>.....] - ETA: 0s - loss: 0.2604 - accuracy: 0.7188Restoring model weights from th
e end of the best epoch: 37.
4/4 [=====] - 0s 15ms/step - loss: 0.3061 - accuracy: 0.7577 - val_loss: 0.9417 - val_
accuracy: 0.6402
Epoch 187: early stopping
2/2 [=====] - 0s 4ms/step - loss: 1.3094 - accuracy: 0.7273
[CV] END .....Dense1=50, Dense2=25; total time= 10.1s
Model: "sequential_51"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_204 (Dense)	(None, 50)	350
batch_normalization_153 (BatchNormalization)	(None, 50)	200
activation_153 (Activation)	(None, 50)	0
dense_205 (Dense)	(None, 25)	1275
batch_normalization_154 (BatchNormalization)	(None, 25)	100
activation_154 (Activation)	(None, 25)	0
dense_206 (Dense)	(None, 10)	260
batch_normalization_155 (BatchNormalization)	(None, 10)	40
activation_155 (Activation)	(None, 10)	0
dense_207 (Dense)	(None, 2)	22
<hr/>		

Total params: 2,247
Trainable params: 2,077
Non-trainable params: 170

```

Epoch 1/1000
4/4 [=====] - 1s 57ms/step - loss: 4.4762 - accuracy: 0.5270 - val_loss: 2.0311 - val_
accuracy: 0.5935
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5306 - accuracy: 0.5450 - val_loss: 2.0656 - val_
accuracy: 0.5701
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3909 - accuracy: 0.5861 - val_loss: 2.0804 - val_
accuracy: 0.5888
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3098 - accuracy: 0.5630 - val_loss: 2.1859 - val_
accuracy: 0.5607
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3546 - accuracy: 0.5347 - val_loss: 2.1761 - val_
accuracy: 0.5280

```

Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3402 - accuracy: 0.5656 - val_loss: 2.2582 - val_accuracy: 0.5047
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2065 - accuracy: 0.5296 - val_loss: 2.3136 - val_accuracy: 0.4626
Epoch 8/1000
4/4 [=====] - 0s 12ms/step - loss: 3.2832 - accuracy: 0.5450 - val_loss: 2.3555 - val_accuracy: 0.4720
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3311 - accuracy: 0.5424 - val_loss: 2.3484 - val_accuracy: 0.4673
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1205 - accuracy: 0.5373 - val_loss: 2.3605 - val_accuracy: 0.4579
Epoch 11/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9165 - accuracy: 0.5733 - val_loss: 2.3888 - val_accuracy: 0.4393
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8700 - accuracy: 0.5553 - val_loss: 2.2936 - val_accuracy: 0.4393
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9518 - accuracy: 0.5476 - val_loss: 2.2538 - val_accuracy: 0.4486
Epoch 14/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8608 - accuracy: 0.5373 - val_loss: 2.2260 - val_accuracy: 0.4533
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7419 - accuracy: 0.5553 - val_loss: 2.1634 - val_accuracy: 0.4579
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6473 - accuracy: 0.5784 - val_loss: 2.1295 - val_accuracy: 0.4533
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7017 - accuracy: 0.5681 - val_loss: 2.0847 - val_accuracy: 0.4486
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6837 - accuracy: 0.5398 - val_loss: 2.0104 - val_accuracy: 0.4533
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3940 - accuracy: 0.5681 - val_loss: 1.9867 - val_accuracy: 0.4673
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3774 - accuracy: 0.5270 - val_loss: 1.9530 - val_accuracy: 0.4626
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3936 - accuracy: 0.5347 - val_loss: 1.9324 - val_accuracy: 0.4673
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2830 - accuracy: 0.5553 - val_loss: 1.8363 - val_accuracy: 0.4673
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2134 - accuracy: 0.5398 - val_loss: 1.8348 - val_accuracy: 0.4813
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2710 - accuracy: 0.5476 - val_loss: 1.8108 - val_accuracy: 0.4860
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4133 - accuracy: 0.5116 - val_loss: 1.7693 - val_accuracy: 0.4860
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3579 - accuracy: 0.5630 - val_loss: 1.7519 - val_accuracy: 0.4860
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1275 - accuracy: 0.5604 - val_loss: 1.7248 - val_accuracy: 0.4907
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2217 - accuracy: 0.5373 - val_loss: 1.6992 - val_accuracy: 0.4953
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2766 - accuracy: 0.5398 - val_loss: 1.6877 - val_accuracy: 0.5000
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1435 - accuracy: 0.5553 - val_loss: 1.6800 - val_accuracy: 0.5000
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1611 - accuracy: 0.5604 - val_loss: 1.6683 - val_accuracy: 0.4907
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2140 - accuracy: 0.5501 - val_loss: 1.6492 - val_accuracy: 0.4953
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0170 - accuracy: 0.5861 - val_loss: 1.6432 - val_accuracy: 0.6822
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0465 - accuracy: 0.5707 - val_loss: 1.6537 - val_accuracy: 0.6916
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9350 - accuracy: 0.5707 - val_loss: 1.6439 - val_accuracy: 0.6916

```
accuracy: 0.6869
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8647 - accuracy: 0.5681 - val_loss: 1.6725 - val_accuracy: 0.6869
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9152 - accuracy: 0.5681 - val_loss: 1.6891 - val_accuracy: 0.6822
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9169 - accuracy: 0.6015 - val_loss: 1.6758 - val_accuracy: 0.6916
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9562 - accuracy: 0.5990 - val_loss: 1.6606 - val_accuracy: 0.6869
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7707 - accuracy: 0.5964 - val_loss: 1.6398 - val_accuracy: 0.6869
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8164 - accuracy: 0.5964 - val_loss: 1.6335 - val_accuracy: 0.6869
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8072 - accuracy: 0.5758 - val_loss: 1.6202 - val_accuracy: 0.6869
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6459 - accuracy: 0.5784 - val_loss: 1.5769 - val_accuracy: 0.6916
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4579 - accuracy: 0.5887 - val_loss: 1.5656 - val_accuracy: 0.6869
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5642 - accuracy: 0.5810 - val_loss: 1.5262 - val_accuracy: 0.6729
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5655 - accuracy: 0.6041 - val_loss: 1.5045 - val_accuracy: 0.6776
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4505 - accuracy: 0.5733 - val_loss: 1.4876 - val_accuracy: 0.6869
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4460 - accuracy: 0.6067 - val_loss: 1.4901 - val_accuracy: 0.6822
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4486 - accuracy: 0.5938 - val_loss: 1.4738 - val_accuracy: 0.6869
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4933 - accuracy: 0.5964 - val_loss: 1.4665 - val_accuracy: 0.6822
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3428 - accuracy: 0.5810 - val_loss: 1.4577 - val_accuracy: 0.6916
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4597 - accuracy: 0.5707 - val_loss: 1.4503 - val_accuracy: 0.6869
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3346 - accuracy: 0.6093 - val_loss: 1.4365 - val_accuracy: 0.6869
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3695 - accuracy: 0.5938 - val_loss: 1.4739 - val_accuracy: 0.6916
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4097 - accuracy: 0.5938 - val_loss: 1.4603 - val_accuracy: 0.6963
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3547 - accuracy: 0.6195 - val_loss: 1.4930 - val_accuracy: 0.6916
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2924 - accuracy: 0.6452 - val_loss: 1.4914 - val_accuracy: 0.6916
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1903 - accuracy: 0.6118 - val_loss: 1.5090 - val_accuracy: 0.6916
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2137 - accuracy: 0.6272 - val_loss: 1.5048 - val_accuracy: 0.6963
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2839 - accuracy: 0.6170 - val_loss: 1.4983 - val_accuracy: 0.6916
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2020 - accuracy: 0.6195 - val_loss: 1.4405 - val_accuracy: 0.6916
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1111 - accuracy: 0.6530 - val_loss: 1.4326 - val_accuracy: 0.6963
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1615 - accuracy: 0.6221 - val_loss: 1.4295 - val_accuracy: 0.6916
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2011 - accuracy: 0.6375 - val_loss: 1.4020 - val_accuracy: 0.6916
Epoch 65/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 1.1316 - accuracy: 0.6272 - val_loss: 1.3730 - val_accuracy: 0.6869
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0124 - accuracy: 0.6195 - val_loss: 1.3855 - val_accuracy: 0.6776
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2566 - accuracy: 0.6247 - val_loss: 1.3804 - val_accuracy: 0.6682
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2743 - accuracy: 0.6375 - val_loss: 1.3665 - val_accuracy: 0.6495
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0176 - accuracy: 0.6324 - val_loss: 1.3575 - val_accuracy: 0.6589
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0567 - accuracy: 0.6272 - val_loss: 1.3140 - val_accuracy: 0.6262
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1484 - accuracy: 0.6144 - val_loss: 1.3049 - val_accuracy: 0.6308
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0779 - accuracy: 0.6530 - val_loss: 1.2893 - val_accuracy: 0.6075
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0339 - accuracy: 0.6298 - val_loss: 1.2769 - val_accuracy: 0.5981
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9792 - accuracy: 0.6221 - val_loss: 1.2901 - val_accuracy: 0.6028
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8947 - accuracy: 0.6427 - val_loss: 1.2733 - val_accuracy: 0.5935
Epoch 76/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0375 - accuracy: 0.6221 - val_loss: 1.2973 - val_accuracy: 0.5654
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0212 - accuracy: 0.6478 - val_loss: 1.2791 - val_accuracy: 0.6168
Epoch 78/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0279 - accuracy: 0.6504 - val_loss: 1.2906 - val_accuracy: 0.6215
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9029 - accuracy: 0.6478 - val_loss: 1.2741 - val_accuracy: 0.6215
Epoch 80/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8754 - accuracy: 0.6632 - val_loss: 1.2559 - val_accuracy: 0.6075
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8420 - accuracy: 0.6324 - val_loss: 1.2410 - val_accuracy: 0.5981
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9212 - accuracy: 0.6710 - val_loss: 1.2341 - val_accuracy: 0.5935
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8334 - accuracy: 0.6375 - val_loss: 1.1786 - val_accuracy: 0.5888
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8251 - accuracy: 0.6632 - val_loss: 1.1616 - val_accuracy: 0.5888
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8575 - accuracy: 0.6632 - val_loss: 1.1660 - val_accuracy: 0.5935
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8093 - accuracy: 0.6530 - val_loss: 1.1311 - val_accuracy: 0.5841
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8050 - accuracy: 0.6427 - val_loss: 1.1287 - val_accuracy: 0.5794
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7578 - accuracy: 0.6298 - val_loss: 1.1500 - val_accuracy: 0.6075
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8604 - accuracy: 0.6478 - val_loss: 1.0819 - val_accuracy: 0.6121
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7349 - accuracy: 0.6530 - val_loss: 1.0222 - val_accuracy: 0.5794
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7521 - accuracy: 0.6375 - val_loss: 0.9867 - val_accuracy: 0.5794
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7681 - accuracy: 0.6452 - val_loss: 0.9995 - val_accuracy: 0.5888
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6573 - accuracy: 0.6812 - val_loss: 0.9826 - val_accuracy: 0.5841
Epoch 94/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7375 - accuracy: 0.6478 - val_loss: 0.9722 - val_accuracy: 0.5888
```

Epoch 95/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7208 - accuracy: 0.6401 - val_loss: 0.9669 - val_accuracy: 0.6168
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6834 - accuracy: 0.6452 - val_loss: 0.9191 - val_accuracy: 0.6121
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7840 - accuracy: 0.6272 - val_loss: 0.9277 - val_accuracy: 0.6121
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6331 - accuracy: 0.6247 - val_loss: 0.8650 - val_accuracy: 0.5981
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5885 - accuracy: 0.6221 - val_loss: 0.8820 - val_accuracy: 0.5888
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6918 - accuracy: 0.6170 - val_loss: 0.8663 - val_accuracy: 0.6121
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6117 - accuracy: 0.6350 - val_loss: 0.8802 - val_accuracy: 0.6262
Epoch 102/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6258 - accuracy: 0.6118 - val_loss: 0.8138 - val_accuracy: 0.6028
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5269 - accuracy: 0.5964 - val_loss: 0.8178 - val_accuracy: 0.5935
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5713 - accuracy: 0.6093 - val_loss: 0.8112 - val_accuracy: 0.5841
Epoch 105/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5345 - accuracy: 0.6093 - val_loss: 0.8271 - val_accuracy: 0.5748
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5654 - accuracy: 0.6041 - val_loss: 0.8091 - val_accuracy: 0.5701
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5554 - accuracy: 0.6015 - val_loss: 0.8187 - val_accuracy: 0.5748
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5006 - accuracy: 0.6324 - val_loss: 0.8320 - val_accuracy: 0.5935
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5306 - accuracy: 0.6093 - val_loss: 0.8727 - val_accuracy: 0.5935
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6378 - accuracy: 0.5784 - val_loss: 0.8278 - val_accuracy: 0.5888
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5195 - accuracy: 0.5656 - val_loss: 0.8442 - val_accuracy: 0.5794
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5694 - accuracy: 0.5913 - val_loss: 0.8372 - val_accuracy: 0.5794
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4777 - accuracy: 0.5887 - val_loss: 0.7906 - val_accuracy: 0.5701
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4608 - accuracy: 0.5758 - val_loss: 0.7763 - val_accuracy: 0.5701
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4762 - accuracy: 0.5656 - val_loss: 0.8266 - val_accuracy: 0.5467
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4610 - accuracy: 0.5964 - val_loss: 0.7855 - val_accuracy: 0.5467
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5290 - accuracy: 0.5938 - val_loss: 0.7574 - val_accuracy: 0.5280
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4743 - accuracy: 0.5424 - val_loss: 0.7771 - val_accuracy: 0.5374
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4095 - accuracy: 0.5707 - val_loss: 0.7866 - val_accuracy: 0.5467
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4025 - accuracy: 0.5681 - val_loss: 0.8028 - val_accuracy: 0.5514
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4417 - accuracy: 0.5476 - val_loss: 0.8204 - val_accuracy: 0.5421
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4298 - accuracy: 0.5553 - val_loss: 0.7887 - val_accuracy: 0.5467
Epoch 123/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3942 - accuracy: 0.5835 - val_loss: 0.8005 - val_accuracy: 0.5374
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4283 - accuracy: 0.5681 - val_loss: 0.8031 - val_accuracy: 0.5374

```
accuracy: 0.5421
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4590 - accuracy: 0.5681 - val_loss: 0.8114 - val_accuracy: 0.5140
Epoch 126/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4638 - accuracy: 0.5938 - val_loss: 0.8089 - val_accuracy: 0.5234
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5686 - accuracy: 0.6041 - val_loss: 0.7316 - val_accuracy: 0.5514
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4206 - accuracy: 0.5630 - val_loss: 0.7764 - val_accuracy: 0.5514
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4065 - accuracy: 0.5270 - val_loss: 0.7120 - val_accuracy: 0.5327
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5215 - accuracy: 0.5578 - val_loss: 0.7805 - val_accuracy: 0.5234
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4697 - accuracy: 0.5604 - val_loss: 0.8048 - val_accuracy: 0.5234
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4212 - accuracy: 0.5450 - val_loss: 0.8034 - val_accuracy: 0.5280
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3771 - accuracy: 0.5424 - val_loss: 0.7816 - val_accuracy: 0.5467
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4396 - accuracy: 0.5347 - val_loss: 0.8180 - val_accuracy: 0.5280
Epoch 135/1000
4/4 [=====] - 0s 20ms/step - loss: 0.3372 - accuracy: 0.5347 - val_loss: 0.7803 - val_accuracy: 0.5234
Epoch 136/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3665 - accuracy: 0.5501 - val_loss: 0.8143 - val_accuracy: 0.5047
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4127 - accuracy: 0.5398 - val_loss: 0.8042 - val_accuracy: 0.5234
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4112 - accuracy: 0.5193 - val_loss: 0.7926 - val_accuracy: 0.5234
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4413 - accuracy: 0.5270 - val_loss: 0.7957 - val_accuracy: 0.5140
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4140 - accuracy: 0.5347 - val_loss: 0.8564 - val_accuracy: 0.5794
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4898 - accuracy: 0.5321 - val_loss: 0.8339 - val_accuracy: 0.5841
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4633 - accuracy: 0.5398 - val_loss: 0.8692 - val_accuracy: 0.5794
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3454 - accuracy: 0.5296 - val_loss: 0.8186 - val_accuracy: 0.5701
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5077 - accuracy: 0.5758 - val_loss: 0.7860 - val_accuracy: 0.5701
Epoch 145/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3968 - accuracy: 0.5296 - val_loss: 0.8196 - val_accuracy: 0.5561
Epoch 146/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3920 - accuracy: 0.5398 - val_loss: 0.8178 - val_accuracy: 0.5421
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4315 - accuracy: 0.5476 - val_loss: 0.7956 - val_accuracy: 0.5421
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4146 - accuracy: 0.5296 - val_loss: 0.7575 - val_accuracy: 0.5280
Epoch 149/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4070 - accuracy: 0.5347 - val_loss: 0.6996 - val_accuracy: 0.5093
Epoch 150/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3895 - accuracy: 0.5193 - val_loss: 0.6976 - val_accuracy: 0.5187
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3829 - accuracy: 0.5553 - val_loss: 0.7654 - val_accuracy: 0.5421
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4604 - accuracy: 0.5630 - val_loss: 0.8099 - val_accuracy: 0.5374
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3906 - accuracy: 0.5527 - val_loss: 0.7451 - val_accuracy: 0.5280
Epoch 154/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3511 - accuracy: 0.5501 - val_loss: 0.7396 - val_accuracy: 0.5140
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3687 - accuracy: 0.5501 - val_loss: 0.7631 - val_accuracy: 0.5093
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3955 - accuracy: 0.5270 - val_loss: 0.8491 - val_accuracy: 0.5000
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3180 - accuracy: 0.5219 - val_loss: 0.8239 - val_accuracy: 0.5047
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3988 - accuracy: 0.5501 - val_loss: 0.7940 - val_accuracy: 0.5047
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4352 - accuracy: 0.5373 - val_loss: 0.8537 - val_accuracy: 0.4953
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3793 - accuracy: 0.5424 - val_loss: 0.9793 - val_accuracy: 0.4766
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3979 - accuracy: 0.5270 - val_loss: 0.9521 - val_accuracy: 0.4860
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3782 - accuracy: 0.5501 - val_loss: 0.9504 - val_accuracy: 0.4907
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3452 - accuracy: 0.5347 - val_loss: 1.0344 - val_accuracy: 0.4766
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3570 - accuracy: 0.5578 - val_loss: 0.8858 - val_accuracy: 0.4953
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4340 - accuracy: 0.5296 - val_loss: 0.8683 - val_accuracy: 0.4953
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3277 - accuracy: 0.5321 - val_loss: 0.9598 - val_accuracy: 0.4813
Epoch 167/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3960 - accuracy: 0.5373 - val_loss: 0.9630 - val_accuracy: 0.4673
Epoch 168/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3354 - accuracy: 0.5219 - val_loss: 1.0493 - val_accuracy: 0.4720
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3379 - accuracy: 0.5193 - val_loss: 1.0479 - val_accuracy: 0.4579
Epoch 170/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3705 - accuracy: 0.5167 - val_loss: 0.9644 - val_accuracy: 0.4720
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4031 - accuracy: 0.5090 - val_loss: 1.0980 - val_accuracy: 0.4766
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4147 - accuracy: 0.5244 - val_loss: 0.9718 - val_accuracy: 0.4860
Epoch 173/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4001 - accuracy: 0.5244 - val_loss: 0.9618 - val_accuracy: 0.4953
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4286 - accuracy: 0.5270 - val_loss: 0.8800 - val_accuracy: 0.4860
Epoch 175/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3996 - accuracy: 0.5450 - val_loss: 0.9377 - val_accuracy: 0.4907
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3829 - accuracy: 0.5141 - val_loss: 0.8439 - val_accuracy: 0.5000
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3130 - accuracy: 0.5064 - val_loss: 0.8947 - val_accuracy: 0.4953
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3410 - accuracy: 0.5141 - val_loss: 0.8941 - val_accuracy: 0.4813
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3700 - accuracy: 0.5373 - val_loss: 0.9391 - val_accuracy: 0.4907
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3435 - accuracy: 0.5064 - val_loss: 0.9054 - val_accuracy: 0.4766
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3412 - accuracy: 0.5373 - val_loss: 0.9010 - val_accuracy: 0.4907
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3084 - accuracy: 0.4936 - val_loss: 0.8929 - val_accuracy: 0.5327
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3562 - accuracy: 0.5167 - val_loss: 0.9269 - val_accuracy: 0.5280
```

Epoch 184/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3613 - accuracy: 0.5244 - val_loss: 0.8439 - val_accuracy: 0.5187
 Epoch 185/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3063 - accuracy: 0.5270 - val_loss: 0.8954 - val_accuracy: 0.5327
 Epoch 186/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3288 - accuracy: 0.5193 - val_loss: 1.0256 - val_accuracy: 0.5234
 Epoch 187/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3040 - accuracy: 0.5193 - val_loss: 1.0562 - val_accuracy: 0.5421
 Epoch 188/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3286 - accuracy: 0.5219 - val_loss: 1.0423 - val_accuracy: 0.5327
 Epoch 189/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3796 - accuracy: 0.5398 - val_loss: 0.9469 - val_accuracy: 0.5280
 Epoch 190/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3529 - accuracy: 0.5116 - val_loss: 0.9919 - val_accuracy: 0.5421
 Epoch 191/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3753 - accuracy: 0.5244 - val_loss: 0.8726 - val_accuracy: 0.5421
 Epoch 192/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4005 - accuracy: 0.5553 - val_loss: 0.9731 - val_accuracy: 0.5374
 Epoch 193/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3518 - accuracy: 0.5501 - val_loss: 0.9850 - val_accuracy: 0.5234
 Epoch 194/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3317 - accuracy: 0.5424 - val_loss: 0.9780 - val_accuracy: 0.5140
 Epoch 195/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3388 - accuracy: 0.5219 - val_loss: 0.9393 - val_accuracy: 0.5280
 Epoch 196/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3571 - accuracy: 0.5141 - val_loss: 0.9193 - val_accuracy: 0.5047
 Epoch 197/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3169 - accuracy: 0.5244 - val_loss: 0.9134 - val_accuracy: 0.5000
 Epoch 198/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3760 - accuracy: 0.5244 - val_loss: 0.9412 - val_accuracy: 0.5093
 Epoch 199/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3043 - accuracy: 0.5398 - val_loss: 0.9684 - val_accuracy: 0.5047
 Epoch 200/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3603 - accuracy: 0.5219 - val_loss: 0.9643 - val_accuracy: 0.5093
 Epoch 201/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3479 - accuracy: 0.5219 - val_loss: 0.9442 - val_accuracy: 0.5047
 Epoch 202/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3926 - accuracy: 0.5424 - val_loss: 0.9403 - val_accuracy: 0.4953
 Epoch 203/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3450 - accuracy: 0.5167 - val_loss: 0.8854 - val_accuracy: 0.5047
 Epoch 204/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3105 - accuracy: 0.5321 - val_loss: 0.9257 - val_accuracy: 0.4953
 Epoch 205/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.2554 - accuracy: 0.4844Restoring model weights from the end of the best epoch: 55.
 4/4 [=====] - 0s 14ms/step - loss: 0.3327 - accuracy: 0.5219 - val_loss: 0.9255 - val_accuracy: 0.5000
 Epoch 205: early stopping
 2/2 [=====] - 0s 4ms/step - loss: 1.5185 - accuracy: 0.6977
 [CV] ENDDense1=50, Dense2=25; total time= 10.6s
 Model: "sequential_52"

Layer (type)	Output Shape	Param #
dense_208 (Dense)	(None, 50)	350
batch_normalization_156 (BatchNormalization)	(None, 50)	200
activation_156 (Activation)	(None, 50)	0
dense_209 (Dense)	(None, 25)	1275
batch_normalization_157 (BatchNormalization)	(None, 25)	100
activation_157 (Activation)	(None, 25)	0

dense_210 (Dense)	(None, 10)	260
batch_normalization_158 (BatchNormalization)	(None, 10)	40
activation_158 (Activation)	(None, 10)	0
dense_211 (Dense)	(None, 2)	22

Total params: 2,247
Trainable params: 2,077
Non-trainable params: 170

Epoch 1/1000
4/4 [=====] - 1s 55ms/step - loss: 5.0010 - accuracy: 0.5013 - val_loss: 2.1259 - val_accuracy: 0.4065
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8389 - accuracy: 0.5733 - val_loss: 2.0551 - val_accuracy: 0.3598
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2473 - accuracy: 0.5913 - val_loss: 2.0014 - val_accuracy: 0.3505
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0966 - accuracy: 0.5707 - val_loss: 2.0268 - val_accuracy: 0.3458
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0495 - accuracy: 0.5630 - val_loss: 2.0716 - val_accuracy: 0.3832
Epoch 6/1000
4/4 [=====] - 0s 15ms/step - loss: 2.8834 - accuracy: 0.5630 - val_loss: 2.0648 - val_accuracy: 0.3645
Epoch 7/1000
4/4 [=====] - 0s 15ms/step - loss: 2.6554 - accuracy: 0.5450 - val_loss: 2.1076 - val_accuracy: 0.3505
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6435 - accuracy: 0.5167 - val_loss: 2.0586 - val_accuracy: 0.4159
Epoch 9/1000
4/4 [=====] - 0s 15ms/step - loss: 2.5191 - accuracy: 0.5141 - val_loss: 2.0801 - val_accuracy: 0.5467
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5344 - accuracy: 0.5244 - val_loss: 2.0099 - val_accuracy: 0.5607
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3178 - accuracy: 0.5398 - val_loss: 1.9824 - val_accuracy: 0.4860
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3698 - accuracy: 0.5116 - val_loss: 1.9839 - val_accuracy: 0.4439
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1909 - accuracy: 0.5244 - val_loss: 1.9580 - val_accuracy: 0.4299
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2225 - accuracy: 0.5398 - val_loss: 1.9181 - val_accuracy: 0.3972
Epoch 15/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0886 - accuracy: 0.5424 - val_loss: 1.9064 - val_accuracy: 0.3738
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0870 - accuracy: 0.5527 - val_loss: 1.8780 - val_accuracy: 0.3738
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0559 - accuracy: 0.5219 - val_loss: 1.8624 - val_accuracy: 0.3879
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8941 - accuracy: 0.5219 - val_loss: 1.8432 - val_accuracy: 0.3879
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7272 - accuracy: 0.4730 - val_loss: 1.7274 - val_accuracy: 0.3972
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7515 - accuracy: 0.4704 - val_loss: 1.6881 - val_accuracy: 0.4065
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6203 - accuracy: 0.4961 - val_loss: 1.6437 - val_accuracy: 0.4065
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5480 - accuracy: 0.4884 - val_loss: 1.6428 - val_accuracy: 0.4065
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4659 - accuracy: 0.4653 - val_loss: 1.5994 - val_accuracy: 0.4112
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4220 - accuracy: 0.5064 - val_loss: 1.5684 - val_accuracy: 0.4019
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4101 - accuracy: 0.5013 - val_loss: 1.5101 - val_accuracy: 0.4252

Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3894 - accuracy: 0.4910 - val_loss: 1.4952 - val_accuracy: 0.4206
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3456 - accuracy: 0.4910 - val_loss: 1.4635 - val_accuracy: 0.4019
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3427 - accuracy: 0.4884 - val_loss: 1.4556 - val_accuracy: 0.4019
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3789 - accuracy: 0.4884 - val_loss: 1.4870 - val_accuracy: 0.4159
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3457 - accuracy: 0.5167 - val_loss: 1.4766 - val_accuracy: 0.4112
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2725 - accuracy: 0.5064 - val_loss: 1.4552 - val_accuracy: 0.4112
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2322 - accuracy: 0.5116 - val_loss: 1.4274 - val_accuracy: 0.4065
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1883 - accuracy: 0.4884 - val_loss: 1.3989 - val_accuracy: 0.4065
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1917 - accuracy: 0.4961 - val_loss: 1.3989 - val_accuracy: 0.4019
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0952 - accuracy: 0.5398 - val_loss: 1.3453 - val_accuracy: 0.4252
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1280 - accuracy: 0.5373 - val_loss: 1.3375 - val_accuracy: 0.4299
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0897 - accuracy: 0.5784 - val_loss: 1.3315 - val_accuracy: 0.4439
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1042 - accuracy: 0.5681 - val_loss: 1.3373 - val_accuracy: 0.4533
Epoch 39/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0579 - accuracy: 0.5835 - val_loss: 1.3157 - val_accuracy: 0.4393
Epoch 40/1000
4/4 [=====] - 0s 16ms/step - loss: 1.0151 - accuracy: 0.5990 - val_loss: 1.2901 - val_accuracy: 0.4579
Epoch 41/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9817 - accuracy: 0.5938 - val_loss: 1.2687 - val_accuracy: 0.4533
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9657 - accuracy: 0.6067 - val_loss: 1.2249 - val_accuracy: 0.4533
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0152 - accuracy: 0.6015 - val_loss: 1.2068 - val_accuracy: 0.4533
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0342 - accuracy: 0.6144 - val_loss: 1.1896 - val_accuracy: 0.4439
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8757 - accuracy: 0.5938 - val_loss: 1.1946 - val_accuracy: 0.4533
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9292 - accuracy: 0.5938 - val_loss: 1.1893 - val_accuracy: 0.4486
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9181 - accuracy: 0.5501 - val_loss: 1.1780 - val_accuracy: 0.4486
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8966 - accuracy: 0.5964 - val_loss: 1.1869 - val_accuracy: 0.4533
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9799 - accuracy: 0.5707 - val_loss: 1.1775 - val_accuracy: 0.4579
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7970 - accuracy: 0.5964 - val_loss: 1.1454 - val_accuracy: 0.4626
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7562 - accuracy: 0.6093 - val_loss: 1.1132 - val_accuracy: 0.4533
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7319 - accuracy: 0.6093 - val_loss: 1.1129 - val_accuracy: 0.4626
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7542 - accuracy: 0.5938 - val_loss: 1.0958 - val_accuracy: 0.4673
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6552 - accuracy: 0.5630 - val_loss: 1.0796 - val_accuracy: 0.4673
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7026 - accuracy: 0.5835 - val_loss: 1.0679 - val_accuracy: 0.4673

```
accuracy: 0.4673
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6419 - accuracy: 0.5810 - val_loss: 1.0465 - val_accuracy: 0.4766
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7161 - accuracy: 0.5990 - val_loss: 1.0385 - val_accuracy: 0.4720
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6992 - accuracy: 0.5784 - val_loss: 1.0243 - val_accuracy: 0.4673
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6767 - accuracy: 0.5810 - val_loss: 1.0183 - val_accuracy: 0.4486
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6210 - accuracy: 0.5321 - val_loss: 1.0080 - val_accuracy: 0.4486
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6473 - accuracy: 0.5450 - val_loss: 1.0018 - val_accuracy: 0.4626
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6055 - accuracy: 0.5501 - val_loss: 1.0018 - val_accuracy: 0.4626
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5883 - accuracy: 0.5681 - val_loss: 0.9906 - val_accuracy: 0.4673
Epoch 64/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6224 - accuracy: 0.5373 - val_loss: 0.9866 - val_accuracy: 0.4766
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6434 - accuracy: 0.5527 - val_loss: 1.0310 - val_accuracy: 0.4673
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6629 - accuracy: 0.5501 - val_loss: 1.0222 - val_accuracy: 0.4626
Epoch 67/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5711 - accuracy: 0.5501 - val_loss: 1.0101 - val_accuracy: 0.4673
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6997 - accuracy: 0.5604 - val_loss: 0.9991 - val_accuracy: 0.4579
Epoch 69/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7293 - accuracy: 0.5321 - val_loss: 1.0496 - val_accuracy: 0.4439
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6288 - accuracy: 0.5501 - val_loss: 1.0427 - val_accuracy: 0.4439
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6257 - accuracy: 0.5578 - val_loss: 1.0395 - val_accuracy: 0.4346
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6901 - accuracy: 0.5296 - val_loss: 1.0395 - val_accuracy: 0.4439
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6110 - accuracy: 0.5450 - val_loss: 1.0534 - val_accuracy: 0.4486
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5960 - accuracy: 0.5398 - val_loss: 1.0728 - val_accuracy: 0.4439
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5580 - accuracy: 0.5578 - val_loss: 1.0674 - val_accuracy: 0.4486
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5489 - accuracy: 0.5321 - val_loss: 1.0653 - val_accuracy: 0.4486
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5600 - accuracy: 0.5296 - val_loss: 1.0582 - val_accuracy: 0.4579
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5989 - accuracy: 0.5450 - val_loss: 1.0748 - val_accuracy: 0.4579
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6346 - accuracy: 0.5424 - val_loss: 1.0665 - val_accuracy: 0.4533
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5829 - accuracy: 0.5219 - val_loss: 1.0576 - val_accuracy: 0.4533
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6325 - accuracy: 0.5604 - val_loss: 1.0116 - val_accuracy: 0.4953
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5569 - accuracy: 0.5938 - val_loss: 0.9942 - val_accuracy: 0.4813
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5846 - accuracy: 0.5835 - val_loss: 0.9876 - val_accuracy: 0.4813
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6438 - accuracy: 0.5990 - val_loss: 0.9841 - val_accuracy: 0.4720
Epoch 85/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.5935 - accuracy: 0.5476 - val_loss: 0.9759 - val_accuracy: 0.5140
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6350 - accuracy: 0.6221 - val_loss: 0.9747 - val_accuracy: 0.5187
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5640 - accuracy: 0.5990 - val_loss: 0.9709 - val_accuracy: 0.5327
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5823 - accuracy: 0.6324 - val_loss: 0.9701 - val_accuracy: 0.5374
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6649 - accuracy: 0.6067 - val_loss: 0.9610 - val_accuracy: 0.5234
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5869 - accuracy: 0.6401 - val_loss: 0.9625 - val_accuracy: 0.5187
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5581 - accuracy: 0.6530 - val_loss: 0.9250 - val_accuracy: 0.5093
Epoch 92/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6442 - accuracy: 0.6015 - val_loss: 0.9463 - val_accuracy: 0.5374
Epoch 93/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6430 - accuracy: 0.6272 - val_loss: 0.9106 - val_accuracy: 0.5514
Epoch 94/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5836 - accuracy: 0.6530 - val_loss: 0.9000 - val_accuracy: 0.5841
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5239 - accuracy: 0.6478 - val_loss: 0.8897 - val_accuracy: 0.6121
Epoch 96/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5252 - accuracy: 0.6607 - val_loss: 0.8831 - val_accuracy: 0.6168
Epoch 97/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6252 - accuracy: 0.6452 - val_loss: 0.9045 - val_accuracy: 0.6495
Epoch 98/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5390 - accuracy: 0.6684 - val_loss: 0.9580 - val_accuracy: 0.6682
Epoch 99/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5370 - accuracy: 0.6504 - val_loss: 0.9558 - val_accuracy: 0.6589
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5293 - accuracy: 0.6581 - val_loss: 0.9552 - val_accuracy: 0.6495
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5582 - accuracy: 0.6607 - val_loss: 0.9891 - val_accuracy: 0.6262
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5113 - accuracy: 0.6427 - val_loss: 0.8899 - val_accuracy: 0.6121
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5212 - accuracy: 0.6581 - val_loss: 0.8807 - val_accuracy: 0.6121
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4799 - accuracy: 0.6530 - val_loss: 0.8750 - val_accuracy: 0.6168
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5044 - accuracy: 0.6478 - val_loss: 0.9097 - val_accuracy: 0.6215
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5953 - accuracy: 0.6452 - val_loss: 0.9212 - val_accuracy: 0.6402
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5020 - accuracy: 0.6555 - val_loss: 0.9154 - val_accuracy: 0.6636
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4982 - accuracy: 0.6478 - val_loss: 0.9493 - val_accuracy: 0.6542
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4906 - accuracy: 0.6864 - val_loss: 0.9112 - val_accuracy: 0.6589
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4948 - accuracy: 0.6658 - val_loss: 0.9190 - val_accuracy: 0.6215
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5387 - accuracy: 0.6915 - val_loss: 0.9126 - val_accuracy: 0.6262
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5464 - accuracy: 0.6864 - val_loss: 0.9095 - val_accuracy: 0.6402
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5216 - accuracy: 0.7044 - val_loss: 0.9088 - val_accuracy: 0.6589
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5361 - accuracy: 0.6812 - val_loss: 0.9034 - val_accuracy: 0.6495
```

Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4942 - accuracy: 0.6838 - val_loss: 0.8774 - val_accuracy: 0.6449
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4770 - accuracy: 0.6684 - val_loss: 0.8742 - val_accuracy: 0.6542
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5321 - accuracy: 0.6864 - val_loss: 0.8685 - val_accuracy: 0.6449
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4587 - accuracy: 0.6607 - val_loss: 0.8638 - val_accuracy: 0.6449
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5071 - accuracy: 0.6632 - val_loss: 0.8610 - val_accuracy: 0.6215
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4910 - accuracy: 0.6632 - val_loss: 0.8450 - val_accuracy: 0.6495
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4567 - accuracy: 0.6838 - val_loss: 0.8466 - val_accuracy: 0.6636
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4968 - accuracy: 0.6658 - val_loss: 0.8566 - val_accuracy: 0.6495
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4614 - accuracy: 0.6530 - val_loss: 0.8533 - val_accuracy: 0.6449
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4699 - accuracy: 0.6581 - val_loss: 0.8536 - val_accuracy: 0.6355
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4889 - accuracy: 0.6555 - val_loss: 0.8660 - val_accuracy: 0.6308
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5002 - accuracy: 0.6504 - val_loss: 0.8562 - val_accuracy: 0.6308
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5310 - accuracy: 0.6324 - val_loss: 0.8630 - val_accuracy: 0.6355
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5517 - accuracy: 0.6350 - val_loss: 0.9637 - val_accuracy: 0.6168
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5295 - accuracy: 0.6093 - val_loss: 0.9662 - val_accuracy: 0.6262
Epoch 130/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4886 - accuracy: 0.6324 - val_loss: 0.9968 - val_accuracy: 0.5935
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5247 - accuracy: 0.6067 - val_loss: 0.9444 - val_accuracy: 0.5888
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4538 - accuracy: 0.5990 - val_loss: 0.9387 - val_accuracy: 0.5981
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4392 - accuracy: 0.5990 - val_loss: 0.9396 - val_accuracy: 0.5981
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4465 - accuracy: 0.6093 - val_loss: 0.9477 - val_accuracy: 0.5981
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4359 - accuracy: 0.5990 - val_loss: 1.0034 - val_accuracy: 0.6028
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4831 - accuracy: 0.6118 - val_loss: 1.0382 - val_accuracy: 0.5935
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5203 - accuracy: 0.5990 - val_loss: 1.0725 - val_accuracy: 0.6075
Epoch 138/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4549 - accuracy: 0.6195 - val_loss: 1.0546 - val_accuracy: 0.6075
Epoch 139/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5068 - accuracy: 0.6170 - val_loss: 1.0186 - val_accuracy: 0.5981
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5490 - accuracy: 0.6221 - val_loss: 1.0982 - val_accuracy: 0.5981
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5286 - accuracy: 0.6530 - val_loss: 1.0743 - val_accuracy: 0.5981
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4000 - accuracy: 0.6375 - val_loss: 1.0757 - val_accuracy: 0.6028
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5192 - accuracy: 0.6093 - val_loss: 1.0963 - val_accuracy: 0.5888
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4455 - accuracy: 0.6632 - val_loss: 1.1269 - val_accuracy: 0.6028

```
accuracy: 0.6028
Epoch 145/1000
4/4 [=====] - 0s 20ms/step - loss: 0.4954 - accuracy: 0.6581 - val_loss: 1.1548 - val_accuracy: 0.6168
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5276 - accuracy: 0.6401 - val_loss: 1.1266 - val_accuracy: 0.6028
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4197 - accuracy: 0.6427 - val_loss: 1.1465 - val_accuracy: 0.6121
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4444 - accuracy: 0.6401 - val_loss: 1.1525 - val_accuracy: 0.6215
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4519 - accuracy: 0.6401 - val_loss: 1.1487 - val_accuracy: 0.6168
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4170 - accuracy: 0.6555 - val_loss: 1.1465 - val_accuracy: 0.5935
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4563 - accuracy: 0.6941 - val_loss: 1.1529 - val_accuracy: 0.5841
Epoch 152/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4660 - accuracy: 0.6401 - val_loss: 1.0935 - val_accuracy: 0.5888
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4697 - accuracy: 0.6401 - val_loss: 1.0853 - val_accuracy: 0.6168
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3935 - accuracy: 0.6555 - val_loss: 1.0638 - val_accuracy: 0.6075
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4412 - accuracy: 0.6658 - val_loss: 1.1483 - val_accuracy: 0.5981
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4839 - accuracy: 0.6298 - val_loss: 1.1431 - val_accuracy: 0.6121
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3838 - accuracy: 0.6530 - val_loss: 1.0379 - val_accuracy: 0.6075
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4229 - accuracy: 0.6427 - val_loss: 1.1379 - val_accuracy: 0.6028
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4804 - accuracy: 0.6478 - val_loss: 1.0819 - val_accuracy: 0.6168
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4870 - accuracy: 0.6375 - val_loss: 1.0645 - val_accuracy: 0.6308
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4340 - accuracy: 0.6401 - val_loss: 1.0606 - val_accuracy: 0.6308
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3793 - accuracy: 0.6581 - val_loss: 1.1104 - val_accuracy: 0.6308
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3995 - accuracy: 0.6478 - val_loss: 1.1119 - val_accuracy: 0.6308
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4233 - accuracy: 0.6427 - val_loss: 1.1141 - val_accuracy: 0.6121
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4262 - accuracy: 0.6427 - val_loss: 1.0900 - val_accuracy: 0.6075
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3674 - accuracy: 0.6478 - val_loss: 1.0317 - val_accuracy: 0.6121
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3930 - accuracy: 0.6452 - val_loss: 1.0540 - val_accuracy: 0.6168
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3699 - accuracy: 0.6530 - val_loss: 1.0605 - val_accuracy: 0.6355
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3939 - accuracy: 0.6427 - val_loss: 1.0664 - val_accuracy: 0.6028
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4245 - accuracy: 0.6478 - val_loss: 1.0698 - val_accuracy: 0.5935
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4277 - accuracy: 0.6452 - val_loss: 1.0407 - val_accuracy: 0.5935
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4819 - accuracy: 0.6530 - val_loss: 1.0679 - val_accuracy: 0.5794
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3784 - accuracy: 0.6427 - val_loss: 1.0625 - val_accuracy: 0.5981
Epoch 174/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.4414 - accuracy: 0.6272 - val_loss: 1.0382 - val_accuracy: 0.5888
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3600 - accuracy: 0.6452 - val_loss: 1.0512 - val_accuracy: 0.5888
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3809 - accuracy: 0.6504 - val_loss: 1.1186 - val_accuracy: 0.5935
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4256 - accuracy: 0.6118 - val_loss: 1.0597 - val_accuracy: 0.5981
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3615 - accuracy: 0.6530 - val_loss: 1.1239 - val_accuracy: 0.5888
Epoch 179/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4096 - accuracy: 0.6504 - val_loss: 1.0691 - val_accuracy: 0.6028
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3968 - accuracy: 0.6170 - val_loss: 1.2175 - val_accuracy: 0.5888
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3861 - accuracy: 0.6221 - val_loss: 1.1279 - val_accuracy: 0.6028
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3121 - accuracy: 0.6710 - val_loss: 1.1225 - val_accuracy: 0.6028
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3825 - accuracy: 0.6427 - val_loss: 1.1185 - val_accuracy: 0.6028
Epoch 184/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3285 - accuracy: 0.6170 - val_loss: 1.0959 - val_accuracy: 0.6075
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3627 - accuracy: 0.6452 - val_loss: 1.1256 - val_accuracy: 0.6308
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3729 - accuracy: 0.6375 - val_loss: 1.2402 - val_accuracy: 0.6215
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3584 - accuracy: 0.6324 - val_loss: 1.2214 - val_accuracy: 0.6168
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4074 - accuracy: 0.6144 - val_loss: 1.2311 - val_accuracy: 0.6308
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3520 - accuracy: 0.6401 - val_loss: 1.1273 - val_accuracy: 0.6262
Epoch 190/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3388 - accuracy: 0.6581 - val_loss: 1.1571 - val_accuracy: 0.6449
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3415 - accuracy: 0.6684 - val_loss: 1.1496 - val_accuracy: 0.6542
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3391 - accuracy: 0.6812 - val_loss: 1.1098 - val_accuracy: 0.6355
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4391 - accuracy: 0.6710 - val_loss: 1.0940 - val_accuracy: 0.6215
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3547 - accuracy: 0.6658 - val_loss: 1.1436 - val_accuracy: 0.6402
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3118 - accuracy: 0.6710 - val_loss: 1.1727 - val_accuracy: 0.6308
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4583 - accuracy: 0.6478 - val_loss: 1.1029 - val_accuracy: 0.6121
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4511 - accuracy: 0.6452 - val_loss: 1.0843 - val_accuracy: 0.6262
Epoch 198/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3807 - accuracy: 0.6504 - val_loss: 1.1275 - val_accuracy: 0.6449
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4348 - accuracy: 0.6555 - val_loss: 1.1672 - val_accuracy: 0.6636
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3860 - accuracy: 0.6581 - val_loss: 1.1705 - val_accuracy: 0.6589
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3753 - accuracy: 0.6427 - val_loss: 1.1328 - val_accuracy: 0.6308
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3445 - accuracy: 0.6478 - val_loss: 1.3077 - val_accuracy: 0.6449
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3505 - accuracy: 0.6555 - val_loss: 1.2019 - val_accuracy: 0.6402
```

Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3378 - accuracy: 0.6530 - val_loss: 1.3103 - val_accuracy: 0.6355
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3547 - accuracy: 0.6272 - val_loss: 1.2850 - val_accuracy: 0.6402
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3150 - accuracy: 0.6247 - val_loss: 1.1920 - val_accuracy: 0.6449
Epoch 207/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3755 - accuracy: 0.6221 - val_loss: 1.2562 - val_accuracy: 0.6402
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3718 - accuracy: 0.6324 - val_loss: 1.2935 - val_accuracy: 0.6449
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3377 - accuracy: 0.6478 - val_loss: 1.3332 - val_accuracy: 0.6402
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3801 - accuracy: 0.6350 - val_loss: 1.2619 - val_accuracy: 0.6449
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3704 - accuracy: 0.6607 - val_loss: 1.2777 - val_accuracy: 0.6589
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3273 - accuracy: 0.6504 - val_loss: 1.3199 - val_accuracy: 0.6355
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3279 - accuracy: 0.6427 - val_loss: 1.2832 - val_accuracy: 0.6215
Epoch 214/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2982 - accuracy: 0.6607 - val_loss: 1.2547 - val_accuracy: 0.6215
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3353 - accuracy: 0.6478 - val_loss: 1.2309 - val_accuracy: 0.5888
Epoch 216/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3263 - accuracy: 0.6375 - val_loss: 1.2513 - val_accuracy: 0.5888
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3833 - accuracy: 0.6067 - val_loss: 1.2605 - val_accuracy: 0.5841
Epoch 218/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3381 - accuracy: 0.6375 - val_loss: 1.2635 - val_accuracy: 0.5748
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4056 - accuracy: 0.6504 - val_loss: 1.3171 - val_accuracy: 0.5888
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3264 - accuracy: 0.6170 - val_loss: 1.2865 - val_accuracy: 0.5935
Epoch 221/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2953 - accuracy: 0.6144 - val_loss: 1.2541 - val_accuracy: 0.5935
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3269 - accuracy: 0.6298 - val_loss: 1.1915 - val_accuracy: 0.6121
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3372 - accuracy: 0.6221 - val_loss: 1.2149 - val_accuracy: 0.6028
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2847 - accuracy: 0.6375 - val_loss: 1.2555 - val_accuracy: 0.6121
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3338 - accuracy: 0.6195 - val_loss: 1.3062 - val_accuracy: 0.6168
Epoch 226/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2951 - accuracy: 0.6144 - val_loss: 1.2790 - val_accuracy: 0.6121
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3454 - accuracy: 0.6221 - val_loss: 1.2006 - val_accuracy: 0.5981
Epoch 228/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3737 - accuracy: 0.6350 - val_loss: 1.3060 - val_accuracy: 0.6028
Epoch 229/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3426 - accuracy: 0.6247 - val_loss: 1.2066 - val_accuracy: 0.5935
Epoch 230/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3574 - accuracy: 0.5964 - val_loss: 1.3425 - val_accuracy: 0.6028
Epoch 231/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3740 - accuracy: 0.6401 - val_loss: 1.3737 - val_accuracy: 0.5888
Epoch 232/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3081 - accuracy: 0.6015 - val_loss: 1.3704 - val_accuracy: 0.6028
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3524 - accuracy: 0.6067 - val_loss: 1.3077 - val_accuracy: 0.6028

```

accuracy: 0.5888
Epoch 234/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3597 - accuracy: 0.5990 - val_loss: 1.3980 - val_
accuracy: 0.5888
Epoch 235/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3396 - accuracy: 0.5990 - val_loss: 1.3866 - val_
accuracy: 0.5981
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3593 - accuracy: 0.6144 - val_loss: 1.4715 - val_
accuracy: 0.5935
Epoch 237/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3266 - accuracy: 0.5861 - val_loss: 1.3261 - val_
accuracy: 0.6028
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3588 - accuracy: 0.6041 - val_loss: 1.3601 - val_
accuracy: 0.6028
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3447 - accuracy: 0.6324 - val_loss: 1.4790 - val_
accuracy: 0.5607
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2982 - accuracy: 0.6247 - val_loss: 1.5041 - val_
accuracy: 0.5561
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2966 - accuracy: 0.6452 - val_loss: 1.4757 - val_
accuracy: 0.5888
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3853 - accuracy: 0.6272 - val_loss: 1.3965 - val_
accuracy: 0.5935
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3800 - accuracy: 0.6427 - val_loss: 1.4368 - val_
accuracy: 0.6028
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3373 - accuracy: 0.6324 - val_loss: 1.4048 - val_
accuracy: 0.5981
Epoch 245/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3338 - accuracy: 0.6427 - val_loss: 1.4046 - val_
accuracy: 0.6075
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3126 - accuracy: 0.6427 - val_loss: 1.4049 - val_
accuracy: 0.6308
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3204 - accuracy: 0.6067 - val_loss: 1.4026 - val_
accuracy: 0.6168
Epoch 248/1000
1/4 [====>.....] - ETA: 0s - loss: 0.2903 - accuracy: 0.6641Restoring model weights from th
e end of the best epoch: 98.
4/4 [=====] - 0s 14ms/step - loss: 0.2777 - accuracy: 0.6452 - val_loss: 1.3529 - val_
accuracy: 0.6121
Epoch 248: early stopping
2/2 [=====] - 0s 3ms/step - loss: 0.4663 - accuracy: 0.6744
[CV] END .....Dense1=50, Dense2=25; total time= 13.3s
Model: "sequential_53"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_212 (Dense)	(None, 50)	350
<hr/>		
batch_normalization_159 (BatchNormalization)	(None, 50)	200
activation_159 (Activation)	(None, 50)	0
dense_213 (Dense)	(None, 25)	1275
batch_normalization_160 (BatchNormalization)	(None, 25)	100
activation_160 (Activation)	(None, 25)	0
dense_214 (Dense)	(None, 10)	260
batch_normalization_161 (BatchNormalization)	(None, 10)	40
activation_161 (Activation)	(None, 10)	0
dense_215 (Dense)	(None, 2)	22
<hr/>		

Total params: 2,247
Trainable params: 2,077
Non-trainable params: 170

Epoch 1/1000
4/4 [=====] - 1s 57ms/step - loss: 6.5171 - accuracy: 0.6118 - val_loss: 3.5317 - val_
accuracy: 0.4579
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 5.7505 - accuracy: 0.6015 - val_loss: 3.3289 - val_
accuracy: 0.4486

Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 5.6975 - accuracy: 0.6170 - val_loss: 3.3525 - val_accuracy: 0.4346
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 5.5734 - accuracy: 0.6170 - val_loss: 3.8501 - val_accuracy: 0.4953
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 4.4626 - accuracy: 0.6298 - val_loss: 3.7504 - val_accuracy: 0.5234
Epoch 6/1000
4/4 [=====] - 0s 15ms/step - loss: 4.3695 - accuracy: 0.6272 - val_loss: 3.6581 - val_accuracy: 0.5514
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 4.1598 - accuracy: 0.6427 - val_loss: 3.3876 - val_accuracy: 0.5607
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9975 - accuracy: 0.6221 - val_loss: 3.2007 - val_accuracy: 0.5607
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7844 - accuracy: 0.6272 - val_loss: 3.1440 - val_accuracy: 0.5981
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 3.6246 - accuracy: 0.6504 - val_loss: 2.9917 - val_accuracy: 0.6075
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6348 - accuracy: 0.6298 - val_loss: 2.8146 - val_accuracy: 0.6355
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4467 - accuracy: 0.6195 - val_loss: 2.6124 - val_accuracy: 0.6542
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2024 - accuracy: 0.6324 - val_loss: 2.5287 - val_accuracy: 0.6589
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9468 - accuracy: 0.6144 - val_loss: 2.4412 - val_accuracy: 0.6402
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0668 - accuracy: 0.6015 - val_loss: 2.3143 - val_accuracy: 0.6449
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0158 - accuracy: 0.6272 - val_loss: 2.2427 - val_accuracy: 0.6355
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6678 - accuracy: 0.6298 - val_loss: 2.1436 - val_accuracy: 0.6355
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5490 - accuracy: 0.6350 - val_loss: 2.0922 - val_accuracy: 0.6402
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3720 - accuracy: 0.6555 - val_loss: 2.0284 - val_accuracy: 0.6355
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3264 - accuracy: 0.6607 - val_loss: 1.9780 - val_accuracy: 0.6262
Epoch 21/1000
4/4 [=====] - 0s 15ms/step - loss: 2.1467 - accuracy: 0.6247 - val_loss: 1.8981 - val_accuracy: 0.6215
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9841 - accuracy: 0.6144 - val_loss: 1.8811 - val_accuracy: 0.6262
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0632 - accuracy: 0.6555 - val_loss: 1.8306 - val_accuracy: 0.6262
Epoch 24/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9156 - accuracy: 0.6401 - val_loss: 1.7682 - val_accuracy: 0.6262
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9104 - accuracy: 0.6195 - val_loss: 1.7280 - val_accuracy: 0.6262
Epoch 26/1000
4/4 [=====] - 0s 15ms/step - loss: 1.8076 - accuracy: 0.6144 - val_loss: 1.7036 - val_accuracy: 0.6215
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6631 - accuracy: 0.5938 - val_loss: 1.6839 - val_accuracy: 0.6215
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5974 - accuracy: 0.6067 - val_loss: 1.6631 - val_accuracy: 0.6215
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6607 - accuracy: 0.6093 - val_loss: 1.6183 - val_accuracy: 0.6215
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5292 - accuracy: 0.6298 - val_loss: 1.5753 - val_accuracy: 0.6215
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6132 - accuracy: 0.6401 - val_loss: 1.5533 - val_accuracy: 0.6215
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4800 - accuracy: 0.6067 - val_loss: 1.5256 - val_accuracy: 0.6215

```
accuracy: 0.6168
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4496 - accuracy: 0.6118 - val_loss: 1.5258 - val_accuracy: 0.6215
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3565 - accuracy: 0.6118 - val_loss: 1.4723 - val_accuracy: 0.6168
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3080 - accuracy: 0.6170 - val_loss: 1.4490 - val_accuracy: 0.6121
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3228 - accuracy: 0.6144 - val_loss: 1.4463 - val_accuracy: 0.6075
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3249 - accuracy: 0.6041 - val_loss: 1.4491 - val_accuracy: 0.6075
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1560 - accuracy: 0.6041 - val_loss: 1.4299 - val_accuracy: 0.6028
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1097 - accuracy: 0.6015 - val_loss: 1.3773 - val_accuracy: 0.6028
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0114 - accuracy: 0.6093 - val_loss: 1.3828 - val_accuracy: 0.6028
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0983 - accuracy: 0.5913 - val_loss: 1.3628 - val_accuracy: 0.6075
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0503 - accuracy: 0.6144 - val_loss: 1.2929 - val_accuracy: 0.6075
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0847 - accuracy: 0.5964 - val_loss: 1.2730 - val_accuracy: 0.6075
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0119 - accuracy: 0.5990 - val_loss: 1.2434 - val_accuracy: 0.6075
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0036 - accuracy: 0.5861 - val_loss: 1.2554 - val_accuracy: 0.6075
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9971 - accuracy: 0.6221 - val_loss: 1.2311 - val_accuracy: 0.5981
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8638 - accuracy: 0.6015 - val_loss: 1.1469 - val_accuracy: 0.5935
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9416 - accuracy: 0.6221 - val_loss: 1.1515 - val_accuracy: 0.5981
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9525 - accuracy: 0.6247 - val_loss: 1.1717 - val_accuracy: 0.6075
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8571 - accuracy: 0.5964 - val_loss: 1.1302 - val_accuracy: 0.6075
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8479 - accuracy: 0.5913 - val_loss: 1.0813 - val_accuracy: 0.6075
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7973 - accuracy: 0.5990 - val_loss: 1.0530 - val_accuracy: 0.6028
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7728 - accuracy: 0.5835 - val_loss: 1.0058 - val_accuracy: 0.6028
Epoch 54/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8006 - accuracy: 0.5913 - val_loss: 0.9777 - val_accuracy: 0.5981
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8631 - accuracy: 0.5990 - val_loss: 0.9702 - val_accuracy: 0.6075
Epoch 56/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8425 - accuracy: 0.6015 - val_loss: 0.9434 - val_accuracy: 0.6121
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8264 - accuracy: 0.6015 - val_loss: 0.9287 - val_accuracy: 0.6028
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7915 - accuracy: 0.6015 - val_loss: 0.9142 - val_accuracy: 0.6028
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7649 - accuracy: 0.6221 - val_loss: 0.8964 - val_accuracy: 0.6168
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7728 - accuracy: 0.5990 - val_loss: 0.8853 - val_accuracy: 0.6215
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6972 - accuracy: 0.5938 - val_loss: 0.8713 - val_accuracy: 0.6215
Epoch 62/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.6949 - accuracy: 0.5964 - val_loss: 0.8505 - val_accuracy: 0.6121
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6941 - accuracy: 0.5990 - val_loss: 0.8376 - val_accuracy: 0.6121
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7710 - accuracy: 0.5887 - val_loss: 0.8325 - val_accuracy: 0.6075
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6856 - accuracy: 0.5835 - val_loss: 0.8264 - val_accuracy: 0.5981
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5670 - accuracy: 0.5913 - val_loss: 0.7826 - val_accuracy: 0.6075
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6528 - accuracy: 0.5810 - val_loss: 0.7641 - val_accuracy: 0.6075
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6458 - accuracy: 0.6041 - val_loss: 0.7533 - val_accuracy: 0.6168
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6080 - accuracy: 0.5887 - val_loss: 0.7430 - val_accuracy: 0.6121
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6008 - accuracy: 0.5656 - val_loss: 0.7263 - val_accuracy: 0.6075
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6194 - accuracy: 0.5604 - val_loss: 0.7121 - val_accuracy: 0.6028
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5750 - accuracy: 0.5861 - val_loss: 0.7115 - val_accuracy: 0.6121
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5928 - accuracy: 0.5656 - val_loss: 0.7142 - val_accuracy: 0.6075
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5507 - accuracy: 0.5835 - val_loss: 0.6977 - val_accuracy: 0.6028
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6382 - accuracy: 0.5861 - val_loss: 0.6984 - val_accuracy: 0.6028
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5123 - accuracy: 0.5656 - val_loss: 0.7145 - val_accuracy: 0.5981
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4900 - accuracy: 0.5707 - val_loss: 0.6690 - val_accuracy: 0.6028
Epoch 78/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5614 - accuracy: 0.5501 - val_loss: 0.6881 - val_accuracy: 0.6028
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5469 - accuracy: 0.5347 - val_loss: 0.6881 - val_accuracy: 0.5981
Epoch 80/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4803 - accuracy: 0.5527 - val_loss: 0.6818 - val_accuracy: 0.5981
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6189 - accuracy: 0.5553 - val_loss: 0.6688 - val_accuracy: 0.6075
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5297 - accuracy: 0.5553 - val_loss: 0.6607 - val_accuracy: 0.5981
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4925 - accuracy: 0.5501 - val_loss: 0.6562 - val_accuracy: 0.5888
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4738 - accuracy: 0.5527 - val_loss: 0.6663 - val_accuracy: 0.5981
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4948 - accuracy: 0.5424 - val_loss: 0.6519 - val_accuracy: 0.6028
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5116 - accuracy: 0.5398 - val_loss: 0.6163 - val_accuracy: 0.6075
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4962 - accuracy: 0.5604 - val_loss: 0.6323 - val_accuracy: 0.6028
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4841 - accuracy: 0.5116 - val_loss: 0.5966 - val_accuracy: 0.5981
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5005 - accuracy: 0.5219 - val_loss: 0.6344 - val_accuracy: 0.6028
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4552 - accuracy: 0.5347 - val_loss: 0.6576 - val_accuracy: 0.6028
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4905 - accuracy: 0.5219 - val_loss: 0.6709 - val_accuracy: 0.6028
```

Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4774 - accuracy: 0.5244 - val_loss: 0.6623 - val_accuracy: 0.6028
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4539 - accuracy: 0.5398 - val_loss: 0.6662 - val_accuracy: 0.5981
Epoch 94/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4399 - accuracy: 0.5347 - val_loss: 0.6570 - val_accuracy: 0.6075
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3703 - accuracy: 0.5373 - val_loss: 0.6472 - val_accuracy: 0.6215
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4812 - accuracy: 0.5450 - val_loss: 0.6483 - val_accuracy: 0.6215
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4754 - accuracy: 0.5630 - val_loss: 0.6445 - val_accuracy: 0.6262
Epoch 98/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5395 - accuracy: 0.5527 - val_loss: 0.6378 - val_accuracy: 0.5981
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4681 - accuracy: 0.5347 - val_loss: 0.6418 - val_accuracy: 0.6028
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5298 - accuracy: 0.5296 - val_loss: 0.6352 - val_accuracy: 0.5935
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4064 - accuracy: 0.5424 - val_loss: 0.6294 - val_accuracy: 0.6028
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4082 - accuracy: 0.5347 - val_loss: 0.6289 - val_accuracy: 0.6075
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4367 - accuracy: 0.5476 - val_loss: 0.6272 - val_accuracy: 0.6168
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4543 - accuracy: 0.5501 - val_loss: 0.6274 - val_accuracy: 0.6075
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3583 - accuracy: 0.5476 - val_loss: 0.6234 - val_accuracy: 0.6075
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4025 - accuracy: 0.5398 - val_loss: 0.6224 - val_accuracy: 0.5841
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3978 - accuracy: 0.5450 - val_loss: 0.6114 - val_accuracy: 0.6495
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3847 - accuracy: 0.6118 - val_loss: 0.6080 - val_accuracy: 0.6075
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4444 - accuracy: 0.5861 - val_loss: 0.6040 - val_accuracy: 0.6449
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5859 - accuracy: 0.5990 - val_loss: 0.6124 - val_accuracy: 0.5888
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4494 - accuracy: 0.5424 - val_loss: 0.6628 - val_accuracy: 0.5841
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4468 - accuracy: 0.5193 - val_loss: 0.6913 - val_accuracy: 0.5794
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3851 - accuracy: 0.5450 - val_loss: 0.6891 - val_accuracy: 0.5841
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3802 - accuracy: 0.5476 - val_loss: 0.6952 - val_accuracy: 0.5748
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4557 - accuracy: 0.5398 - val_loss: 0.6717 - val_accuracy: 0.5701
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4047 - accuracy: 0.5476 - val_loss: 0.6706 - val_accuracy: 0.5701
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3803 - accuracy: 0.5347 - val_loss: 0.6395 - val_accuracy: 0.5794
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4277 - accuracy: 0.5733 - val_loss: 0.6625 - val_accuracy: 0.5794
Epoch 119/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4242 - accuracy: 0.5398 - val_loss: 0.6386 - val_accuracy: 0.5841
Epoch 120/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4116 - accuracy: 0.5656 - val_loss: 0.6618 - val_accuracy: 0.5701
Epoch 121/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4624 - accuracy: 0.5604 - val_loss: 0.6647 - val_accuracy: 0.5841

```
accuracy: 0.5841
Epoch 122/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4346 - accuracy: 0.5630 - val_loss: 0.6639 - val_
accuracy: 0.5701
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5391 - accuracy: 0.5578 - val_loss: 0.6631 - val_
accuracy: 0.5841
Epoch 124/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4108 - accuracy: 0.5424 - val_loss: 0.6949 - val_
accuracy: 0.5935
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4101 - accuracy: 0.5501 - val_loss: 0.6970 - val_
accuracy: 0.5888
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4225 - accuracy: 0.5656 - val_loss: 0.6691 - val_
accuracy: 0.5935
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4058 - accuracy: 0.5424 - val_loss: 0.6451 - val_
accuracy: 0.5888
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3961 - accuracy: 0.5501 - val_loss: 0.6629 - val_
accuracy: 0.5981
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3765 - accuracy: 0.5578 - val_loss: 0.6616 - val_
accuracy: 0.5888
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4431 - accuracy: 0.5527 - val_loss: 0.6909 - val_
accuracy: 0.5935
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3922 - accuracy: 0.5656 - val_loss: 0.7184 - val_
accuracy: 0.5794
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3899 - accuracy: 0.5553 - val_loss: 0.6782 - val_
accuracy: 0.6028
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4543 - accuracy: 0.5630 - val_loss: 0.6907 - val_
accuracy: 0.6028
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3748 - accuracy: 0.5861 - val_loss: 0.6919 - val_
accuracy: 0.6121
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3898 - accuracy: 0.5733 - val_loss: 0.6932 - val_
accuracy: 0.6028
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3969 - accuracy: 0.5938 - val_loss: 0.6917 - val_
accuracy: 0.6121
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3976 - accuracy: 0.5553 - val_loss: 0.6680 - val_
accuracy: 0.6075
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3981 - accuracy: 0.5707 - val_loss: 0.6660 - val_
accuracy: 0.6075
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3862 - accuracy: 0.5681 - val_loss: 0.6633 - val_
accuracy: 0.6121
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3829 - accuracy: 0.5656 - val_loss: 0.6916 - val_
accuracy: 0.6075
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3626 - accuracy: 0.5398 - val_loss: 0.6908 - val_
accuracy: 0.6075
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4065 - accuracy: 0.5656 - val_loss: 0.6901 - val_
accuracy: 0.5981
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4273 - accuracy: 0.5630 - val_loss: 0.6891 - val_
accuracy: 0.5794
Epoch 144/1000
4/4 [=====] - 0s 18ms/step - loss: 0.3299 - accuracy: 0.5630 - val_loss: 0.6979 - val_
accuracy: 0.6542
Epoch 145/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4055 - accuracy: 0.6093 - val_loss: 0.7211 - val_
accuracy: 0.6449
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4190 - accuracy: 0.5964 - val_loss: 0.7450 - val_
accuracy: 0.6355
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3459 - accuracy: 0.5990 - val_loss: 0.7714 - val_
accuracy: 0.6495
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3788 - accuracy: 0.5861 - val_loss: 0.7698 - val_
accuracy: 0.6729
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4527 - accuracy: 0.5758 - val_loss: 0.7719 - val_
accuracy: 0.6075
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4142 - accuracy: 0.5578 - val_loss: 0.7871 - val_
accuracy: 0.5888
Epoch 151/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3371 - accuracy: 0.5656 - val_loss: 0.8046 - val_accuracy: 0.6028
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3792 - accuracy: 0.5476 - val_loss: 0.7788 - val_accuracy: 0.5935
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4387 - accuracy: 0.5347 - val_loss: 0.7790 - val_accuracy: 0.6495
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3559 - accuracy: 0.5964 - val_loss: 0.7784 - val_accuracy: 0.6542
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3817 - accuracy: 0.6170 - val_loss: 0.7803 - val_accuracy: 0.6495
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4093 - accuracy: 0.6067 - val_loss: 0.7586 - val_accuracy: 0.6495
Epoch 157/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4431 - accuracy: 0.5861 - val_loss: 0.7948 - val_accuracy: 0.6495
Epoch 158/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5219 - accuracy: 0.6067 - val_loss: 0.7894 - val_accuracy: 0.6589
Epoch 159/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3334 - accuracy: 0.6195 - val_loss: 0.8107 - val_accuracy: 0.6636
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4386 - accuracy: 0.5887 - val_loss: 0.7885 - val_accuracy: 0.6682
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4071 - accuracy: 0.5861 - val_loss: 0.8116 - val_accuracy: 0.6636
Epoch 162/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3742 - accuracy: 0.5913 - val_loss: 0.7938 - val_accuracy: 0.6542
Epoch 163/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3717 - accuracy: 0.5784 - val_loss: 0.7870 - val_accuracy: 0.6776
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4298 - accuracy: 0.5578 - val_loss: 0.7615 - val_accuracy: 0.6168
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3455 - accuracy: 0.5476 - val_loss: 0.7827 - val_accuracy: 0.6121
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3660 - accuracy: 0.5450 - val_loss: 0.8224 - val_accuracy: 0.6168
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3855 - accuracy: 0.5578 - val_loss: 0.7693 - val_accuracy: 0.6168
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3856 - accuracy: 0.5733 - val_loss: 0.7910 - val_accuracy: 0.5981
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3761 - accuracy: 0.5733 - val_loss: 0.8052 - val_accuracy: 0.5935
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3591 - accuracy: 0.5527 - val_loss: 0.7776 - val_accuracy: 0.5981
Epoch 171/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3552 - accuracy: 0.5501 - val_loss: 0.7832 - val_accuracy: 0.5794
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3530 - accuracy: 0.5476 - val_loss: 0.7520 - val_accuracy: 0.5654
Epoch 173/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3526 - accuracy: 0.5244 - val_loss: 0.7466 - val_accuracy: 0.5654
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2993 - accuracy: 0.5553 - val_loss: 0.7468 - val_accuracy: 0.5748
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3168 - accuracy: 0.5553 - val_loss: 0.7715 - val_accuracy: 0.5748
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2938 - accuracy: 0.5347 - val_loss: 0.7528 - val_accuracy: 0.5841
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3834 - accuracy: 0.5398 - val_loss: 0.7707 - val_accuracy: 0.5701
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3091 - accuracy: 0.5296 - val_loss: 0.7243 - val_accuracy: 0.5701
Epoch 179/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2793 - accuracy: 0.5347 - val_loss: 0.7899 - val_accuracy: 0.5701
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3834 - accuracy: 0.5527 - val_loss: 0.8652 - val_accuracy: 0.5748
```

Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3430 - accuracy: 0.5296 - val_loss: 0.8074 - val_accuracy: 0.5748
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2975 - accuracy: 0.5450 - val_loss: 0.8004 - val_accuracy: 0.6308
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3002 - accuracy: 0.5990 - val_loss: 0.8257 - val_accuracy: 0.6308
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3193 - accuracy: 0.6195 - val_loss: 0.8021 - val_accuracy: 0.6308
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3289 - accuracy: 0.6118 - val_loss: 0.7785 - val_accuracy: 0.6308
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4027 - accuracy: 0.5990 - val_loss: 0.7653 - val_accuracy: 0.6449
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3026 - accuracy: 0.6118 - val_loss: 0.8112 - val_accuracy: 0.6402
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3364 - accuracy: 0.5938 - val_loss: 0.7897 - val_accuracy: 0.6449
Epoch 189/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3588 - accuracy: 0.6170 - val_loss: 0.7842 - val_accuracy: 0.6449
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3279 - accuracy: 0.6478 - val_loss: 0.7399 - val_accuracy: 0.6402
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3074 - accuracy: 0.6324 - val_loss: 0.7791 - val_accuracy: 0.6355
Epoch 192/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3205 - accuracy: 0.6195 - val_loss: 0.7823 - val_accuracy: 0.6308
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2928 - accuracy: 0.6581 - val_loss: 0.7840 - val_accuracy: 0.6402
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3143 - accuracy: 0.5938 - val_loss: 0.8124 - val_accuracy: 0.6355
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2882 - accuracy: 0.5913 - val_loss: 0.7913 - val_accuracy: 0.6308
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3729 - accuracy: 0.6401 - val_loss: 0.8152 - val_accuracy: 0.6355
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4709 - accuracy: 0.5913 - val_loss: 0.7882 - val_accuracy: 0.6449
Epoch 198/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2754 - accuracy: 0.6195 - val_loss: 0.7546 - val_accuracy: 0.6121
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4092 - accuracy: 0.6221 - val_loss: 0.7581 - val_accuracy: 0.6121
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3452 - accuracy: 0.6195 - val_loss: 0.9533 - val_accuracy: 0.5421
Epoch 201/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3600 - accuracy: 0.5758 - val_loss: 0.9565 - val_accuracy: 0.5374
Epoch 202/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3070 - accuracy: 0.5527 - val_loss: 0.8969 - val_accuracy: 0.5467
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3305 - accuracy: 0.5681 - val_loss: 0.8494 - val_accuracy: 0.5654
Epoch 204/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3431 - accuracy: 0.5707 - val_loss: 0.8758 - val_accuracy: 0.5654
Epoch 205/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3799 - accuracy: 0.5604 - val_loss: 0.8485 - val_accuracy: 0.5654
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3088 - accuracy: 0.5733 - val_loss: 0.8737 - val_accuracy: 0.5701
Epoch 207/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3419 - accuracy: 0.5656 - val_loss: 0.8666 - val_accuracy: 0.5654
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3207 - accuracy: 0.5733 - val_loss: 0.9333 - val_accuracy: 0.5607
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2665 - accuracy: 0.5553 - val_loss: 0.9312 - val_accuracy: 0.5654
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3635 - accuracy: 0.5835 - val_loss: 0.8762 - val_accuracy: 0.5607

```
accuracy: 0.5607
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3883 - accuracy: 0.5810 - val_loss: 0.8756 - val_accuracy: 0.5607
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3124 - accuracy: 0.5553 - val_loss: 0.8231 - val_accuracy: 0.5701
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3559 - accuracy: 0.5630 - val_loss: 0.7912 - val_accuracy: 0.5561
Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3177 - accuracy: 0.5681 - val_loss: 0.7882 - val_accuracy: 0.5654
Epoch 215/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2584 - accuracy: 0.5578 - val_loss: 0.8175 - val_accuracy: 0.5654
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2727 - accuracy: 0.5527 - val_loss: 0.8427 - val_accuracy: 0.5607
Epoch 217/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3545 - accuracy: 0.5553 - val_loss: 0.8444 - val_accuracy: 0.5421
Epoch 218/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2854 - accuracy: 0.5347 - val_loss: 0.8186 - val_accuracy: 0.5374
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2697 - accuracy: 0.5193 - val_loss: 0.8484 - val_accuracy: 0.5327
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3735 - accuracy: 0.5347 - val_loss: 0.8142 - val_accuracy: 0.5327
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2625 - accuracy: 0.5219 - val_loss: 0.8162 - val_accuracy: 0.5421
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2677 - accuracy: 0.5707 - val_loss: 0.8185 - val_accuracy: 0.5467
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2446 - accuracy: 0.5630 - val_loss: 0.8208 - val_accuracy: 0.5374
Epoch 224/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2936 - accuracy: 0.5604 - val_loss: 0.8168 - val_accuracy: 0.5514
Epoch 225/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2669 - accuracy: 0.5501 - val_loss: 0.8224 - val_accuracy: 0.5514
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2659 - accuracy: 0.5527 - val_loss: 0.8189 - val_accuracy: 0.5514
Epoch 227/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3198 - accuracy: 0.5296 - val_loss: 0.8172 - val_accuracy: 0.5514
Epoch 228/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4100 - accuracy: 0.5296 - val_loss: 0.8729 - val_accuracy: 0.6028
Epoch 229/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3384 - accuracy: 0.6272 - val_loss: 0.8457 - val_accuracy: 0.6028
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2820 - accuracy: 0.6324 - val_loss: 0.7736 - val_accuracy: 0.5374
Epoch 231/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3165 - accuracy: 0.5244 - val_loss: 0.8364 - val_accuracy: 0.5374
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2606 - accuracy: 0.5064 - val_loss: 0.7944 - val_accuracy: 0.5374
Epoch 233/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3495 - accuracy: 0.5270 - val_loss: 0.7983 - val_accuracy: 0.4953
Epoch 234/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3195 - accuracy: 0.4653 - val_loss: 0.8513 - val_accuracy: 0.5187
Epoch 235/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3179 - accuracy: 0.5244 - val_loss: 0.8072 - val_accuracy: 0.5327
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3238 - accuracy: 0.4756 - val_loss: 0.8995 - val_accuracy: 0.4626
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2861 - accuracy: 0.4293 - val_loss: 0.8981 - val_accuracy: 0.4533
Epoch 238/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3566 - accuracy: 0.4293 - val_loss: 0.8947 - val_accuracy: 0.4626
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3750 - accuracy: 0.4319 - val_loss: 0.8719 - val_accuracy: 0.4673
Epoch 240/1000
```

```
4/4 [=====] - 0s 11ms/step - loss: 0.3057 - accuracy: 0.4267 - val_loss: 0.8918 - val_accuracy: 0.4486
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2909 - accuracy: 0.4447 - val_loss: 0.8382 - val_accuracy: 0.4533
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3514 - accuracy: 0.4370 - val_loss: 0.9165 - val_accuracy: 0.4673
Epoch 243/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2913 - accuracy: 0.4422 - val_loss: 0.8905 - val_accuracy: 0.4673
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3085 - accuracy: 0.4370 - val_loss: 0.8883 - val_accuracy: 0.5327
Epoch 245/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2614 - accuracy: 0.4653 - val_loss: 0.8949 - val_accuracy: 0.4673
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3801 - accuracy: 0.4524 - val_loss: 0.9061 - val_accuracy: 0.4766
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2624 - accuracy: 0.4704 - val_loss: 0.9053 - val_accuracy: 0.4720
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2827 - accuracy: 0.4319 - val_loss: 0.8963 - val_accuracy: 0.4720
Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2880 - accuracy: 0.4370 - val_loss: 0.9103 - val_accuracy: 0.4720
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3322 - accuracy: 0.4267 - val_loss: 0.9853 - val_accuracy: 0.4720
Epoch 251/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3456 - accuracy: 0.4550 - val_loss: 0.9640 - val_accuracy: 0.4813
Epoch 252/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4800 - accuracy: 0.4216 - val_loss: 0.8348 - val_accuracy: 0.4813
Epoch 253/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2857 - accuracy: 0.4216 - val_loss: 0.8689 - val_accuracy: 0.4813
Epoch 254/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3137 - accuracy: 0.4344 - val_loss: 0.8694 - val_accuracy: 0.4813
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3450 - accuracy: 0.4216 - val_loss: 0.8623 - val_accuracy: 0.4907
Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2450 - accuracy: 0.4165 - val_loss: 0.8648 - val_accuracy: 0.4813
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2955 - accuracy: 0.4576 - val_loss: 0.8631 - val_accuracy: 0.4860
Epoch 258/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2542 - accuracy: 0.4550 - val_loss: 0.8684 - val_accuracy: 0.4953
Epoch 259/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2691 - accuracy: 0.4242 - val_loss: 0.8671 - val_accuracy: 0.4860
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2459 - accuracy: 0.4370 - val_loss: 0.8660 - val_accuracy: 0.4766
Epoch 261/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2458 - accuracy: 0.4447 - val_loss: 0.8748 - val_accuracy: 0.4860
Epoch 262/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2369 - accuracy: 0.4679 - val_loss: 0.9225 - val_accuracy: 0.4766
Epoch 263/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2465 - accuracy: 0.4602 - val_loss: 0.9205 - val_accuracy: 0.4953
Epoch 264/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2375 - accuracy: 0.4190 - val_loss: 1.0177 - val_accuracy: 0.4907
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2917 - accuracy: 0.4576 - val_loss: 0.9918 - val_accuracy: 0.4907
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2469 - accuracy: 0.4447 - val_loss: 0.9737 - val_accuracy: 0.5000
Epoch 267/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3091 - accuracy: 0.4576 - val_loss: 1.0167 - val_accuracy: 0.5140
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2915 - accuracy: 0.5347 - val_loss: 1.0426 - val_accuracy: 0.5654
Epoch 269/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2426 - accuracy: 0.5784 - val_loss: 1.0109 - val_accuracy: 0.5935
```

Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3553 - accuracy: 0.5810 - val_loss: 1.1368 - val_accuracy: 0.5841
Epoch 271/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2836 - accuracy: 0.5861 - val_loss: 0.9481 - val_accuracy: 0.5888
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3681 - accuracy: 0.5604 - val_loss: 0.9433 - val_accuracy: 0.5607
Epoch 273/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2576 - accuracy: 0.5707 - val_loss: 1.0106 - val_accuracy: 0.5794
Epoch 274/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2267 - accuracy: 0.5630 - val_loss: 0.9495 - val_accuracy: 0.5841
Epoch 275/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3752 - accuracy: 0.5938 - val_loss: 0.9233 - val_accuracy: 0.5607
Epoch 276/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3215 - accuracy: 0.5604 - val_loss: 0.9534 - val_accuracy: 0.5888
Epoch 277/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3153 - accuracy: 0.5296 - val_loss: 1.0574 - val_accuracy: 0.5514
Epoch 278/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2686 - accuracy: 0.5630 - val_loss: 1.0259 - val_accuracy: 0.5561
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3701 - accuracy: 0.5681 - val_loss: 1.0213 - val_accuracy: 0.5607
Epoch 280/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2462 - accuracy: 0.5630 - val_loss: 1.0625 - val_accuracy: 0.5981
Epoch 281/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2621 - accuracy: 0.5681 - val_loss: 1.0676 - val_accuracy: 0.6121
Epoch 282/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2752 - accuracy: 0.5733 - val_loss: 1.0977 - val_accuracy: 0.6308
Epoch 283/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2975 - accuracy: 0.6170 - val_loss: 1.2127 - val_accuracy: 0.6121
Epoch 284/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3825 - accuracy: 0.5835 - val_loss: 1.1618 - val_accuracy: 0.5981
Epoch 285/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2871 - accuracy: 0.5733 - val_loss: 1.1390 - val_accuracy: 0.6075
Epoch 286/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2685 - accuracy: 0.5938 - val_loss: 1.1119 - val_accuracy: 0.6121
Epoch 287/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3794 - accuracy: 0.6272 - val_loss: 1.0989 - val_accuracy: 0.6168
Epoch 288/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2596 - accuracy: 0.5913 - val_loss: 1.0223 - val_accuracy: 0.5888
Epoch 289/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2658 - accuracy: 0.5990 - val_loss: 1.0589 - val_accuracy: 0.5607
Epoch 290/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2496 - accuracy: 0.5681 - val_loss: 1.0846 - val_accuracy: 0.6028
Epoch 291/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3458 - accuracy: 0.5964 - val_loss: 1.0595 - val_accuracy: 0.6075
Epoch 292/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3135 - accuracy: 0.6324 - val_loss: 1.0481 - val_accuracy: 0.6168
Epoch 293/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2281 - accuracy: 0.5990 - val_loss: 1.0198 - val_accuracy: 0.6075
Epoch 294/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3512 - accuracy: 0.5553 - val_loss: 1.0217 - val_accuracy: 0.6168
Epoch 295/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4593 - accuracy: 0.5964 - val_loss: 1.0167 - val_accuracy: 0.5981
Epoch 296/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2377 - accuracy: 0.5835 - val_loss: 1.0329 - val_accuracy: 0.6168
Epoch 297/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2366 - accuracy: 0.6041 - val_loss: 1.0556 - val_accuracy: 0.6308
Epoch 298/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2724 - accuracy: 0.5733 - val_loss: 0.9738 - val_accuracy: 0.6308
Epoch 299/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3364 - accuracy: 0.5784 - val_loss: 0.9954 - val_accuracy: 0.6308

```

accuracy: 0.6308
Epoch 300/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2597 - accuracy: 0.6170 - val_loss: 1.0185 - val_
accuracy: 0.6262
Epoch 301/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2018 - accuracy: 0.5964 - val_loss: 1.0347 - val_
accuracy: 0.6308
Epoch 302/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2934 - accuracy: 0.5784 - val_loss: 1.0604 - val_
accuracy: 0.5701
Epoch 303/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3047 - accuracy: 0.5347 - val_loss: 1.0576 - val_
accuracy: 0.5654
Epoch 304/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2537 - accuracy: 0.5527 - val_loss: 1.0818 - val_
accuracy: 0.5140
Epoch 305/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2760 - accuracy: 0.5219 - val_loss: 1.0882 - val_
accuracy: 0.5093
Epoch 306/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2965 - accuracy: 0.4910 - val_loss: 1.0283 - val_
accuracy: 0.5748
Epoch 307/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3521 - accuracy: 0.5193 - val_loss: 1.0147 - val_
accuracy: 0.5654
Epoch 308/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3897 - accuracy: 0.5141 - val_loss: 1.0347 - val_
accuracy: 0.5701
Epoch 309/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3060 - accuracy: 0.5450 - val_loss: 1.0178 - val_
accuracy: 0.5794
Epoch 310/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2977 - accuracy: 0.5527 - val_loss: 1.0335 - val_
accuracy: 0.5841
Epoch 311/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2805 - accuracy: 0.5527 - val_loss: 1.0290 - val_
accuracy: 0.5935
Epoch 312/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2924 - accuracy: 0.5913 - val_loss: 1.0653 - val_
accuracy: 0.5981
Epoch 313/1000
1/4 [====>.....] - ETA: 0s - loss: 0.1907 - accuracy: 0.5469Restoring model weights from th
e end of the best epoch: 163.
4/4 [=====] - 0s 14ms/step - loss: 0.2037 - accuracy: 0.5707 - val_loss: 1.1894 - val_
accuracy: 0.6168
Epoch 313: early stopping
2/2 [=====] - 0s 5ms/step - loss: 0.6237 - accuracy: 0.5814
[CV] END .....Dense1=50, Dense2=25; total time= 15.7s
Model: "sequential_54"

```

Layer (type)	Output Shape	Param #
dense_216 (Dense)	(None, 50)	350
batch_normalization_162 (BatchNormalization)	(None, 50)	200
activation_162 (Activation)	(None, 50)	0
dense_217 (Dense)	(None, 25)	1275
batch_normalization_163 (BatchNormalization)	(None, 25)	100
activation_163 (Activation)	(None, 25)	0
dense_218 (Dense)	(None, 10)	260
batch_normalization_164 (BatchNormalization)	(None, 10)	40
activation_164 (Activation)	(None, 10)	0
dense_219 (Dense)	(None, 2)	22

```

=====
Total params: 2,247
Trainable params: 2,077
Non-trainable params: 170

```

```

Epoch 1/1000
4/4 [=====] - 1s 57ms/step - loss: 5.6494 - accuracy: 0.5527 - val_loss: 5.3906 - val_
accuracy: 0.7103
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 4.7517 - accuracy: 0.5913 - val_loss: 5.3021 - val_
accuracy: 0.7150
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 4.4701 - accuracy: 0.5527 - val_loss: 5.2310 - val_
accuracy: 0.7056

```

Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 4.2781 - accuracy: 0.5733 - val_loss: 4.8090 - val_accuracy: 0.7196
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 4.4272 - accuracy: 0.5553 - val_loss: 4.2251 - val_accuracy: 0.7196
Epoch 6/1000
4/4 [=====] - 0s 15ms/step - loss: 4.0687 - accuracy: 0.5707 - val_loss: 3.8564 - val_accuracy: 0.7150
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 3.8069 - accuracy: 0.6272 - val_loss: 3.6155 - val_accuracy: 0.6916
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8307 - accuracy: 0.6221 - val_loss: 3.1183 - val_accuracy: 0.6822
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7123 - accuracy: 0.6375 - val_loss: 2.7962 - val_accuracy: 0.6822
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5399 - accuracy: 0.6504 - val_loss: 2.6115 - val_accuracy: 0.5748
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4356 - accuracy: 0.6067 - val_loss: 2.3180 - val_accuracy: 0.5234
Epoch 12/1000
4/4 [=====] - 0s 12ms/step - loss: 3.4255 - accuracy: 0.5553 - val_loss: 2.0628 - val_accuracy: 0.4860
Epoch 13/1000
4/4 [=====] - 0s 12ms/step - loss: 3.2281 - accuracy: 0.5450 - val_loss: 1.9643 - val_accuracy: 0.4486
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1436 - accuracy: 0.5835 - val_loss: 1.9027 - val_accuracy: 0.4486
Epoch 15/1000
4/4 [=====] - 0s 12ms/step - loss: 3.0739 - accuracy: 0.5707 - val_loss: 1.7588 - val_accuracy: 0.4393
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0115 - accuracy: 0.5604 - val_loss: 1.7388 - val_accuracy: 0.4252
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9848 - accuracy: 0.5758 - val_loss: 1.6778 - val_accuracy: 0.4252
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9440 - accuracy: 0.5450 - val_loss: 1.6446 - val_accuracy: 0.6449
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6519 - accuracy: 0.6401 - val_loss: 1.6185 - val_accuracy: 0.6402
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7000 - accuracy: 0.6298 - val_loss: 1.6252 - val_accuracy: 0.6402
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5222 - accuracy: 0.6375 - val_loss: 1.5998 - val_accuracy: 0.6495
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3515 - accuracy: 0.6632 - val_loss: 1.5846 - val_accuracy: 0.6495
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3561 - accuracy: 0.6427 - val_loss: 1.5723 - val_accuracy: 0.6402
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3143 - accuracy: 0.6530 - val_loss: 1.5356 - val_accuracy: 0.6028
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2765 - accuracy: 0.6144 - val_loss: 1.5262 - val_accuracy: 0.5935
Epoch 26/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1614 - accuracy: 0.6581 - val_loss: 1.5327 - val_accuracy: 0.5935
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1182 - accuracy: 0.6478 - val_loss: 1.4963 - val_accuracy: 0.5935
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1638 - accuracy: 0.6375 - val_loss: 1.4834 - val_accuracy: 0.5888
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2182 - accuracy: 0.6452 - val_loss: 1.4631 - val_accuracy: 0.5981
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8927 - accuracy: 0.6761 - val_loss: 1.4250 - val_accuracy: 0.6028
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9436 - accuracy: 0.6658 - val_loss: 1.3998 - val_accuracy: 0.6028
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8419 - accuracy: 0.6735 - val_loss: 1.3858 - val_accuracy: 0.6028
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7721 - accuracy: 0.6761 - val_loss: 1.3453 - val_accuracy: 0.6028

```
accuracy: 0.6028
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7351 - accuracy: 0.6658 - val_loss: 1.3494 - val_accuracy: 0.6121
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6122 - accuracy: 0.6812 - val_loss: 1.3052 - val_accuracy: 0.6121
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6474 - accuracy: 0.6889 - val_loss: 1.3152 - val_accuracy: 0.6168
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6171 - accuracy: 0.6941 - val_loss: 1.2696 - val_accuracy: 0.5981
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3649 - accuracy: 0.6889 - val_loss: 1.2608 - val_accuracy: 0.5981
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3541 - accuracy: 0.6889 - val_loss: 1.2779 - val_accuracy: 0.6028
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3359 - accuracy: 0.6761 - val_loss: 1.2671 - val_accuracy: 0.6028
Epoch 41/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3873 - accuracy: 0.6838 - val_loss: 1.2558 - val_accuracy: 0.5935
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2869 - accuracy: 0.6787 - val_loss: 1.2423 - val_accuracy: 0.6028
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2374 - accuracy: 0.6915 - val_loss: 1.2338 - val_accuracy: 0.6028
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2792 - accuracy: 0.6992 - val_loss: 1.2225 - val_accuracy: 0.6121
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1376 - accuracy: 0.7198 - val_loss: 1.2120 - val_accuracy: 0.6215
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2675 - accuracy: 0.7044 - val_loss: 1.2004 - val_accuracy: 0.6215
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2708 - accuracy: 0.6941 - val_loss: 1.2204 - val_accuracy: 0.6028
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2100 - accuracy: 0.7095 - val_loss: 1.1807 - val_accuracy: 0.6075
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2217 - accuracy: 0.7018 - val_loss: 1.1765 - val_accuracy: 0.6075
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3334 - accuracy: 0.6915 - val_loss: 1.1587 - val_accuracy: 0.6262
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1593 - accuracy: 0.7044 - val_loss: 1.1488 - val_accuracy: 0.6262
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1840 - accuracy: 0.6992 - val_loss: 1.1278 - val_accuracy: 0.6449
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1016 - accuracy: 0.7147 - val_loss: 1.1165 - val_accuracy: 0.6262
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0411 - accuracy: 0.7121 - val_loss: 1.1023 - val_accuracy: 0.6402
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0289 - accuracy: 0.7121 - val_loss: 1.1019 - val_accuracy: 0.6495
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1270 - accuracy: 0.7069 - val_loss: 1.0954 - val_accuracy: 0.6495
Epoch 57/1000
4/4 [=====] - 0s 20ms/step - loss: 0.9570 - accuracy: 0.6967 - val_loss: 1.0864 - val_accuracy: 0.6495
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9876 - accuracy: 0.7069 - val_loss: 1.0786 - val_accuracy: 0.6495
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1139 - accuracy: 0.6838 - val_loss: 1.0731 - val_accuracy: 0.6589
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9698 - accuracy: 0.7018 - val_loss: 1.0682 - val_accuracy: 0.6636
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0001 - accuracy: 0.7147 - val_loss: 1.0872 - val_accuracy: 0.6636
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9644 - accuracy: 0.7121 - val_loss: 1.0836 - val_accuracy: 0.6682
Epoch 63/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.9271 - accuracy: 0.7249 - val_loss: 1.0738 - val_accuracy: 0.6682
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9738 - accuracy: 0.7044 - val_loss: 1.0739 - val_accuracy: 0.6682
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8906 - accuracy: 0.7275 - val_loss: 1.0889 - val_accuracy: 0.6682
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9605 - accuracy: 0.7069 - val_loss: 1.0793 - val_accuracy: 0.6729
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8884 - accuracy: 0.7121 - val_loss: 1.0706 - val_accuracy: 0.6729
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8428 - accuracy: 0.7301 - val_loss: 1.0554 - val_accuracy: 0.6729
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9487 - accuracy: 0.7069 - val_loss: 1.0484 - val_accuracy: 0.6682
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8542 - accuracy: 0.7198 - val_loss: 1.0464 - val_accuracy: 0.6729
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7840 - accuracy: 0.7352 - val_loss: 1.0374 - val_accuracy: 0.6729
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8992 - accuracy: 0.7018 - val_loss: 1.0292 - val_accuracy: 0.6776
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8639 - accuracy: 0.6992 - val_loss: 1.0295 - val_accuracy: 0.6729
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8221 - accuracy: 0.7301 - val_loss: 1.0482 - val_accuracy: 0.6822
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7786 - accuracy: 0.7172 - val_loss: 1.0416 - val_accuracy: 0.6822
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8595 - accuracy: 0.7172 - val_loss: 1.0367 - val_accuracy: 0.6822
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7796 - accuracy: 0.7147 - val_loss: 1.0299 - val_accuracy: 0.6822
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8808 - accuracy: 0.7044 - val_loss: 0.9940 - val_accuracy: 0.6822
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7678 - accuracy: 0.7249 - val_loss: 0.9849 - val_accuracy: 0.6729
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7412 - accuracy: 0.6967 - val_loss: 0.9764 - val_accuracy: 0.6822
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7839 - accuracy: 0.7044 - val_loss: 0.9679 - val_accuracy: 0.6729
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7417 - accuracy: 0.7147 - val_loss: 0.9578 - val_accuracy: 0.6776
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7676 - accuracy: 0.7044 - val_loss: 0.9444 - val_accuracy: 0.6822
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7522 - accuracy: 0.7147 - val_loss: 0.9301 - val_accuracy: 0.6822
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8377 - accuracy: 0.7069 - val_loss: 0.8983 - val_accuracy: 0.6869
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7099 - accuracy: 0.7249 - val_loss: 0.8828 - val_accuracy: 0.6869
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7199 - accuracy: 0.6967 - val_loss: 0.8953 - val_accuracy: 0.6869
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6896 - accuracy: 0.7224 - val_loss: 0.8862 - val_accuracy: 0.6869
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7589 - accuracy: 0.7069 - val_loss: 0.8770 - val_accuracy: 0.6869
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7080 - accuracy: 0.7069 - val_loss: 0.8692 - val_accuracy: 0.6916
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6983 - accuracy: 0.7352 - val_loss: 0.8593 - val_accuracy: 0.6916
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6932 - accuracy: 0.7301 - val_loss: 0.8442 - val_accuracy: 0.6869
```

Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6879 - accuracy: 0.6992 - val_loss: 0.8338 - val_accuracy: 0.6869
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6676 - accuracy: 0.7044 - val_loss: 0.8224 - val_accuracy: 0.6963
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6267 - accuracy: 0.7121 - val_loss: 0.8165 - val_accuracy: 0.7009
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6738 - accuracy: 0.6941 - val_loss: 0.8283 - val_accuracy: 0.6963
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6012 - accuracy: 0.7275 - val_loss: 0.7990 - val_accuracy: 0.6963
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7201 - accuracy: 0.7044 - val_loss: 0.7892 - val_accuracy: 0.6916
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6433 - accuracy: 0.7069 - val_loss: 0.7725 - val_accuracy: 0.6916
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5894 - accuracy: 0.7147 - val_loss: 0.7539 - val_accuracy: 0.7009
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6486 - accuracy: 0.7121 - val_loss: 0.7438 - val_accuracy: 0.7009
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5786 - accuracy: 0.7044 - val_loss: 0.7476 - val_accuracy: 0.6916
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6070 - accuracy: 0.7095 - val_loss: 0.7401 - val_accuracy: 0.6916
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6521 - accuracy: 0.7121 - val_loss: 0.7333 - val_accuracy: 0.6963
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5424 - accuracy: 0.7069 - val_loss: 0.7219 - val_accuracy: 0.6869
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6135 - accuracy: 0.7249 - val_loss: 0.7131 - val_accuracy: 0.6869
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5827 - accuracy: 0.7095 - val_loss: 0.7107 - val_accuracy: 0.6822
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5314 - accuracy: 0.7121 - val_loss: 0.6906 - val_accuracy: 0.6869
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5195 - accuracy: 0.7018 - val_loss: 0.6799 - val_accuracy: 0.6963
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5804 - accuracy: 0.7147 - val_loss: 0.6809 - val_accuracy: 0.6869
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5657 - accuracy: 0.6838 - val_loss: 0.6750 - val_accuracy: 0.6869
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5438 - accuracy: 0.6941 - val_loss: 0.6657 - val_accuracy: 0.6869
Epoch 113/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5963 - accuracy: 0.7121 - val_loss: 0.6578 - val_accuracy: 0.7290
Epoch 114/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5603 - accuracy: 0.7249 - val_loss: 0.6519 - val_accuracy: 0.7383
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4943 - accuracy: 0.7352 - val_loss: 0.6467 - val_accuracy: 0.7290
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5234 - accuracy: 0.7198 - val_loss: 0.6365 - val_accuracy: 0.7383
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5583 - accuracy: 0.7172 - val_loss: 0.6334 - val_accuracy: 0.7336
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4848 - accuracy: 0.7352 - val_loss: 0.6306 - val_accuracy: 0.7570
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5250 - accuracy: 0.7352 - val_loss: 0.6250 - val_accuracy: 0.7477
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5267 - accuracy: 0.7249 - val_loss: 0.6215 - val_accuracy: 0.7477
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5059 - accuracy: 0.7326 - val_loss: 0.6186 - val_accuracy: 0.7523
Epoch 122/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5661 - accuracy: 0.7172 - val_loss: 0.6142 - val_accuracy: 0.7523

```
accuracy: 0.7477
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5000 - accuracy: 0.7584 - val_loss: 0.6092 - val_
accuracy: 0.7570
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5108 - accuracy: 0.7455 - val_loss: 0.5986 - val_
accuracy: 0.7523
Epoch 125/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4886 - accuracy: 0.7429 - val_loss: 0.5962 - val_
accuracy: 0.7430
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5910 - accuracy: 0.7095 - val_loss: 0.5946 - val_
accuracy: 0.7710
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4499 - accuracy: 0.7506 - val_loss: 0.5905 - val_
accuracy: 0.7523
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4383 - accuracy: 0.7326 - val_loss: 0.6001 - val_
accuracy: 0.7570
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4651 - accuracy: 0.7326 - val_loss: 0.5952 - val_
accuracy: 0.7570
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4658 - accuracy: 0.7404 - val_loss: 0.5909 - val_
accuracy: 0.7617
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5223 - accuracy: 0.7558 - val_loss: 0.6198 - val_
accuracy: 0.7617
Epoch 132/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5367 - accuracy: 0.7249 - val_loss: 0.6603 - val_
accuracy: 0.7523
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4899 - accuracy: 0.7249 - val_loss: 0.6386 - val_
accuracy: 0.7617
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4632 - accuracy: 0.7635 - val_loss: 0.6576 - val_
accuracy: 0.7430
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4044 - accuracy: 0.7558 - val_loss: 0.6565 - val_
accuracy: 0.7523
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4341 - accuracy: 0.7506 - val_loss: 0.6441 - val_
accuracy: 0.7336
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4745 - accuracy: 0.7352 - val_loss: 0.6151 - val_
accuracy: 0.7383
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4432 - accuracy: 0.7532 - val_loss: 0.6092 - val_
accuracy: 0.7290
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3990 - accuracy: 0.7532 - val_loss: 0.6311 - val_
accuracy: 0.7336
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4212 - accuracy: 0.7738 - val_loss: 0.6287 - val_
accuracy: 0.7290
Epoch 141/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4777 - accuracy: 0.7506 - val_loss: 0.6303 - val_
accuracy: 0.7243
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4500 - accuracy: 0.7378 - val_loss: 0.6071 - val_
accuracy: 0.7336
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4453 - accuracy: 0.7352 - val_loss: 0.6055 - val_
accuracy: 0.7243
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4254 - accuracy: 0.7301 - val_loss: 0.6012 - val_
accuracy: 0.7056
Epoch 145/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4696 - accuracy: 0.7018 - val_loss: 0.5991 - val_
accuracy: 0.6916
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4345 - accuracy: 0.7301 - val_loss: 0.5977 - val_
accuracy: 0.6776
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4267 - accuracy: 0.6941 - val_loss: 0.6466 - val_
accuracy: 0.6449
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4144 - accuracy: 0.6967 - val_loss: 0.6484 - val_
accuracy: 0.6262
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4476 - accuracy: 0.6632 - val_loss: 0.6465 - val_
accuracy: 0.6168
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4390 - accuracy: 0.6889 - val_loss: 0.6444 - val_
accuracy: 0.6028
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4249 - accuracy: 0.6787 - val_loss: 0.6664 - val_
accuracy: 0.6121
Epoch 152/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3497 - accuracy: 0.6838 - val_loss: 0.6636 - val_accuracy: 0.6028
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4901 - accuracy: 0.7018 - val_loss: 0.6517 - val_accuracy: 0.6168
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4073 - accuracy: 0.6941 - val_loss: 0.6564 - val_accuracy: 0.6168
Epoch 155/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4434 - accuracy: 0.7069 - val_loss: 0.6575 - val_accuracy: 0.5981
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3779 - accuracy: 0.6915 - val_loss: 0.6534 - val_accuracy: 0.5981
Epoch 157/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4531 - accuracy: 0.6838 - val_loss: 0.6835 - val_accuracy: 0.5981
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3777 - accuracy: 0.6967 - val_loss: 0.6908 - val_accuracy: 0.6262
Epoch 159/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3895 - accuracy: 0.6632 - val_loss: 0.7757 - val_accuracy: 0.6308
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4386 - accuracy: 0.6761 - val_loss: 0.7851 - val_accuracy: 0.6121
Epoch 161/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4029 - accuracy: 0.6684 - val_loss: 0.7784 - val_accuracy: 0.6215
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5600 - accuracy: 0.6710 - val_loss: 0.7269 - val_accuracy: 0.6262
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4776 - accuracy: 0.6710 - val_loss: 0.7590 - val_accuracy: 0.6355
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4223 - accuracy: 0.6992 - val_loss: 0.7591 - val_accuracy: 0.6121
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3504 - accuracy: 0.6812 - val_loss: 0.7577 - val_accuracy: 0.6402
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3896 - accuracy: 0.6787 - val_loss: 0.7269 - val_accuracy: 0.6449
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4055 - accuracy: 0.6915 - val_loss: 0.7569 - val_accuracy: 0.6355
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3983 - accuracy: 0.6864 - val_loss: 0.7512 - val_accuracy: 0.6215
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4463 - accuracy: 0.6838 - val_loss: 0.7564 - val_accuracy: 0.6495
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4203 - accuracy: 0.7069 - val_loss: 0.7481 - val_accuracy: 0.6495
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4062 - accuracy: 0.6992 - val_loss: 0.7448 - val_accuracy: 0.6402
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4176 - accuracy: 0.6710 - val_loss: 0.7175 - val_accuracy: 0.6308
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4420 - accuracy: 0.6658 - val_loss: 0.7466 - val_accuracy: 0.6215
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3890 - accuracy: 0.6607 - val_loss: 0.8057 - val_accuracy: 0.6495
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4244 - accuracy: 0.6864 - val_loss: 0.7775 - val_accuracy: 0.6682
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3359 - accuracy: 0.7584 - val_loss: 0.7767 - val_accuracy: 0.6682
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3640 - accuracy: 0.7558 - val_loss: 0.7746 - val_accuracy: 0.6729
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3763 - accuracy: 0.7558 - val_loss: 0.7715 - val_accuracy: 0.6776
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4613 - accuracy: 0.7609 - val_loss: 0.8335 - val_accuracy: 0.6682
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4202 - accuracy: 0.7481 - val_loss: 0.7609 - val_accuracy: 0.6776
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4334 - accuracy: 0.7532 - val_loss: 0.7991 - val_accuracy: 0.6636
```

Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5118 - accuracy: 0.7455 - val_loss: 0.7400 - val_accuracy: 0.6729
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4012 - accuracy: 0.7532 - val_loss: 0.7401 - val_accuracy: 0.6729
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4066 - accuracy: 0.7506 - val_loss: 0.7453 - val_accuracy: 0.6916
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4381 - accuracy: 0.7404 - val_loss: 0.7419 - val_accuracy: 0.6916
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3429 - accuracy: 0.7584 - val_loss: 0.7160 - val_accuracy: 0.6822
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3639 - accuracy: 0.7352 - val_loss: 0.7408 - val_accuracy: 0.6495
Epoch 188/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4072 - accuracy: 0.7378 - val_loss: 0.7179 - val_accuracy: 0.6682
Epoch 189/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3406 - accuracy: 0.7481 - val_loss: 0.7434 - val_accuracy: 0.6636
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3997 - accuracy: 0.7301 - val_loss: 0.6975 - val_accuracy: 0.6729
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3510 - accuracy: 0.7455 - val_loss: 0.7475 - val_accuracy: 0.6682
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3208 - accuracy: 0.7532 - val_loss: 0.7276 - val_accuracy: 0.6682
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4012 - accuracy: 0.7352 - val_loss: 0.7448 - val_accuracy: 0.6682
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4153 - accuracy: 0.7455 - val_loss: 0.7437 - val_accuracy: 0.6916
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3736 - accuracy: 0.7121 - val_loss: 0.6628 - val_accuracy: 0.6822
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3889 - accuracy: 0.7455 - val_loss: 0.6673 - val_accuracy: 0.6916
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3757 - accuracy: 0.7404 - val_loss: 0.6896 - val_accuracy: 0.6963
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3536 - accuracy: 0.7301 - val_loss: 0.6918 - val_accuracy: 0.6963
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3670 - accuracy: 0.7455 - val_loss: 0.7500 - val_accuracy: 0.6822
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4169 - accuracy: 0.7224 - val_loss: 0.7737 - val_accuracy: 0.6729
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3791 - accuracy: 0.7172 - val_loss: 0.7149 - val_accuracy: 0.6682
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3740 - accuracy: 0.7044 - val_loss: 0.7434 - val_accuracy: 0.6449
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3662 - accuracy: 0.7172 - val_loss: 0.7375 - val_accuracy: 0.6402
Epoch 204/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3815 - accuracy: 0.7198 - val_loss: 0.7059 - val_accuracy: 0.6262
Epoch 205/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4048 - accuracy: 0.6632 - val_loss: 0.7072 - val_accuracy: 0.6075
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4508 - accuracy: 0.7044 - val_loss: 0.7373 - val_accuracy: 0.6075
Epoch 207/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4256 - accuracy: 0.6735 - val_loss: 0.7305 - val_accuracy: 0.5981
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3827 - accuracy: 0.6607 - val_loss: 0.7247 - val_accuracy: 0.6168
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3608 - accuracy: 0.7326 - val_loss: 0.7248 - val_accuracy: 0.6168
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5431 - accuracy: 0.6812 - val_loss: 0.7293 - val_accuracy: 0.6449
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4290 - accuracy: 0.7249 - val_loss: 0.7330 - val_accuracy: 0.6449

```
accuracy: 0.6402
Epoch 212/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3908 - accuracy: 0.7326 - val_loss: 0.7380 - val_accuracy: 0.6495
Epoch 213/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3723 - accuracy: 0.7249 - val_loss: 0.7620 - val_accuracy: 0.6729
Epoch 214/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3324 - accuracy: 0.7481 - val_loss: 0.7643 - val_accuracy: 0.6682
Epoch 215/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3883 - accuracy: 0.7481 - val_loss: 0.7652 - val_accuracy: 0.6729
Epoch 216/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4751 - accuracy: 0.7275 - val_loss: 0.7457 - val_accuracy: 0.6495
Epoch 217/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4038 - accuracy: 0.7147 - val_loss: 0.6673 - val_accuracy: 0.6449
Epoch 218/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4073 - accuracy: 0.6967 - val_loss: 0.6948 - val_accuracy: 0.6402
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4716 - accuracy: 0.7224 - val_loss: 0.7030 - val_accuracy: 0.6495
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3898 - accuracy: 0.6992 - val_loss: 0.7456 - val_accuracy: 0.6542
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4008 - accuracy: 0.6915 - val_loss: 0.7469 - val_accuracy: 0.6449
Epoch 222/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3885 - accuracy: 0.6992 - val_loss: 0.7723 - val_accuracy: 0.6776
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3669 - accuracy: 0.7095 - val_loss: 0.7415 - val_accuracy: 0.6822
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3654 - accuracy: 0.7506 - val_loss: 0.7415 - val_accuracy: 0.6869
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4464 - accuracy: 0.7558 - val_loss: 0.7431 - val_accuracy: 0.6916
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4397 - accuracy: 0.7224 - val_loss: 0.7749 - val_accuracy: 0.6776
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4463 - accuracy: 0.7481 - val_loss: 0.7738 - val_accuracy: 0.6822
Epoch 228/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3843 - accuracy: 0.7481 - val_loss: 0.7713 - val_accuracy: 0.6822
Epoch 229/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4638 - accuracy: 0.7584 - val_loss: 0.7707 - val_accuracy: 0.6822
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3660 - accuracy: 0.7429 - val_loss: 0.7441 - val_accuracy: 0.6869
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3727 - accuracy: 0.7455 - val_loss: 0.7698 - val_accuracy: 0.6963
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4170 - accuracy: 0.7584 - val_loss: 0.7485 - val_accuracy: 0.6869
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3988 - accuracy: 0.7686 - val_loss: 0.7418 - val_accuracy: 0.6916
Epoch 234/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4188 - accuracy: 0.7635 - val_loss: 0.7268 - val_accuracy: 0.6916
Epoch 235/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3928 - accuracy: 0.7481 - val_loss: 0.7701 - val_accuracy: 0.6869
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4305 - accuracy: 0.7481 - val_loss: 0.7652 - val_accuracy: 0.6822
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3779 - accuracy: 0.7558 - val_loss: 0.7649 - val_accuracy: 0.6822
Epoch 238/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3643 - accuracy: 0.7763 - val_loss: 0.7665 - val_accuracy: 0.6822
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3666 - accuracy: 0.7301 - val_loss: 0.8033 - val_accuracy: 0.6776
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3560 - accuracy: 0.7198 - val_loss: 0.8109 - val_accuracy: 0.6776
Epoch 241/1000
```

4/4 [=====] - 0s 12ms/step - loss: 0.3512 - accuracy: 0.7249 - val_loss: 0.7718 - val_accuracy: 0.6495
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3594 - accuracy: 0.6992 - val_loss: 0.7681 - val_accuracy: 0.6215
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4595 - accuracy: 0.6684 - val_loss: 0.7647 - val_accuracy: 0.5888
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3655 - accuracy: 0.6761 - val_loss: 0.7414 - val_accuracy: 0.6028
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3743 - accuracy: 0.6735 - val_loss: 0.7504 - val_accuracy: 0.6028
Epoch 246/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3986 - accuracy: 0.6915 - val_loss: 0.7488 - val_accuracy: 0.5935
Epoch 247/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3742 - accuracy: 0.6889 - val_loss: 0.7478 - val_accuracy: 0.5935
Epoch 248/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3876 - accuracy: 0.6812 - val_loss: 0.8251 - val_accuracy: 0.5935
Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3784 - accuracy: 0.6967 - val_loss: 0.7656 - val_accuracy: 0.5888
Epoch 250/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4325 - accuracy: 0.6710 - val_loss: 0.7708 - val_accuracy: 0.5935
Epoch 251/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4149 - accuracy: 0.6941 - val_loss: 0.7720 - val_accuracy: 0.5981
Epoch 252/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4292 - accuracy: 0.6710 - val_loss: 0.7947 - val_accuracy: 0.5981
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4012 - accuracy: 0.6710 - val_loss: 0.7635 - val_accuracy: 0.6028
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3969 - accuracy: 0.6607 - val_loss: 0.7609 - val_accuracy: 0.5981
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3889 - accuracy: 0.6555 - val_loss: 0.8014 - val_accuracy: 0.5981
Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3990 - accuracy: 0.6658 - val_loss: 0.8316 - val_accuracy: 0.6121
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4469 - accuracy: 0.6864 - val_loss: 0.8350 - val_accuracy: 0.6215
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3688 - accuracy: 0.6787 - val_loss: 0.9112 - val_accuracy: 0.6075
Epoch 259/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4650 - accuracy: 0.6684 - val_loss: 0.8833 - val_accuracy: 0.6215
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3640 - accuracy: 0.6967 - val_loss: 0.8856 - val_accuracy: 0.6308
Epoch 261/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3572 - accuracy: 0.6735 - val_loss: 0.8312 - val_accuracy: 0.6262
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3593 - accuracy: 0.6787 - val_loss: 0.8307 - val_accuracy: 0.6121
Epoch 263/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4652 - accuracy: 0.6658 - val_loss: 0.7710 - val_accuracy: 0.6075
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3921 - accuracy: 0.6555 - val_loss: 0.7118 - val_accuracy: 0.6075
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4568 - accuracy: 0.6684 - val_loss: 0.7323 - val_accuracy: 0.5981
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3516 - accuracy: 0.6812 - val_loss: 0.7041 - val_accuracy: 0.6121
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3429 - accuracy: 0.6761 - val_loss: 0.7922 - val_accuracy: 0.6075
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3756 - accuracy: 0.6941 - val_loss: 0.7649 - val_accuracy: 0.5981
Epoch 269/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3533 - accuracy: 0.6632 - val_loss: 0.6526 - val_accuracy: 0.5981
Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4469 - accuracy: 0.6684 - val_loss: 0.7055 - val_accuracy: 0.6075

```

Epoch 271/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4371 - accuracy: 0.6787 - val_loss: 0.7099 - val_accuracy: 0.5841
Epoch 272/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3650 - accuracy: 0.6864 - val_loss: 0.7178 - val_accuracy: 0.5748
Epoch 273/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3851 - accuracy: 0.6838 - val_loss: 0.7977 - val_accuracy: 0.5888
Epoch 274/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3185 - accuracy: 0.6735 - val_loss: 0.8205 - val_accuracy: 0.6215
Epoch 275/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3691 - accuracy: 0.6864 - val_loss: 0.8216 - val_accuracy: 0.6121
Epoch 276/1000
1/4 [====>.....] - ETA: 0s - loss: 0.2439 - accuracy: 0.6875Restoring model weights from the end of the best epoch: 126.
4/4 [=====] - 0s 14ms/step - loss: 0.4316 - accuracy: 0.6684 - val_loss: 0.8244 - val_accuracy: 0.6262
Epoch 276: early stopping
2/2 [=====] - 0s 3ms/step - loss: 0.6297 - accuracy: 0.8605
[CV] END .....Dense1=50, Dense2=25; total time= 14.0s
Model: "sequential_55"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_220 (Dense)	(None, 50)	350
batch_normalization_165 (BatchNormalization)	(None, 50)	200
activation_165 (Activation)	(None, 50)	0
dense_221 (Dense)	(None, 25)	1275
batch_normalization_166 (BatchNormalization)	(None, 25)	100
activation_166 (Activation)	(None, 25)	0
dense_222 (Dense)	(None, 10)	260
batch_normalization_167 (BatchNormalization)	(None, 10)	40
activation_167 (Activation)	(None, 10)	0
dense_223 (Dense)	(None, 2)	22
<hr/>		
Total params: 2,247		
Trainable params: 2,077		
Non-trainable params: 170		

```

Epoch 1/1000
4/4 [=====] - 1s 57ms/step - loss: 5.3588 - accuracy: 0.5527 - val_loss: 5.1833 - val_accuracy: 0.4673
Epoch 2/1000
4/4 [=====] - 0s 15ms/step - loss: 4.7488 - accuracy: 0.5990 - val_loss: 5.0710 - val_accuracy: 0.5701
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 4.6457 - accuracy: 0.5964 - val_loss: 4.9777 - val_accuracy: 0.5654
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 4.5344 - accuracy: 0.5913 - val_loss: 4.7545 - val_accuracy: 0.5561
Epoch 5/1000
4/4 [=====] - 0s 16ms/step - loss: 4.0620 - accuracy: 0.5938 - val_loss: 4.5636 - val_accuracy: 0.5794
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 3.7335 - accuracy: 0.5964 - val_loss: 4.1963 - val_accuracy: 0.6075
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 3.8456 - accuracy: 0.5861 - val_loss: 3.8941 - val_accuracy: 0.6075
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5126 - accuracy: 0.5553 - val_loss: 3.8307 - val_accuracy: 0.5841
Epoch 9/1000
4/4 [=====] - 0s 19ms/step - loss: 3.3322 - accuracy: 0.5681 - val_loss: 3.9504 - val_accuracy: 0.5888
Epoch 10/1000
4/4 [=====] - 0s 19ms/step - loss: 3.3000 - accuracy: 0.5656 - val_loss: 3.9832 - val_accuracy: 0.5935
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1983 - accuracy: 0.5630 - val_loss: 3.8290 - val_accuracy: 0.5794
Epoch 12/1000

```

```
4/4 [=====] - 0s 15ms/step - loss: 3.0752 - accuracy: 0.5758 - val_loss: 3.6448 - val_accuracy: 0.5794
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1484 - accuracy: 0.5758 - val_loss: 3.5894 - val_accuracy: 0.5748
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0695 - accuracy: 0.5681 - val_loss: 3.4717 - val_accuracy: 0.5514
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9432 - accuracy: 0.5810 - val_loss: 3.3007 - val_accuracy: 0.5654
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8480 - accuracy: 0.5861 - val_loss: 3.1421 - val_accuracy: 0.5607
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7506 - accuracy: 0.5758 - val_loss: 2.9147 - val_accuracy: 0.5607
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8554 - accuracy: 0.5501 - val_loss: 2.6687 - val_accuracy: 0.5561
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7196 - accuracy: 0.5758 - val_loss: 2.5371 - val_accuracy: 0.5561
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7498 - accuracy: 0.5527 - val_loss: 2.4825 - val_accuracy: 0.5561
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7494 - accuracy: 0.5733 - val_loss: 2.4229 - val_accuracy: 0.5514
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5613 - accuracy: 0.5578 - val_loss: 2.4204 - val_accuracy: 0.5467
Epoch 23/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4448 - accuracy: 0.5784 - val_loss: 2.3836 - val_accuracy: 0.5421
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5941 - accuracy: 0.5758 - val_loss: 2.3161 - val_accuracy: 0.5421
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4947 - accuracy: 0.5707 - val_loss: 2.2191 - val_accuracy: 0.5514
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5017 - accuracy: 0.5553 - val_loss: 2.1730 - val_accuracy: 0.5514
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3727 - accuracy: 0.5835 - val_loss: 1.9399 - val_accuracy: 0.5561
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2904 - accuracy: 0.5630 - val_loss: 1.9125 - val_accuracy: 0.5514
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1917 - accuracy: 0.5784 - val_loss: 1.8748 - val_accuracy: 0.5467
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1734 - accuracy: 0.5784 - val_loss: 1.8199 - val_accuracy: 0.5467
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1502 - accuracy: 0.5527 - val_loss: 1.8308 - val_accuracy: 0.5467
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9880 - accuracy: 0.5733 - val_loss: 1.8112 - val_accuracy: 0.5514
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0413 - accuracy: 0.5733 - val_loss: 1.7694 - val_accuracy: 0.5514
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8809 - accuracy: 0.5810 - val_loss: 1.6689 - val_accuracy: 0.5561
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7171 - accuracy: 0.5424 - val_loss: 1.6399 - val_accuracy: 0.5607
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7919 - accuracy: 0.5553 - val_loss: 1.6243 - val_accuracy: 0.5607
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6228 - accuracy: 0.5424 - val_loss: 1.6168 - val_accuracy: 0.5561
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5852 - accuracy: 0.5501 - val_loss: 1.6616 - val_accuracy: 0.5561
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5924 - accuracy: 0.5347 - val_loss: 1.6915 - val_accuracy: 0.6776
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6427 - accuracy: 0.6375 - val_loss: 1.7679 - val_accuracy: 0.5467
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4878 - accuracy: 0.5424 - val_loss: 1.7375 - val_accuracy: 0.6729
```

Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5769 - accuracy: 0.6427 - val_loss: 1.6966 - val_accuracy: 0.6729
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4214 - accuracy: 0.6298 - val_loss: 1.5863 - val_accuracy: 0.6822
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5329 - accuracy: 0.6298 - val_loss: 1.5636 - val_accuracy: 0.6729
Epoch 45/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5071 - accuracy: 0.6015 - val_loss: 1.5328 - val_accuracy: 0.6963
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3460 - accuracy: 0.6093 - val_loss: 1.5578 - val_accuracy: 0.6916
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4404 - accuracy: 0.6221 - val_loss: 1.5159 - val_accuracy: 0.6869
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3910 - accuracy: 0.6041 - val_loss: 1.5005 - val_accuracy: 0.6963
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3458 - accuracy: 0.5784 - val_loss: 1.4572 - val_accuracy: 0.6963
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3464 - accuracy: 0.6555 - val_loss: 1.4347 - val_accuracy: 0.6963
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3894 - accuracy: 0.6478 - val_loss: 1.4233 - val_accuracy: 0.6916
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5315 - accuracy: 0.6452 - val_loss: 1.3927 - val_accuracy: 0.6916
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4225 - accuracy: 0.6401 - val_loss: 1.4035 - val_accuracy: 0.6869
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1856 - accuracy: 0.6350 - val_loss: 1.3239 - val_accuracy: 0.6776
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3143 - accuracy: 0.6195 - val_loss: 1.3039 - val_accuracy: 0.6729
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2702 - accuracy: 0.6452 - val_loss: 1.1612 - val_accuracy: 0.6869
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1477 - accuracy: 0.6555 - val_loss: 1.1157 - val_accuracy: 0.6776
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1679 - accuracy: 0.6684 - val_loss: 1.0939 - val_accuracy: 0.6682
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1174 - accuracy: 0.6658 - val_loss: 1.0444 - val_accuracy: 0.6682
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9789 - accuracy: 0.6478 - val_loss: 1.0361 - val_accuracy: 0.6682
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0704 - accuracy: 0.6530 - val_loss: 1.0370 - val_accuracy: 0.6589
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9160 - accuracy: 0.6324 - val_loss: 0.9948 - val_accuracy: 0.6729
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9644 - accuracy: 0.6658 - val_loss: 0.9682 - val_accuracy: 0.6682
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9370 - accuracy: 0.6427 - val_loss: 0.9547 - val_accuracy: 0.6822
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9366 - accuracy: 0.6710 - val_loss: 0.9641 - val_accuracy: 0.6869
Epoch 66/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8223 - accuracy: 0.6350 - val_loss: 0.9736 - val_accuracy: 0.6822
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8837 - accuracy: 0.6555 - val_loss: 0.9673 - val_accuracy: 0.6869
Epoch 68/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7295 - accuracy: 0.6710 - val_loss: 0.9558 - val_accuracy: 0.6682
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7810 - accuracy: 0.6787 - val_loss: 0.9474 - val_accuracy: 0.6822
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8107 - accuracy: 0.6864 - val_loss: 0.9393 - val_accuracy: 0.6636
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7713 - accuracy: 0.6452 - val_loss: 0.9268 - val_accuracy: 0.6636

```
accuracy: 0.6869
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7327 - accuracy: 0.6632 - val_loss: 0.9022 - val_accuracy: 0.6916
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7061 - accuracy: 0.6607 - val_loss: 0.8911 - val_accuracy: 0.6729
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7521 - accuracy: 0.6684 - val_loss: 0.8851 - val_accuracy: 0.6636
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6918 - accuracy: 0.6401 - val_loss: 0.8669 - val_accuracy: 0.6402
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7204 - accuracy: 0.6247 - val_loss: 0.8656 - val_accuracy: 0.6215
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7087 - accuracy: 0.6093 - val_loss: 0.8598 - val_accuracy: 0.6028
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6961 - accuracy: 0.6041 - val_loss: 0.8464 - val_accuracy: 0.6168
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6749 - accuracy: 0.6504 - val_loss: 0.8330 - val_accuracy: 0.6121
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6464 - accuracy: 0.6452 - val_loss: 0.8476 - val_accuracy: 0.6028
Epoch 81/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7068 - accuracy: 0.6992 - val_loss: 0.8366 - val_accuracy: 0.5981
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5782 - accuracy: 0.6607 - val_loss: 0.8215 - val_accuracy: 0.6028
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6186 - accuracy: 0.6530 - val_loss: 0.8139 - val_accuracy: 0.6028
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6403 - accuracy: 0.6761 - val_loss: 0.8178 - val_accuracy: 0.5888
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6549 - accuracy: 0.6632 - val_loss: 0.8106 - val_accuracy: 0.5794
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6556 - accuracy: 0.6298 - val_loss: 0.8254 - val_accuracy: 0.5701
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5760 - accuracy: 0.6221 - val_loss: 0.8185 - val_accuracy: 0.5748
Epoch 88/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6145 - accuracy: 0.6170 - val_loss: 0.8050 - val_accuracy: 0.5607
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5819 - accuracy: 0.6067 - val_loss: 0.7890 - val_accuracy: 0.5561
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5617 - accuracy: 0.6298 - val_loss: 0.7786 - val_accuracy: 0.5748
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5636 - accuracy: 0.6272 - val_loss: 0.7713 - val_accuracy: 0.5561
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6272 - accuracy: 0.6067 - val_loss: 0.7711 - val_accuracy: 0.5748
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5667 - accuracy: 0.6118 - val_loss: 0.7664 - val_accuracy: 0.5981
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5467 - accuracy: 0.6607 - val_loss: 0.7868 - val_accuracy: 0.5935
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5584 - accuracy: 0.6427 - val_loss: 0.7778 - val_accuracy: 0.5794
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5912 - accuracy: 0.6350 - val_loss: 0.7721 - val_accuracy: 0.5935
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5006 - accuracy: 0.6581 - val_loss: 0.7727 - val_accuracy: 0.5841
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5284 - accuracy: 0.6478 - val_loss: 0.7659 - val_accuracy: 0.5935
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4769 - accuracy: 0.6761 - val_loss: 0.7973 - val_accuracy: 0.6215
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5083 - accuracy: 0.6864 - val_loss: 0.7853 - val_accuracy: 0.6028
Epoch 101/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.5158 - accuracy: 0.6838 - val_loss: 0.8062 - val_accuracy: 0.6028
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5143 - accuracy: 0.6992 - val_loss: 0.8001 - val_accuracy: 0.6075
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4773 - accuracy: 0.6941 - val_loss: 0.8017 - val_accuracy: 0.5981
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5122 - accuracy: 0.6915 - val_loss: 0.8192 - val_accuracy: 0.5981
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4476 - accuracy: 0.6941 - val_loss: 0.8196 - val_accuracy: 0.5888
Epoch 106/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4661 - accuracy: 0.6658 - val_loss: 0.8113 - val_accuracy: 0.5888
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4858 - accuracy: 0.6915 - val_loss: 0.8113 - val_accuracy: 0.5888
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5485 - accuracy: 0.6864 - val_loss: 0.8113 - val_accuracy: 0.5935
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4957 - accuracy: 0.6684 - val_loss: 0.8076 - val_accuracy: 0.5935
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5120 - accuracy: 0.6838 - val_loss: 0.8049 - val_accuracy: 0.5935
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5307 - accuracy: 0.6761 - val_loss: 0.8063 - val_accuracy: 0.5935
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4991 - accuracy: 0.6581 - val_loss: 0.8415 - val_accuracy: 0.6028
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5159 - accuracy: 0.6889 - val_loss: 0.8447 - val_accuracy: 0.5841
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5724 - accuracy: 0.6735 - val_loss: 0.8408 - val_accuracy: 0.5888
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4024 - accuracy: 0.6555 - val_loss: 0.8187 - val_accuracy: 0.6028
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4642 - accuracy: 0.6992 - val_loss: 0.8366 - val_accuracy: 0.5935
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5118 - accuracy: 0.6812 - val_loss: 0.8320 - val_accuracy: 0.6075
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4895 - accuracy: 0.6761 - val_loss: 0.8323 - val_accuracy: 0.5888
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5232 - accuracy: 0.6658 - val_loss: 0.8204 - val_accuracy: 0.6168
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4987 - accuracy: 0.6787 - val_loss: 0.8167 - val_accuracy: 0.6075
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5121 - accuracy: 0.6632 - val_loss: 0.8069 - val_accuracy: 0.6215
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4751 - accuracy: 0.7095 - val_loss: 0.8207 - val_accuracy: 0.6028
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4731 - accuracy: 0.6941 - val_loss: 0.8280 - val_accuracy: 0.6028
Epoch 124/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4736 - accuracy: 0.6992 - val_loss: 0.8036 - val_accuracy: 0.6075
Epoch 125/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5546 - accuracy: 0.7147 - val_loss: 0.8317 - val_accuracy: 0.6075
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5128 - accuracy: 0.7095 - val_loss: 0.8348 - val_accuracy: 0.6075
Epoch 127/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4401 - accuracy: 0.7018 - val_loss: 0.8529 - val_accuracy: 0.5607
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5664 - accuracy: 0.6787 - val_loss: 0.8555 - val_accuracy: 0.5654
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4266 - accuracy: 0.6915 - val_loss: 0.8374 - val_accuracy: 0.5561
Epoch 130/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4670 - accuracy: 0.6941 - val_loss: 0.8210 - val_accuracy: 0.6028
```

Epoch 131/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4771 - accuracy: 0.7249 - val_loss: 0.8165 - val_accuracy: 0.5841
Epoch 132/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5410 - accuracy: 0.6710 - val_loss: 0.8068 - val_accuracy: 0.5935
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4212 - accuracy: 0.6889 - val_loss: 0.7931 - val_accuracy: 0.5888
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4775 - accuracy: 0.7069 - val_loss: 0.8095 - val_accuracy: 0.6262
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3991 - accuracy: 0.6864 - val_loss: 0.8187 - val_accuracy: 0.5794
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4470 - accuracy: 0.6992 - val_loss: 0.8238 - val_accuracy: 0.5981
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4016 - accuracy: 0.6889 - val_loss: 0.8146 - val_accuracy: 0.5981
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4591 - accuracy: 0.7069 - val_loss: 0.8592 - val_accuracy: 0.5888
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5046 - accuracy: 0.7172 - val_loss: 0.8751 - val_accuracy: 0.5981
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5070 - accuracy: 0.7069 - val_loss: 0.9284 - val_accuracy: 0.6028
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5004 - accuracy: 0.6992 - val_loss: 0.9264 - val_accuracy: 0.6028
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5106 - accuracy: 0.6812 - val_loss: 0.9192 - val_accuracy: 0.6028
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4552 - accuracy: 0.6941 - val_loss: 0.9148 - val_accuracy: 0.6075
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4525 - accuracy: 0.6941 - val_loss: 0.9377 - val_accuracy: 0.6121
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3767 - accuracy: 0.7275 - val_loss: 0.9418 - val_accuracy: 0.5981
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4663 - accuracy: 0.6967 - val_loss: 0.9963 - val_accuracy: 0.5935
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4343 - accuracy: 0.7018 - val_loss: 0.9153 - val_accuracy: 0.5701
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5012 - accuracy: 0.6812 - val_loss: 0.8861 - val_accuracy: 0.5794
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4659 - accuracy: 0.6889 - val_loss: 0.8950 - val_accuracy: 0.6028
Epoch 150/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4275 - accuracy: 0.7172 - val_loss: 0.8693 - val_accuracy: 0.6121
Epoch 151/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4114 - accuracy: 0.7352 - val_loss: 0.8702 - val_accuracy: 0.5841
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4419 - accuracy: 0.7275 - val_loss: 0.8454 - val_accuracy: 0.5935
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4125 - accuracy: 0.7172 - val_loss: 0.8041 - val_accuracy: 0.6028
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4492 - accuracy: 0.7198 - val_loss: 1.0102 - val_accuracy: 0.6028
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4789 - accuracy: 0.7249 - val_loss: 0.9674 - val_accuracy: 0.6075
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4235 - accuracy: 0.7121 - val_loss: 0.9440 - val_accuracy: 0.5981
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4332 - accuracy: 0.6992 - val_loss: 0.9385 - val_accuracy: 0.6075
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4553 - accuracy: 0.7018 - val_loss: 0.9344 - val_accuracy: 0.6075
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3901 - accuracy: 0.7224 - val_loss: 0.9692 - val_accuracy: 0.5981
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4577 - accuracy: 0.7044 - val_loss: 0.9933 - val_accuracy: 0.6075

```
accuracy: 0.6215
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4840 - accuracy: 0.6967 - val_loss: 0.9585 - val_accuracy: 0.6355
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5923 - accuracy: 0.7429 - val_loss: 0.9837 - val_accuracy: 0.6495
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4541 - accuracy: 0.7018 - val_loss: 0.9892 - val_accuracy: 0.6542
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4817 - accuracy: 0.7147 - val_loss: 0.9653 - val_accuracy: 0.6542
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4258 - accuracy: 0.7121 - val_loss: 0.9008 - val_accuracy: 0.6075
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3820 - accuracy: 0.7172 - val_loss: 0.8737 - val_accuracy: 0.5981
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4222 - accuracy: 0.7352 - val_loss: 0.9532 - val_accuracy: 0.6168
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4641 - accuracy: 0.7404 - val_loss: 0.9562 - val_accuracy: 0.6308
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4274 - accuracy: 0.7404 - val_loss: 1.0438 - val_accuracy: 0.6402
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3705 - accuracy: 0.7455 - val_loss: 1.0134 - val_accuracy: 0.6215
Epoch 171/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3921 - accuracy: 0.7121 - val_loss: 1.0216 - val_accuracy: 0.6308
Epoch 172/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4497 - accuracy: 0.7095 - val_loss: 1.0957 - val_accuracy: 0.6495
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4253 - accuracy: 0.7661 - val_loss: 1.0757 - val_accuracy: 0.6355
Epoch 174/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4212 - accuracy: 0.7352 - val_loss: 1.1487 - val_accuracy: 0.6402
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3990 - accuracy: 0.7147 - val_loss: 1.1195 - val_accuracy: 0.6402
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4101 - accuracy: 0.7044 - val_loss: 1.1143 - val_accuracy: 0.6542
Epoch 177/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4537 - accuracy: 0.7301 - val_loss: 1.1166 - val_accuracy: 0.6542
Epoch 178/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3958 - accuracy: 0.7147 - val_loss: 1.0954 - val_accuracy: 0.6636
Epoch 179/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4015 - accuracy: 0.7429 - val_loss: 1.0808 - val_accuracy: 0.6682
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3665 - accuracy: 0.7121 - val_loss: 1.1055 - val_accuracy: 0.6589
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4826 - accuracy: 0.7326 - val_loss: 1.0563 - val_accuracy: 0.6308
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3725 - accuracy: 0.7224 - val_loss: 1.1316 - val_accuracy: 0.6495
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4386 - accuracy: 0.7249 - val_loss: 1.1483 - val_accuracy: 0.6495
Epoch 184/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4217 - accuracy: 0.7352 - val_loss: 1.1521 - val_accuracy: 0.6542
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3928 - accuracy: 0.7404 - val_loss: 1.0822 - val_accuracy: 0.6402
Epoch 186/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3878 - accuracy: 0.7249 - val_loss: 1.1188 - val_accuracy: 0.6402
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4165 - accuracy: 0.7455 - val_loss: 1.0972 - val_accuracy: 0.6262
Epoch 188/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3717 - accuracy: 0.7506 - val_loss: 1.1447 - val_accuracy: 0.6542
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4557 - accuracy: 0.7455 - val_loss: 1.2132 - val_accuracy: 0.6168
Epoch 190/1000
```

```

4/4 [=====] - 0s 14ms/step - loss: 0.3834 - accuracy: 0.7506 - val_loss: 1.1942 - val_accuracy: 0.6262
Epoch 191/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3488 - accuracy: 0.7789 - val_loss: 1.1573 - val_accuracy: 0.6449
Epoch 192/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3634 - accuracy: 0.7532 - val_loss: 1.1801 - val_accuracy: 0.6402
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3952 - accuracy: 0.7429 - val_loss: 1.2239 - val_accuracy: 0.6262
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3868 - accuracy: 0.7455 - val_loss: 1.1956 - val_accuracy: 0.6449
Epoch 195/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3630 - accuracy: 0.7891Restoring model weights from the end of the best epoch: 45.
4/4 [=====] - 0s 14ms/step - loss: 0.3496 - accuracy: 0.7815 - val_loss: 1.2572 - val_accuracy: 0.6262
Epoch 195: early stopping
2/2 [=====] - 0s 3ms/step - loss: 1.2204 - accuracy: 0.7907
[CV] END .....Dense1=50, Dense2=25; total time= 10.8s
Model: "sequential_56"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_224 (Dense)	(None, 50)	350
batch_normalization_168 (BatchNormalization)	(None, 50)	200
activation_168 (Activation)	(None, 50)	0
dense_225 (Dense)	(None, 25)	1275
batch_normalization_169 (BatchNormalization)	(None, 25)	100
activation_169 (Activation)	(None, 25)	0
dense_226 (Dense)	(None, 10)	260
batch_normalization_170 (BatchNormalization)	(None, 10)	40
activation_170 (Activation)	(None, 10)	0
dense_227 (Dense)	(None, 2)	22
<hr/>		
Total params: 2,247		
Trainable params: 2,077		
Non-trainable params: 170		

```

Epoch 1/1000
4/4 [=====] - 1s 55ms/step - loss: 5.5398 - accuracy: 0.5424 - val_loss: 6.6792 - val_accuracy: 0.5234
Epoch 2/1000
4/4 [=====] - 0s 15ms/step - loss: 4.5925 - accuracy: 0.5707 - val_loss: 5.9547 - val_accuracy: 0.5654
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 4.2733 - accuracy: 0.5835 - val_loss: 4.5302 - val_accuracy: 0.6682
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5753 - accuracy: 0.6093 - val_loss: 3.4875 - val_accuracy: 0.6589
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 3.3108 - accuracy: 0.6067 - val_loss: 2.7392 - val_accuracy: 0.6776
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0438 - accuracy: 0.6581 - val_loss: 2.4101 - val_accuracy: 0.7196
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 2.9273 - accuracy: 0.6272 - val_loss: 2.2694 - val_accuracy: 0.6963
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8086 - accuracy: 0.6298 - val_loss: 2.1396 - val_accuracy: 0.6729
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4834 - accuracy: 0.6581 - val_loss: 2.0749 - val_accuracy: 0.6869
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4703 - accuracy: 0.6221 - val_loss: 2.0532 - val_accuracy: 0.6636
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2328 - accuracy: 0.6658 - val_loss: 1.9882 - val_accuracy: 0.6682
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1578 - accuracy: 0.6761 - val_loss: 1.9722 - val_

```

```
accuracy: 0.6776
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1226 - accuracy: 0.6555 - val_loss: 1.9267 - val_
accuracy: 0.6822
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9700 - accuracy: 0.6530 - val_loss: 1.8289 - val_
accuracy: 0.6869
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9313 - accuracy: 0.6684 - val_loss: 1.7620 - val_
accuracy: 0.6822
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9603 - accuracy: 0.6504 - val_loss: 1.7072 - val_
accuracy: 0.6822
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8132 - accuracy: 0.6710 - val_loss: 1.6550 - val_
accuracy: 0.6776
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8492 - accuracy: 0.6581 - val_loss: 1.6273 - val_
accuracy: 0.6682
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6933 - accuracy: 0.6581 - val_loss: 1.5796 - val_
accuracy: 0.6682
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6962 - accuracy: 0.6452 - val_loss: 1.4943 - val_
accuracy: 0.6589
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6765 - accuracy: 0.6555 - val_loss: 1.4686 - val_
accuracy: 0.6542
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6095 - accuracy: 0.6864 - val_loss: 1.4258 - val_
accuracy: 0.6495
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4513 - accuracy: 0.6787 - val_loss: 1.3913 - val_
accuracy: 0.6495
Epoch 24/1000
4/4 [=====] - 0s 17ms/step - loss: 1.4605 - accuracy: 0.6761 - val_loss: 1.3760 - val_
accuracy: 0.4579
Epoch 25/1000
4/4 [=====] - 0s 18ms/step - loss: 1.5684 - accuracy: 0.6298 - val_loss: 1.3592 - val_
accuracy: 0.4486
Epoch 26/1000
4/4 [=====] - 0s 15ms/step - loss: 1.4131 - accuracy: 0.6221 - val_loss: 1.3442 - val_
accuracy: 0.4439
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3748 - accuracy: 0.6401 - val_loss: 1.3258 - val_
accuracy: 0.4346
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4631 - accuracy: 0.6298 - val_loss: 1.3092 - val_
accuracy: 0.4393
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4185 - accuracy: 0.6118 - val_loss: 1.2947 - val_
accuracy: 0.4299
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3096 - accuracy: 0.6452 - val_loss: 1.3080 - val_
accuracy: 0.4439
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1951 - accuracy: 0.6221 - val_loss: 1.2881 - val_
accuracy: 0.4439
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1880 - accuracy: 0.6350 - val_loss: 1.2755 - val_
accuracy: 0.4346
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3007 - accuracy: 0.6195 - val_loss: 1.2619 - val_
accuracy: 0.4346
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0968 - accuracy: 0.6195 - val_loss: 1.2492 - val_
accuracy: 0.4533
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1681 - accuracy: 0.6221 - val_loss: 1.2461 - val_
accuracy: 0.4579
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0509 - accuracy: 0.6298 - val_loss: 1.2309 - val_
accuracy: 0.4533
Epoch 37/1000
4/4 [=====] - 0s 18ms/step - loss: 1.1152 - accuracy: 0.6247 - val_loss: 1.2245 - val_
accuracy: 0.4533
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9549 - accuracy: 0.6324 - val_loss: 1.2496 - val_
accuracy: 0.4579
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9646 - accuracy: 0.6427 - val_loss: 1.2529 - val_
accuracy: 0.4533
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9389 - accuracy: 0.6478 - val_loss: 1.2408 - val_
accuracy: 0.4579
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9661 - accuracy: 0.6401 - val_loss: 1.2218 - val_
accuracy: 0.4626
Epoch 42/1000
```

4/4 [=====] - 0s 13ms/step - loss: 0.7761 - accuracy: 0.6555 - val_loss: 1.2079 - val_accuracy: 0.4626
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8218 - accuracy: 0.6504 - val_loss: 1.1941 - val_accuracy: 0.4673
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8423 - accuracy: 0.6478 - val_loss: 1.1897 - val_accuracy: 0.4860
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7706 - accuracy: 0.6195 - val_loss: 1.1787 - val_accuracy: 0.4813
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8014 - accuracy: 0.6144 - val_loss: 1.1630 - val_accuracy: 0.4813
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7507 - accuracy: 0.6298 - val_loss: 1.1543 - val_accuracy: 0.4860
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6628 - accuracy: 0.6452 - val_loss: 1.1448 - val_accuracy: 0.4860
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7038 - accuracy: 0.6401 - val_loss: 1.1661 - val_accuracy: 0.4907
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8103 - accuracy: 0.6272 - val_loss: 1.1407 - val_accuracy: 0.4953
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6779 - accuracy: 0.6298 - val_loss: 1.1287 - val_accuracy: 0.4953
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6760 - accuracy: 0.6530 - val_loss: 1.1134 - val_accuracy: 0.4860
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6978 - accuracy: 0.6272 - val_loss: 1.1054 - val_accuracy: 0.4860
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6741 - accuracy: 0.6298 - val_loss: 1.0577 - val_accuracy: 0.5047
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6522 - accuracy: 0.6504 - val_loss: 1.0801 - val_accuracy: 0.5000
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5641 - accuracy: 0.6272 - val_loss: 1.0668 - val_accuracy: 0.5047
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5860 - accuracy: 0.6478 - val_loss: 1.0512 - val_accuracy: 0.5047
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5388 - accuracy: 0.6350 - val_loss: 1.0422 - val_accuracy: 0.5000
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6252 - accuracy: 0.6581 - val_loss: 1.0204 - val_accuracy: 0.5327
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5219 - accuracy: 0.6787 - val_loss: 1.0343 - val_accuracy: 0.5327
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5484 - accuracy: 0.6607 - val_loss: 0.9879 - val_accuracy: 0.5561
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6061 - accuracy: 0.6658 - val_loss: 0.9982 - val_accuracy: 0.5701
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6281 - accuracy: 0.6787 - val_loss: 0.9929 - val_accuracy: 0.5654
Epoch 64/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5042 - accuracy: 0.6684 - val_loss: 0.9828 - val_accuracy: 0.5701
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5937 - accuracy: 0.6684 - val_loss: 0.9620 - val_accuracy: 0.5514
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5088 - accuracy: 0.6555 - val_loss: 0.9465 - val_accuracy: 0.5607
Epoch 67/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5573 - accuracy: 0.6941 - val_loss: 0.9609 - val_accuracy: 0.5794
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5242 - accuracy: 0.6915 - val_loss: 0.9569 - val_accuracy: 0.5935
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5300 - accuracy: 0.7018 - val_loss: 0.9418 - val_accuracy: 0.5981
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5011 - accuracy: 0.6941 - val_loss: 0.9088 - val_accuracy: 0.5841
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4769 - accuracy: 0.6530 - val_loss: 0.9216 - val_accuracy: 0.5888

Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5365 - accuracy: 0.6684 - val_loss: 0.9116 - val_accuracy: 0.5794
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5152 - accuracy: 0.6735 - val_loss: 0.8963 - val_accuracy: 0.5607
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4429 - accuracy: 0.6684 - val_loss: 0.8840 - val_accuracy: 0.5701
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4316 - accuracy: 0.6787 - val_loss: 0.8679 - val_accuracy: 0.5701
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5035 - accuracy: 0.6658 - val_loss: 0.8571 - val_accuracy: 0.5561
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4521 - accuracy: 0.6812 - val_loss: 0.8435 - val_accuracy: 0.5654
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4920 - accuracy: 0.6478 - val_loss: 0.8385 - val_accuracy: 0.5841
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4807 - accuracy: 0.6710 - val_loss: 0.8421 - val_accuracy: 0.5888
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5628 - accuracy: 0.6427 - val_loss: 0.8340 - val_accuracy: 0.6075
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4800 - accuracy: 0.6401 - val_loss: 0.8529 - val_accuracy: 0.5888
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4557 - accuracy: 0.6632 - val_loss: 0.8500 - val_accuracy: 0.6075
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4749 - accuracy: 0.6684 - val_loss: 0.8431 - val_accuracy: 0.6028
Epoch 84/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5676 - accuracy: 0.6915 - val_loss: 0.8708 - val_accuracy: 0.5701
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4749 - accuracy: 0.6915 - val_loss: 0.8549 - val_accuracy: 0.5421
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5111 - accuracy: 0.6478 - val_loss: 0.8478 - val_accuracy: 0.5654
Epoch 87/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4497 - accuracy: 0.6915 - val_loss: 0.8356 - val_accuracy: 0.5748
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4406 - accuracy: 0.6761 - val_loss: 0.8262 - val_accuracy: 0.5654
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4596 - accuracy: 0.6941 - val_loss: 0.8216 - val_accuracy: 0.5841
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4388 - accuracy: 0.6658 - val_loss: 0.8186 - val_accuracy: 0.5841
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4507 - accuracy: 0.6581 - val_loss: 0.8428 - val_accuracy: 0.5794
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4894 - accuracy: 0.6838 - val_loss: 0.8344 - val_accuracy: 0.5841
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4462 - accuracy: 0.6504 - val_loss: 0.8087 - val_accuracy: 0.5888
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4286 - accuracy: 0.6504 - val_loss: 0.7988 - val_accuracy: 0.6028
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4296 - accuracy: 0.6710 - val_loss: 0.7861 - val_accuracy: 0.6075
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4442 - accuracy: 0.6838 - val_loss: 0.7704 - val_accuracy: 0.6121
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4467 - accuracy: 0.6658 - val_loss: 0.7724 - val_accuracy: 0.6262
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4566 - accuracy: 0.6761 - val_loss: 0.8171 - val_accuracy: 0.5888
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4840 - accuracy: 0.6889 - val_loss: 0.8310 - val_accuracy: 0.5981
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4412 - accuracy: 0.6864 - val_loss: 0.8266 - val_accuracy: 0.6215
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3826 - accuracy: 0.6864 - val_loss: 0.8184 - val_accuracy: 0.6215

```
accuracy: 0.6168
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3827 - accuracy: 0.6787 - val_loss: 0.8150 - val_
accuracy: 0.6168
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4413 - accuracy: 0.7172 - val_loss: 0.7951 - val_
accuracy: 0.6075
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4421 - accuracy: 0.6992 - val_loss: 0.7908 - val_
accuracy: 0.6121
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4513 - accuracy: 0.6864 - val_loss: 0.8107 - val_
accuracy: 0.6075
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4715 - accuracy: 0.7018 - val_loss: 0.8052 - val_
accuracy: 0.6075
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4742 - accuracy: 0.6915 - val_loss: 0.8046 - val_
accuracy: 0.6028
Epoch 108/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3679 - accuracy: 0.7095 - val_loss: 0.7742 - val_
accuracy: 0.6075
Epoch 109/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4441 - accuracy: 0.6941 - val_loss: 0.7687 - val_
accuracy: 0.6262
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4066 - accuracy: 0.7121 - val_loss: 0.7893 - val_
accuracy: 0.6075
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4046 - accuracy: 0.7326 - val_loss: 0.7598 - val_
accuracy: 0.6308
Epoch 112/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4433 - accuracy: 0.6941 - val_loss: 0.7738 - val_
accuracy: 0.6308
Epoch 113/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4248 - accuracy: 0.7224 - val_loss: 0.7698 - val_
accuracy: 0.6262
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4065 - accuracy: 0.7326 - val_loss: 0.7684 - val_
accuracy: 0.6495
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3654 - accuracy: 0.7198 - val_loss: 0.7633 - val_
accuracy: 0.6495
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4085 - accuracy: 0.7275 - val_loss: 0.7547 - val_
accuracy: 0.6542
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4837 - accuracy: 0.7224 - val_loss: 0.7842 - val_
accuracy: 0.6449
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4261 - accuracy: 0.6710 - val_loss: 0.8071 - val_
accuracy: 0.6495
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5059 - accuracy: 0.6658 - val_loss: 0.8029 - val_
accuracy: 0.6355
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3857 - accuracy: 0.6864 - val_loss: 0.7989 - val_
accuracy: 0.6402
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3891 - accuracy: 0.6658 - val_loss: 0.7934 - val_
accuracy: 0.6355
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3933 - accuracy: 0.6555 - val_loss: 0.7934 - val_
accuracy: 0.6308
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4640 - accuracy: 0.6401 - val_loss: 0.7646 - val_
accuracy: 0.6449
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4361 - accuracy: 0.6658 - val_loss: 0.7575 - val_
accuracy: 0.6262
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4389 - accuracy: 0.6478 - val_loss: 0.7554 - val_
accuracy: 0.6449
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4458 - accuracy: 0.6375 - val_loss: 0.7566 - val_
accuracy: 0.6495
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3796 - accuracy: 0.6427 - val_loss: 0.7619 - val_
accuracy: 0.6542
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3855 - accuracy: 0.6504 - val_loss: 0.7844 - val_
accuracy: 0.6355
Epoch 129/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4358 - accuracy: 0.6452 - val_loss: 0.7878 - val_
accuracy: 0.6495
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3630 - accuracy: 0.6401 - val_loss: 0.7868 - val_
accuracy: 0.6495
Epoch 131/1000
```

4/4 [=====] - 0s 12ms/step - loss: 0.4710 - accuracy: 0.6478 - val_loss: 0.7889 - val_accuracy: 0.6542
 Epoch 132/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.4043 - accuracy: 0.6375 - val_loss: 0.7867 - val_accuracy: 0.6682
 Epoch 133/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3596 - accuracy: 0.6504 - val_loss: 0.7920 - val_accuracy: 0.6402
 Epoch 134/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3605 - accuracy: 0.6324 - val_loss: 0.7901 - val_accuracy: 0.6682
 Epoch 135/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3948 - accuracy: 0.7044 - val_loss: 0.7941 - val_accuracy: 0.6542
 Epoch 136/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.4059 - accuracy: 0.6632 - val_loss: 0.7871 - val_accuracy: 0.6495
 Epoch 137/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.4079 - accuracy: 0.7121 - val_loss: 0.8067 - val_accuracy: 0.6262
 Epoch 138/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4685 - accuracy: 0.6761 - val_loss: 0.8011 - val_accuracy: 0.6402
 Epoch 139/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3959 - accuracy: 0.6324 - val_loss: 0.7989 - val_accuracy: 0.6308
 Epoch 140/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3525 - accuracy: 0.6530 - val_loss: 0.7983 - val_accuracy: 0.6682
 Epoch 141/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3980 - accuracy: 0.6812 - val_loss: 0.8025 - val_accuracy: 0.6729
 Epoch 142/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3704 - accuracy: 0.6684 - val_loss: 0.8096 - val_accuracy: 0.6449
 Epoch 143/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4660 - accuracy: 0.6555 - val_loss: 0.8030 - val_accuracy: 0.6308
 Epoch 144/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4570 - accuracy: 0.6478 - val_loss: 0.7998 - val_accuracy: 0.6215
 Epoch 145/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3540 - accuracy: 0.6427 - val_loss: 0.8010 - val_accuracy: 0.6215
 Epoch 146/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4425 - accuracy: 0.6530 - val_loss: 0.8100 - val_accuracy: 0.6262
 Epoch 147/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4809 - accuracy: 0.6478 - val_loss: 0.8110 - val_accuracy: 0.6636
 Epoch 148/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3832 - accuracy: 0.6889 - val_loss: 0.8129 - val_accuracy: 0.6682
 Epoch 149/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3529 - accuracy: 0.6889 - val_loss: 0.8104 - val_accuracy: 0.6449
 Epoch 150/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4361 - accuracy: 0.6581 - val_loss: 0.8411 - val_accuracy: 0.6402
 Epoch 151/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3492 - accuracy: 0.6632 - val_loss: 0.8173 - val_accuracy: 0.6215
 Epoch 152/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3815 - accuracy: 0.6710 - val_loss: 0.8204 - val_accuracy: 0.6075
 Epoch 153/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3422 - accuracy: 0.6967 - val_loss: 0.8258 - val_accuracy: 0.6075
 Epoch 154/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4197 - accuracy: 0.7069 - val_loss: 0.8495 - val_accuracy: 0.6168
 Epoch 155/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3553 - accuracy: 0.6710 - val_loss: 0.8491 - val_accuracy: 0.6215
 Epoch 156/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.3326 - accuracy: 0.6641 Restoring model weights from the end of the best epoch: 6.
 4/4 [=====] - 0s 13ms/step - loss: 0.3456 - accuracy: 0.7147 - val_loss: 0.8467 - val_accuracy: 0.6215
 Epoch 156: early stopping
 2/2 [=====] - 0s 3ms/step - loss: 1.8363 - accuracy: 0.7209
 [CV] END Dense1=50, Dense2=25; total time= 8.4s
 Model: "sequential_57"

Layer (type)	Output Shape	Param #
<hr/>		
dense_228 (Dense)	(None, 50)	350
batch_normalization_171 (Batch Normalization)	(None, 50)	200

```
tchNormalization)

activation_171 (Activation) (None, 50) 0
dense_229 (Dense) (None, 25) 1275
batch_normalization_172 (BatchNormalization) (None, 25) 100
activation_172 (Activation) (None, 25) 0
dense_230 (Dense) (None, 10) 260
batch_normalization_173 (BatchNormalization) (None, 10) 40
activation_173 (Activation) (None, 10) 0
dense_231 (Dense) (None, 2) 22
=====
Total params: 2,247
Trainable params: 2,077
Non-trainable params: 170

Epoch 1/1000
4/4 [=====] - 1s 55ms/step - loss: 5.0108 - accuracy: 0.5347 - val_loss: 3.5658 - val_accuracy: 0.4579
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 4.7745 - accuracy: 0.5064 - val_loss: 3.5066 - val_accuracy: 0.4626
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 4.3198 - accuracy: 0.5270 - val_loss: 3.4563 - val_accuracy: 0.5561
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 4.4705 - accuracy: 0.5321 - val_loss: 3.5716 - val_accuracy: 0.6262
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 4.2102 - accuracy: 0.5527 - val_loss: 3.5643 - val_accuracy: 0.6121
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 4.2171 - accuracy: 0.5373 - val_loss: 3.8472 - val_accuracy: 0.6215
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9984 - accuracy: 0.5758 - val_loss: 3.9147 - val_accuracy: 0.6308
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7589 - accuracy: 0.5270 - val_loss: 3.3930 - val_accuracy: 0.6121
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5511 - accuracy: 0.5373 - val_loss: 3.2387 - val_accuracy: 0.6168
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3267 - accuracy: 0.5476 - val_loss: 3.2382 - val_accuracy: 0.5935
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1260 - accuracy: 0.5553 - val_loss: 3.1071 - val_accuracy: 0.5841
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 3.2343 - accuracy: 0.5784 - val_loss: 3.1437 - val_accuracy: 0.5794
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0856 - accuracy: 0.5501 - val_loss: 3.0767 - val_accuracy: 0.5794
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1895 - accuracy: 0.5296 - val_loss: 3.0081 - val_accuracy: 0.5794
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0437 - accuracy: 0.5604 - val_loss: 2.9847 - val_accuracy: 0.5841
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9421 - accuracy: 0.5578 - val_loss: 2.8494 - val_accuracy: 0.5841
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8715 - accuracy: 0.5578 - val_loss: 2.7507 - val_accuracy: 0.5841
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7855 - accuracy: 0.5656 - val_loss: 2.6905 - val_accuracy: 0.5841
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7642 - accuracy: 0.5527 - val_loss: 2.5662 - val_accuracy: 0.5888
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8838 - accuracy: 0.5758 - val_loss: 2.5718 - val_accuracy: 0.5841
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6160 - accuracy: 0.5450 - val_loss: 2.5283 - val_accuracy: 0.5888
Epoch 22/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 2.7625 - accuracy: 0.5373 - val_loss: 2.5025 - val_accuracy: 0.5841
Epoch 23/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5410 - accuracy: 0.5810 - val_loss: 2.4508 - val_accuracy: 0.5841
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4775 - accuracy: 0.5990 - val_loss: 2.4389 - val_accuracy: 0.5841
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5381 - accuracy: 0.5758 - val_loss: 2.3151 - val_accuracy: 0.5794
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3703 - accuracy: 0.5758 - val_loss: 2.2927 - val_accuracy: 0.5794
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4107 - accuracy: 0.5501 - val_loss: 2.2956 - val_accuracy: 0.5794
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2147 - accuracy: 0.5887 - val_loss: 2.2391 - val_accuracy: 0.5841
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2711 - accuracy: 0.5913 - val_loss: 2.2204 - val_accuracy: 0.5841
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2197 - accuracy: 0.5835 - val_loss: 2.2324 - val_accuracy: 0.5794
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1474 - accuracy: 0.5784 - val_loss: 2.2120 - val_accuracy: 0.5794
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1527 - accuracy: 0.5656 - val_loss: 2.1666 - val_accuracy: 0.5794
Epoch 33/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9308 - accuracy: 0.5630 - val_loss: 2.1438 - val_accuracy: 0.5748
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8894 - accuracy: 0.5347 - val_loss: 2.1282 - val_accuracy: 0.5794
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9240 - accuracy: 0.5681 - val_loss: 2.0426 - val_accuracy: 0.5794
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8583 - accuracy: 0.5707 - val_loss: 2.0467 - val_accuracy: 0.5794
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8376 - accuracy: 0.5630 - val_loss: 2.0260 - val_accuracy: 0.5841
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7987 - accuracy: 0.5656 - val_loss: 2.0156 - val_accuracy: 0.5748
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7534 - accuracy: 0.5758 - val_loss: 2.0083 - val_accuracy: 0.5748
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7351 - accuracy: 0.5501 - val_loss: 1.9649 - val_accuracy: 0.5794
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7158 - accuracy: 0.5681 - val_loss: 1.9547 - val_accuracy: 0.5794
Epoch 42/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7580 - accuracy: 0.5553 - val_loss: 1.9646 - val_accuracy: 0.5748
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7191 - accuracy: 0.5861 - val_loss: 1.9097 - val_accuracy: 0.5841
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7373 - accuracy: 0.5758 - val_loss: 1.8911 - val_accuracy: 0.5467
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6587 - accuracy: 0.6015 - val_loss: 1.8483 - val_accuracy: 0.5467
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6282 - accuracy: 0.5938 - val_loss: 1.7667 - val_accuracy: 0.5654
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5509 - accuracy: 0.5810 - val_loss: 1.8022 - val_accuracy: 0.5654
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5496 - accuracy: 0.5553 - val_loss: 1.8024 - val_accuracy: 0.5654
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4898 - accuracy: 0.5784 - val_loss: 1.7904 - val_accuracy: 0.5607
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5020 - accuracy: 0.5681 - val_loss: 1.8044 - val_accuracy: 0.5654
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4948 - accuracy: 0.5656 - val_loss: 1.7922 - val_accuracy: 0.5654
```

Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4300 - accuracy: 0.5527 - val_loss: 1.7518 - val_accuracy: 0.5654
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3218 - accuracy: 0.5296 - val_loss: 1.7577 - val_accuracy: 0.5701
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4018 - accuracy: 0.5758 - val_loss: 1.6839 - val_accuracy: 0.5701
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4074 - accuracy: 0.5707 - val_loss: 1.6892 - val_accuracy: 0.5748
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4373 - accuracy: 0.5553 - val_loss: 1.6701 - val_accuracy: 0.5748
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3685 - accuracy: 0.5501 - val_loss: 1.6142 - val_accuracy: 0.5748
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3569 - accuracy: 0.5733 - val_loss: 1.5863 - val_accuracy: 0.5794
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3877 - accuracy: 0.5656 - val_loss: 1.5553 - val_accuracy: 0.5794
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3821 - accuracy: 0.5656 - val_loss: 1.5425 - val_accuracy: 0.5748
Epoch 61/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1750 - accuracy: 0.5424 - val_loss: 1.4617 - val_accuracy: 0.5701
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1793 - accuracy: 0.5553 - val_loss: 1.3305 - val_accuracy: 0.5701
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1138 - accuracy: 0.5476 - val_loss: 1.2745 - val_accuracy: 0.5701
Epoch 64/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1695 - accuracy: 0.5810 - val_loss: 1.1692 - val_accuracy: 0.5748
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0829 - accuracy: 0.5501 - val_loss: 1.1551 - val_accuracy: 0.5701
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1093 - accuracy: 0.5835 - val_loss: 1.1131 - val_accuracy: 0.5701
Epoch 67/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0345 - accuracy: 0.5501 - val_loss: 1.1350 - val_accuracy: 0.5701
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0877 - accuracy: 0.5501 - val_loss: 1.1222 - val_accuracy: 0.5654
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0000 - accuracy: 0.5270 - val_loss: 1.1253 - val_accuracy: 0.5654
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9962 - accuracy: 0.5373 - val_loss: 1.1215 - val_accuracy: 0.5654
Epoch 71/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1195 - accuracy: 0.5296 - val_loss: 1.0761 - val_accuracy: 0.5654
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0171 - accuracy: 0.5424 - val_loss: 1.0818 - val_accuracy: 0.5654
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0791 - accuracy: 0.5141 - val_loss: 1.0559 - val_accuracy: 0.5654
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0137 - accuracy: 0.5527 - val_loss: 0.9999 - val_accuracy: 0.5654
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9736 - accuracy: 0.5167 - val_loss: 0.9597 - val_accuracy: 0.5561
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9341 - accuracy: 0.5476 - val_loss: 0.9784 - val_accuracy: 0.5607
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0260 - accuracy: 0.5321 - val_loss: 0.9420 - val_accuracy: 0.5654
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9554 - accuracy: 0.5398 - val_loss: 0.9069 - val_accuracy: 0.5654
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9379 - accuracy: 0.5244 - val_loss: 0.8850 - val_accuracy: 0.5654
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9537 - accuracy: 0.5090 - val_loss: 0.8623 - val_accuracy: 0.5607
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9361 - accuracy: 0.5296 - val_loss: 0.8445 - val_accuracy: 0.5654

accuracy: 0.5561
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8436 - accuracy: 0.5219 - val_loss: 0.8258 - val_accuracy: 0.5654
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8980 - accuracy: 0.5244 - val_loss: 0.7652 - val_accuracy: 0.5607
Epoch 84/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8954 - accuracy: 0.5476 - val_loss: 0.7721 - val_accuracy: 0.5607
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9220 - accuracy: 0.5141 - val_loss: 0.7577 - val_accuracy: 0.5701
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8823 - accuracy: 0.5244 - val_loss: 0.7392 - val_accuracy: 0.5794
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8829 - accuracy: 0.5116 - val_loss: 0.6998 - val_accuracy: 0.5748
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8867 - accuracy: 0.5219 - val_loss: 0.6953 - val_accuracy: 0.5607
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9079 - accuracy: 0.5193 - val_loss: 0.7058 - val_accuracy: 0.5607
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8151 - accuracy: 0.4884 - val_loss: 0.6895 - val_accuracy: 0.5561
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8433 - accuracy: 0.4936 - val_loss: 0.6662 - val_accuracy: 0.5654
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7916 - accuracy: 0.5398 - val_loss: 0.7035 - val_accuracy: 0.6262
Epoch 93/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8402 - accuracy: 0.5553 - val_loss: 0.6596 - val_accuracy: 0.6402
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8787 - accuracy: 0.5630 - val_loss: 0.6726 - val_accuracy: 0.6402
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9002 - accuracy: 0.5990 - val_loss: 0.6693 - val_accuracy: 0.6495
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7915 - accuracy: 0.5758 - val_loss: 0.6650 - val_accuracy: 0.6495
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8199 - accuracy: 0.5835 - val_loss: 0.6231 - val_accuracy: 0.6355
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7541 - accuracy: 0.5681 - val_loss: 0.6495 - val_accuracy: 0.6355
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7720 - accuracy: 0.5656 - val_loss: 0.6264 - val_accuracy: 0.6308
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7436 - accuracy: 0.5835 - val_loss: 0.6146 - val_accuracy: 0.6121
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8074 - accuracy: 0.6195 - val_loss: 0.6040 - val_accuracy: 0.6355
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7564 - accuracy: 0.5784 - val_loss: 0.6281 - val_accuracy: 0.6355
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7416 - accuracy: 0.5887 - val_loss: 0.6152 - val_accuracy: 0.6308
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7529 - accuracy: 0.5835 - val_loss: 0.6106 - val_accuracy: 0.6262
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7142 - accuracy: 0.5681 - val_loss: 0.6047 - val_accuracy: 0.6168
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7305 - accuracy: 0.5938 - val_loss: 0.6010 - val_accuracy: 0.6215
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7480 - accuracy: 0.5835 - val_loss: 0.6051 - val_accuracy: 0.6121
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6799 - accuracy: 0.6015 - val_loss: 0.6045 - val_accuracy: 0.6121
Epoch 109/1000
4/4 [=====] - 0s 16ms/step - loss: 0.7224 - accuracy: 0.5707 - val_loss: 0.6504 - val_accuracy: 0.6028
Epoch 110/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6619 - accuracy: 0.5630 - val_loss: 0.6488 - val_accuracy: 0.5981
Epoch 111/1000

```
4/4 [=====] - 0s 14ms/step - loss: 0.7480 - accuracy: 0.5501 - val_loss: 0.6126 - val_accuracy: 0.6121
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6659 - accuracy: 0.5810 - val_loss: 0.6085 - val_accuracy: 0.6168
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7511 - accuracy: 0.5527 - val_loss: 0.6046 - val_accuracy: 0.6075
Epoch 114/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6703 - accuracy: 0.5784 - val_loss: 0.6007 - val_accuracy: 0.6075
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6488 - accuracy: 0.5527 - val_loss: 0.6001 - val_accuracy: 0.5981
Epoch 116/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7266 - accuracy: 0.5527 - val_loss: 0.5966 - val_accuracy: 0.5888
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8466 - accuracy: 0.5373 - val_loss: 0.6042 - val_accuracy: 0.5794
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6420 - accuracy: 0.5476 - val_loss: 0.5959 - val_accuracy: 0.5841
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6427 - accuracy: 0.5296 - val_loss: 0.5935 - val_accuracy: 0.5981
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6330 - accuracy: 0.5501 - val_loss: 0.5920 - val_accuracy: 0.5888
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6688 - accuracy: 0.5398 - val_loss: 0.5853 - val_accuracy: 0.5841
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6401 - accuracy: 0.5219 - val_loss: 0.5949 - val_accuracy: 0.5701
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5789 - accuracy: 0.5476 - val_loss: 0.6474 - val_accuracy: 0.5654
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6464 - accuracy: 0.5398 - val_loss: 0.6472 - val_accuracy: 0.5514
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5886 - accuracy: 0.5630 - val_loss: 0.6498 - val_accuracy: 0.5421
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5658 - accuracy: 0.5013 - val_loss: 0.6807 - val_accuracy: 0.5607
Epoch 127/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6221 - accuracy: 0.5476 - val_loss: 0.6862 - val_accuracy: 0.5748
Epoch 128/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5399 - accuracy: 0.5193 - val_loss: 0.6175 - val_accuracy: 0.5888
Epoch 129/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5449 - accuracy: 0.5656 - val_loss: 0.5895 - val_accuracy: 0.5841
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5091 - accuracy: 0.5527 - val_loss: 0.6063 - val_accuracy: 0.6028
Epoch 131/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5138 - accuracy: 0.5527 - val_loss: 0.6055 - val_accuracy: 0.6028
Epoch 132/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4642 - accuracy: 0.5887 - val_loss: 0.6063 - val_accuracy: 0.5654
Epoch 133/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4383 - accuracy: 0.5681 - val_loss: 0.5800 - val_accuracy: 0.5794
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4358 - accuracy: 0.5219 - val_loss: 0.5774 - val_accuracy: 0.5841
Epoch 135/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4939 - accuracy: 0.5810 - val_loss: 0.5503 - val_accuracy: 0.5888
Epoch 136/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3653 - accuracy: 0.5578 - val_loss: 0.5466 - val_accuracy: 0.5794
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4425 - accuracy: 0.5681 - val_loss: 0.5875 - val_accuracy: 0.5654
Epoch 138/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4444 - accuracy: 0.5784 - val_loss: 0.5706 - val_accuracy: 0.5794
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4114 - accuracy: 0.5733 - val_loss: 0.5913 - val_accuracy: 0.5748
Epoch 140/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4316 - accuracy: 0.5707 - val_loss: 0.5916 - val_accuracy: 0.5654
```

Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4433 - accuracy: 0.5681 - val_loss: 0.6017 - val_accuracy: 0.5654
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4510 - accuracy: 0.5681 - val_loss: 0.7350 - val_accuracy: 0.5654
Epoch 143/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4359 - accuracy: 0.5167 - val_loss: 0.7297 - val_accuracy: 0.5888
Epoch 144/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4627 - accuracy: 0.5656 - val_loss: 0.6991 - val_accuracy: 0.5794
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3945 - accuracy: 0.5630 - val_loss: 0.5935 - val_accuracy: 0.5794
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4875 - accuracy: 0.5733 - val_loss: 0.6834 - val_accuracy: 0.5561
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4025 - accuracy: 0.5347 - val_loss: 0.6552 - val_accuracy: 0.5514
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4205 - accuracy: 0.5064 - val_loss: 0.6033 - val_accuracy: 0.5234
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4634 - accuracy: 0.5141 - val_loss: 0.6090 - val_accuracy: 0.5327
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4349 - accuracy: 0.5270 - val_loss: 0.5673 - val_accuracy: 0.5047
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3387 - accuracy: 0.5424 - val_loss: 0.5382 - val_accuracy: 0.5187
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4330 - accuracy: 0.5450 - val_loss: 0.5482 - val_accuracy: 0.5093
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3765 - accuracy: 0.5347 - val_loss: 0.5854 - val_accuracy: 0.5000
Epoch 154/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5312 - accuracy: 0.5296 - val_loss: 0.6642 - val_accuracy: 0.4860
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3897 - accuracy: 0.5219 - val_loss: 0.5700 - val_accuracy: 0.5047
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4147 - accuracy: 0.5296 - val_loss: 0.5611 - val_accuracy: 0.5280
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4295 - accuracy: 0.5476 - val_loss: 0.5669 - val_accuracy: 0.5093
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4418 - accuracy: 0.5347 - val_loss: 0.6168 - val_accuracy: 0.5140
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4017 - accuracy: 0.5373 - val_loss: 0.5828 - val_accuracy: 0.5327
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3916 - accuracy: 0.5347 - val_loss: 0.5747 - val_accuracy: 0.5093
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4171 - accuracy: 0.5835 - val_loss: 0.5799 - val_accuracy: 0.5140
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4502 - accuracy: 0.5090 - val_loss: 0.6098 - val_accuracy: 0.5280
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3795 - accuracy: 0.5347 - val_loss: 0.5630 - val_accuracy: 0.5514
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3799 - accuracy: 0.5501 - val_loss: 0.4984 - val_accuracy: 0.5327
Epoch 165/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4444 - accuracy: 0.5270 - val_loss: 0.5465 - val_accuracy: 0.5327
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4414 - accuracy: 0.5450 - val_loss: 0.5909 - val_accuracy: 0.5234
Epoch 167/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4245 - accuracy: 0.5476 - val_loss: 0.6276 - val_accuracy: 0.5140
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4008 - accuracy: 0.5296 - val_loss: 0.6399 - val_accuracy: 0.5093
Epoch 169/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4058 - accuracy: 0.5270 - val_loss: 0.6428 - val_accuracy: 0.5187
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3685 - accuracy: 0.5476 - val_loss: 0.6490 - val_accuracy: 0.5187

```
accuracy: 0.4860
Epoch 171/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3731 - accuracy: 0.4730 - val_loss: 0.6557 - val_accuracy: 0.5093
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4825 - accuracy: 0.4859 - val_loss: 0.6583 - val_accuracy: 0.4860
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4057 - accuracy: 0.5064 - val_loss: 0.6581 - val_accuracy: 0.4813
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3805 - accuracy: 0.5039 - val_loss: 0.6702 - val_accuracy: 0.4673
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4118 - accuracy: 0.5064 - val_loss: 0.7541 - val_accuracy: 0.4486
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3748 - accuracy: 0.5193 - val_loss: 0.6888 - val_accuracy: 0.5000
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3991 - accuracy: 0.5476 - val_loss: 0.6907 - val_accuracy: 0.5093
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4117 - accuracy: 0.5347 - val_loss: 0.7210 - val_accuracy: 0.4953
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4150 - accuracy: 0.5476 - val_loss: 0.7173 - val_accuracy: 0.5047
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4170 - accuracy: 0.5013 - val_loss: 0.6619 - val_accuracy: 0.5093
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3569 - accuracy: 0.5193 - val_loss: 0.8234 - val_accuracy: 0.4720
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3852 - accuracy: 0.4987 - val_loss: 0.7647 - val_accuracy: 0.4766
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4372 - accuracy: 0.5039 - val_loss: 0.7879 - val_accuracy: 0.4907
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4101 - accuracy: 0.5347 - val_loss: 0.7611 - val_accuracy: 0.5000
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3427 - accuracy: 0.5116 - val_loss: 0.6923 - val_accuracy: 0.5140
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3434 - accuracy: 0.5321 - val_loss: 0.7483 - val_accuracy: 0.5047
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3120 - accuracy: 0.5424 - val_loss: 0.6967 - val_accuracy: 0.5187
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3837 - accuracy: 0.5373 - val_loss: 0.7476 - val_accuracy: 0.5093
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3881 - accuracy: 0.5424 - val_loss: 0.6489 - val_accuracy: 0.5514
Epoch 190/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4109 - accuracy: 0.5219 - val_loss: 0.6479 - val_accuracy: 0.5561
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3669 - accuracy: 0.5424 - val_loss: 0.6302 - val_accuracy: 0.5467
Epoch 192/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3527 - accuracy: 0.5810 - val_loss: 0.6624 - val_accuracy: 0.5607
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3767 - accuracy: 0.5501 - val_loss: 0.6894 - val_accuracy: 0.5467
Epoch 194/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3656 - accuracy: 0.5476 - val_loss: 0.7197 - val_accuracy: 0.5421
Epoch 195/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3574 - accuracy: 0.5373 - val_loss: 0.7175 - val_accuracy: 0.5327
Epoch 196/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3582 - accuracy: 0.4987 - val_loss: 0.6932 - val_accuracy: 0.5327
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3505 - accuracy: 0.5064 - val_loss: 0.6996 - val_accuracy: 0.5280
Epoch 198/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3423 - accuracy: 0.5424 - val_loss: 0.6767 - val_accuracy: 0.5467
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3561 - accuracy: 0.5424 - val_loss: 0.7016 - val_accuracy: 0.5280
Epoch 200/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.4096 - accuracy: 0.5296 - val_loss: 0.7342 - val_accuracy: 0.5187
Epoch 201/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3482 - accuracy: 0.5630 - val_loss: 0.7071 - val_accuracy: 0.5234
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3365 - accuracy: 0.5656 - val_loss: 0.7355 - val_accuracy: 0.5234
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3879 - accuracy: 0.5578 - val_loss: 0.7582 - val_accuracy: 0.5280
Epoch 204/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3284 - accuracy: 0.5450 - val_loss: 0.8147 - val_accuracy: 0.4860
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3096 - accuracy: 0.5244 - val_loss: 0.8187 - val_accuracy: 0.4860
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3670 - accuracy: 0.5347 - val_loss: 0.7915 - val_accuracy: 0.5047
Epoch 207/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4242 - accuracy: 0.5527 - val_loss: 0.7126 - val_accuracy: 0.5234
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4918 - accuracy: 0.5270 - val_loss: 0.6724 - val_accuracy: 0.5421
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3178 - accuracy: 0.5398 - val_loss: 0.6958 - val_accuracy: 0.5421
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3973 - accuracy: 0.5296 - val_loss: 0.7640 - val_accuracy: 0.5280
Epoch 211/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3185 - accuracy: 0.5424 - val_loss: 0.7599 - val_accuracy: 0.5047
Epoch 212/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3825 - accuracy: 0.5321 - val_loss: 0.7564 - val_accuracy: 0.5093
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3736 - accuracy: 0.5193 - val_loss: 0.7424 - val_accuracy: 0.5000
Epoch 214/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3322 - accuracy: 0.5090 - val_loss: 0.7709 - val_accuracy: 0.4813
Epoch 215/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2952 - accuracy: 0.5398 - val_loss: 0.8070 - val_accuracy: 0.4579
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3791 - accuracy: 0.5347 - val_loss: 0.8485 - val_accuracy: 0.4673
Epoch 217/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3952 - accuracy: 0.5193 - val_loss: 0.8534 - val_accuracy: 0.4720
Epoch 218/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3232 - accuracy: 0.5578 - val_loss: 0.8026 - val_accuracy: 0.4720
Epoch 219/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3134 - accuracy: 0.5064 - val_loss: 0.8231 - val_accuracy: 0.4673
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3595 - accuracy: 0.5476 - val_loss: 0.7731 - val_accuracy: 0.4533
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3496 - accuracy: 0.5141 - val_loss: 0.7612 - val_accuracy: 0.4579
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3409 - accuracy: 0.5141 - val_loss: 0.7600 - val_accuracy: 0.4486
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3242 - accuracy: 0.5219 - val_loss: 0.7572 - val_accuracy: 0.4439
Epoch 224/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3369 - accuracy: 0.5167 - val_loss: 0.8401 - val_accuracy: 0.4346
Epoch 225/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3419 - accuracy: 0.5064 - val_loss: 0.7998 - val_accuracy: 0.4486
Epoch 226/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2689 - accuracy: 0.5244 - val_loss: 0.8054 - val_accuracy: 0.4579
Epoch 227/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3347 - accuracy: 0.5244 - val_loss: 0.8329 - val_accuracy: 0.4673
Epoch 228/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3109 - accuracy: 0.5193 - val_loss: 0.8345 - val_accuracy: 0.4860
Epoch 229/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3211 - accuracy: 0.5296 - val_loss: 0.8432 - val_accuracy: 0.4579
```

Epoch 230/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3096 - accuracy: 0.5296 - val_loss: 0.8878 - val_accuracy: 0.4486
 Epoch 231/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3206 - accuracy: 0.4499 - val_loss: 0.8876 - val_accuracy: 0.4766
 Epoch 232/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.4075 - accuracy: 0.4910 - val_loss: 0.8849 - val_accuracy: 0.4533
 Epoch 233/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2924 - accuracy: 0.5141 - val_loss: 0.8677 - val_accuracy: 0.4813
 Epoch 234/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4064 - accuracy: 0.5090 - val_loss: 0.8118 - val_accuracy: 0.4860
 Epoch 235/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3814 - accuracy: 0.4961 - val_loss: 0.8039 - val_accuracy: 0.5000
 Epoch 236/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2875 - accuracy: 0.5296 - val_loss: 0.8574 - val_accuracy: 0.4953
 Epoch 237/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.2941 - accuracy: 0.5270 - val_loss: 0.8652 - val_accuracy: 0.4860
 Epoch 238/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3153 - accuracy: 0.5373 - val_loss: 0.8861 - val_accuracy: 0.4907
 Epoch 239/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3317 - accuracy: 0.5347 - val_loss: 0.8306 - val_accuracy: 0.4907
 Epoch 240/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3503 - accuracy: 0.5244 - val_loss: 0.8359 - val_accuracy: 0.5000
 Epoch 241/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2679 - accuracy: 0.5090 - val_loss: 0.8593 - val_accuracy: 0.5000
 Epoch 242/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2948 - accuracy: 0.5553 - val_loss: 0.8610 - val_accuracy: 0.5047
 Epoch 243/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3528 - accuracy: 0.5630 - val_loss: 0.8998 - val_accuracy: 0.5000
 Epoch 244/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3090 - accuracy: 0.5707 - val_loss: 0.8691 - val_accuracy: 0.4953
 Epoch 245/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.3332 - accuracy: 0.5391 Restoring model weights from the end of the best epoch: 95.
 4/4 [=====] - 0s 15ms/step - loss: 0.3388 - accuracy: 0.5296 - val_loss: 0.9023 - val_accuracy: 0.4860
 Epoch 245: early stopping
 2/2 [=====] - 0s 3ms/step - loss: 1.3050 - accuracy: 0.6279
 [CV] END Dense1=50, Dense2=25; total time= 12.9s
 Model: "sequential_58"

Layer (type)	Output Shape	Param #
<hr/>		
dense_232 (Dense)	(None, 50)	350
batch_normalization_174 (BatchNormalization)	(None, 50)	200
activation_174 (Activation)	(None, 50)	0
dense_233 (Dense)	(None, 25)	1275
batch_normalization_175 (BatchNormalization)	(None, 25)	100
activation_175 (Activation)	(None, 25)	0
dense_234 (Dense)	(None, 10)	260
batch_normalization_176 (BatchNormalization)	(None, 10)	40
activation_176 (Activation)	(None, 10)	0
dense_235 (Dense)	(None, 2)	22
<hr/>		

Total params: 2,247
 Trainable params: 2,077
 Non-trainable params: 170

Epoch 1/1000
 4/4 [=====] - 1s 62ms/step - loss: 5.1586 - accuracy: 0.5167 - val_loss: 2.2456 - val_accuracy: 0.5421
 Epoch 2/1000

```
4/4 [=====] - 0s 15ms/step - loss: 3.4579 - accuracy: 0.5835 - val_loss: 1.9505 - val_accuracy: 0.5374
Epoch 3/1000
4/4 [=====] - 0s 16ms/step - loss: 3.2128 - accuracy: 0.5990 - val_loss: 1.8316 - val_accuracy: 0.5467
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 2.9628 - accuracy: 0.6247 - val_loss: 1.7937 - val_accuracy: 0.5841
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8233 - accuracy: 0.6452 - val_loss: 1.8141 - val_accuracy: 0.6075
Epoch 6/1000
4/4 [=====] - 0s 15ms/step - loss: 2.6194 - accuracy: 0.6221 - val_loss: 1.8602 - val_accuracy: 0.6262
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4394 - accuracy: 0.6607 - val_loss: 1.8488 - val_accuracy: 0.6262
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5093 - accuracy: 0.6324 - val_loss: 1.8318 - val_accuracy: 0.6215
Epoch 9/1000
4/4 [=====] - 0s 15ms/step - loss: 2.1085 - accuracy: 0.6607 - val_loss: 1.8760 - val_accuracy: 0.6729
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0207 - accuracy: 0.6761 - val_loss: 1.8901 - val_accuracy: 0.6636
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9776 - accuracy: 0.6658 - val_loss: 1.9298 - val_accuracy: 0.6729
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9600 - accuracy: 0.6607 - val_loss: 1.9372 - val_accuracy: 0.7710
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8698 - accuracy: 0.7147 - val_loss: 1.9417 - val_accuracy: 0.7710
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6726 - accuracy: 0.7609 - val_loss: 1.8578 - val_accuracy: 0.7897
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7080 - accuracy: 0.7172 - val_loss: 1.7282 - val_accuracy: 0.7664
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3850 - accuracy: 0.7404 - val_loss: 1.7508 - val_accuracy: 0.7430
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4463 - accuracy: 0.7404 - val_loss: 1.7159 - val_accuracy: 0.7383
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4084 - accuracy: 0.7378 - val_loss: 1.6730 - val_accuracy: 0.7290
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3313 - accuracy: 0.7455 - val_loss: 1.6199 - val_accuracy: 0.7383
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1014 - accuracy: 0.7481 - val_loss: 1.5991 - val_accuracy: 0.6308
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1989 - accuracy: 0.6967 - val_loss: 1.5880 - val_accuracy: 0.6028
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2529 - accuracy: 0.6967 - val_loss: 1.5703 - val_accuracy: 0.5888
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1512 - accuracy: 0.7069 - val_loss: 1.5534 - val_accuracy: 0.5888
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0985 - accuracy: 0.7224 - val_loss: 1.5322 - val_accuracy: 0.7009
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9916 - accuracy: 0.7352 - val_loss: 1.5151 - val_accuracy: 0.7009
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9515 - accuracy: 0.7481 - val_loss: 1.4993 - val_accuracy: 0.6869
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9704 - accuracy: 0.7404 - val_loss: 1.4776 - val_accuracy: 0.6963
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9159 - accuracy: 0.7301 - val_loss: 1.4334 - val_accuracy: 0.6963
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8721 - accuracy: 0.7326 - val_loss: 1.3906 - val_accuracy: 0.6869
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8996 - accuracy: 0.7481 - val_loss: 1.4188 - val_accuracy: 0.6916
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8099 - accuracy: 0.7275 - val_loss: 1.3706 - val_accuracy: 0.6869
```

Epoch 32/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8234 - accuracy: 0.7224 - val_loss: 1.3588 - val_accuracy: 0.6869
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7652 - accuracy: 0.7558 - val_loss: 1.3458 - val_accuracy: 0.6869
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7998 - accuracy: 0.7301 - val_loss: 1.3396 - val_accuracy: 0.5888
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7817 - accuracy: 0.7429 - val_loss: 1.3410 - val_accuracy: 0.7103
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6598 - accuracy: 0.7352 - val_loss: 1.3281 - val_accuracy: 0.7103
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7207 - accuracy: 0.7301 - val_loss: 1.3244 - val_accuracy: 0.7150
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6737 - accuracy: 0.7378 - val_loss: 1.3174 - val_accuracy: 0.7056
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6552 - accuracy: 0.7378 - val_loss: 1.3085 - val_accuracy: 0.7009
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6664 - accuracy: 0.7301 - val_loss: 1.2984 - val_accuracy: 0.7009
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5954 - accuracy: 0.7404 - val_loss: 1.2900 - val_accuracy: 0.7009
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7149 - accuracy: 0.7198 - val_loss: 1.2699 - val_accuracy: 0.6916
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6864 - accuracy: 0.7455 - val_loss: 1.2897 - val_accuracy: 0.6869
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6151 - accuracy: 0.7301 - val_loss: 1.2821 - val_accuracy: 0.6869
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6117 - accuracy: 0.7404 - val_loss: 1.2694 - val_accuracy: 0.6776
Epoch 46/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5638 - accuracy: 0.7224 - val_loss: 1.2602 - val_accuracy: 0.6822
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5624 - accuracy: 0.7429 - val_loss: 1.2533 - val_accuracy: 0.6682
Epoch 48/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5804 - accuracy: 0.7198 - val_loss: 1.2397 - val_accuracy: 0.6121
Epoch 49/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5776 - accuracy: 0.7404 - val_loss: 1.2283 - val_accuracy: 0.6121
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5127 - accuracy: 0.7506 - val_loss: 1.2141 - val_accuracy: 0.6121
Epoch 51/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6454 - accuracy: 0.7326 - val_loss: 1.2019 - val_accuracy: 0.6168
Epoch 52/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5800 - accuracy: 0.7481 - val_loss: 1.1894 - val_accuracy: 0.6121
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6018 - accuracy: 0.7455 - val_loss: 1.1784 - val_accuracy: 0.6121
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6006 - accuracy: 0.7249 - val_loss: 1.1666 - val_accuracy: 0.6215
Epoch 55/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5839 - accuracy: 0.7506 - val_loss: 1.1531 - val_accuracy: 0.6215
Epoch 56/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6133 - accuracy: 0.7481 - val_loss: 1.1353 - val_accuracy: 0.6262
Epoch 57/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5957 - accuracy: 0.7455 - val_loss: 1.1174 - val_accuracy: 0.6262
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6010 - accuracy: 0.7352 - val_loss: 1.1222 - val_accuracy: 0.6168
Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5518 - accuracy: 0.7404 - val_loss: 1.1049 - val_accuracy: 0.6308
Epoch 60/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6395 - accuracy: 0.7352 - val_loss: 1.0707 - val_accuracy: 0.6402
Epoch 61/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5036 - accuracy: 0.7532 - val_loss: 1.0443 - val_accuracy: 0.6402

accuracy: 0.6869
Epoch 62/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5921 - accuracy: 0.7378 - val_loss: 1.0567 - val_accuracy: 0.6589
Epoch 63/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5290 - accuracy: 0.7404 - val_loss: 1.0402 - val_accuracy: 0.6636
Epoch 64/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4901 - accuracy: 0.7275 - val_loss: 1.0284 - val_accuracy: 0.6729
Epoch 65/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4889 - accuracy: 0.7429 - val_loss: 1.0204 - val_accuracy: 0.6682
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5839 - accuracy: 0.7301 - val_loss: 1.0127 - val_accuracy: 0.6822
Epoch 67/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4887 - accuracy: 0.7481 - val_loss: 1.0470 - val_accuracy: 0.6822
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5207 - accuracy: 0.7301 - val_loss: 0.9954 - val_accuracy: 0.6963
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5036 - accuracy: 0.7609 - val_loss: 0.9735 - val_accuracy: 0.6916
Epoch 70/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5353 - accuracy: 0.7352 - val_loss: 0.9582 - val_accuracy: 0.7056
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5059 - accuracy: 0.7481 - val_loss: 0.9360 - val_accuracy: 0.7150
Epoch 72/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5172 - accuracy: 0.7352 - val_loss: 0.9092 - val_accuracy: 0.6963
Epoch 73/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4673 - accuracy: 0.7404 - val_loss: 0.8879 - val_accuracy: 0.7056
Epoch 74/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4487 - accuracy: 0.7558 - val_loss: 0.8957 - val_accuracy: 0.7103
Epoch 75/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4773 - accuracy: 0.7301 - val_loss: 0.8774 - val_accuracy: 0.7196
Epoch 76/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4972 - accuracy: 0.7224 - val_loss: 0.8651 - val_accuracy: 0.7150
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5148 - accuracy: 0.7249 - val_loss: 0.8616 - val_accuracy: 0.7150
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4472 - accuracy: 0.7326 - val_loss: 0.8970 - val_accuracy: 0.7009
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4724 - accuracy: 0.7198 - val_loss: 0.8267 - val_accuracy: 0.7150
Epoch 80/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7302 - accuracy: 0.6735 - val_loss: 0.8182 - val_accuracy: 0.7196
Epoch 81/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6347 - accuracy: 0.6992 - val_loss: 0.8176 - val_accuracy: 0.6869
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5271 - accuracy: 0.7147 - val_loss: 0.8406 - val_accuracy: 0.6776
Epoch 83/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4873 - accuracy: 0.6941 - val_loss: 0.8622 - val_accuracy: 0.6636
Epoch 84/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5024 - accuracy: 0.7121 - val_loss: 0.8544 - val_accuracy: 0.6589
Epoch 85/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5286 - accuracy: 0.6992 - val_loss: 0.8494 - val_accuracy: 0.6589
Epoch 86/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5163 - accuracy: 0.7095 - val_loss: 0.8462 - val_accuracy: 0.6916
Epoch 87/1000
4/4 [=====] - 0s 18ms/step - loss: 0.5260 - accuracy: 0.7095 - val_loss: 0.8364 - val_accuracy: 0.7103
Epoch 88/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4333 - accuracy: 0.7044 - val_loss: 0.8523 - val_accuracy: 0.7056
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6673 - accuracy: 0.6864 - val_loss: 0.8070 - val_accuracy: 0.7056
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4383 - accuracy: 0.7275 - val_loss: 0.7905 - val_accuracy: 0.6916
Epoch 91/1000

```
4/4 [=====] - 0s 13ms/step - loss: 0.4810 - accuracy: 0.7224 - val_loss: 0.7922 - val_accuracy: 0.7150
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5164 - accuracy: 0.7326 - val_loss: 0.8056 - val_accuracy: 0.7103
Epoch 93/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4811 - accuracy: 0.7326 - val_loss: 0.7956 - val_accuracy: 0.7243
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4422 - accuracy: 0.7275 - val_loss: 0.7916 - val_accuracy: 0.7150
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5116 - accuracy: 0.7249 - val_loss: 0.7825 - val_accuracy: 0.7150
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4638 - accuracy: 0.7301 - val_loss: 0.7815 - val_accuracy: 0.7103
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4413 - accuracy: 0.7378 - val_loss: 0.7280 - val_accuracy: 0.7103
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5330 - accuracy: 0.7172 - val_loss: 0.7306 - val_accuracy: 0.7056
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4687 - accuracy: 0.7172 - val_loss: 0.7208 - val_accuracy: 0.7150
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4328 - accuracy: 0.7095 - val_loss: 0.7113 - val_accuracy: 0.7150
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5339 - accuracy: 0.7249 - val_loss: 0.7128 - val_accuracy: 0.7150
Epoch 102/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4915 - accuracy: 0.7224 - val_loss: 0.7096 - val_accuracy: 0.7196
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4038 - accuracy: 0.7326 - val_loss: 0.6985 - val_accuracy: 0.7243
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4413 - accuracy: 0.7224 - val_loss: 0.6951 - val_accuracy: 0.7290
Epoch 105/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5431 - accuracy: 0.7044 - val_loss: 0.6703 - val_accuracy: 0.7617
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4386 - accuracy: 0.7224 - val_loss: 0.6745 - val_accuracy: 0.7477
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4327 - accuracy: 0.7198 - val_loss: 0.6556 - val_accuracy: 0.7523
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4394 - accuracy: 0.7378 - val_loss: 0.6644 - val_accuracy: 0.7477
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4969 - accuracy: 0.7121 - val_loss: 0.6433 - val_accuracy: 0.7477
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4865 - accuracy: 0.7558 - val_loss: 0.6363 - val_accuracy: 0.7430
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5293 - accuracy: 0.7172 - val_loss: 0.6362 - val_accuracy: 0.7383
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4006 - accuracy: 0.7198 - val_loss: 0.6359 - val_accuracy: 0.7477
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5392 - accuracy: 0.7301 - val_loss: 0.6952 - val_accuracy: 0.7383
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5003 - accuracy: 0.7275 - val_loss: 0.6407 - val_accuracy: 0.7430
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4037 - accuracy: 0.7249 - val_loss: 0.6284 - val_accuracy: 0.7243
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4870 - accuracy: 0.7198 - val_loss: 0.6458 - val_accuracy: 0.7243
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4612 - accuracy: 0.7404 - val_loss: 0.6319 - val_accuracy: 0.7243
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4193 - accuracy: 0.7378 - val_loss: 0.6621 - val_accuracy: 0.7290
Epoch 119/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4493 - accuracy: 0.7249 - val_loss: 0.6512 - val_accuracy: 0.7196
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5220 - accuracy: 0.7275 - val_loss: 0.6506 - val_accuracy: 0.7243
```

Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4869 - accuracy: 0.7378 - val_loss: 0.6702 - val_accuracy: 0.7196
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4593 - accuracy: 0.7326 - val_loss: 0.7159 - val_accuracy: 0.7336
Epoch 123/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4229 - accuracy: 0.7506 - val_loss: 0.6883 - val_accuracy: 0.7150
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3953 - accuracy: 0.7404 - val_loss: 0.7136 - val_accuracy: 0.7383
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5533 - accuracy: 0.7532 - val_loss: 0.6917 - val_accuracy: 0.7290
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4442 - accuracy: 0.7224 - val_loss: 0.6793 - val_accuracy: 0.7290
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4192 - accuracy: 0.7429 - val_loss: 0.6538 - val_accuracy: 0.7196
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3758 - accuracy: 0.7378 - val_loss: 0.6874 - val_accuracy: 0.7290
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3997 - accuracy: 0.7378 - val_loss: 0.6521 - val_accuracy: 0.7290
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4040 - accuracy: 0.7455 - val_loss: 0.6548 - val_accuracy: 0.7336
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4584 - accuracy: 0.7352 - val_loss: 0.6468 - val_accuracy: 0.7336
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4866 - accuracy: 0.7455 - val_loss: 0.6449 - val_accuracy: 0.7430
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4162 - accuracy: 0.7326 - val_loss: 0.6414 - val_accuracy: 0.7290
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5141 - accuracy: 0.7224 - val_loss: 0.6693 - val_accuracy: 0.7290
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3553 - accuracy: 0.7532 - val_loss: 0.6323 - val_accuracy: 0.7150
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4168 - accuracy: 0.7584 - val_loss: 0.6541 - val_accuracy: 0.7290
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3540 - accuracy: 0.7584 - val_loss: 0.6545 - val_accuracy: 0.7290
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4700 - accuracy: 0.7249 - val_loss: 0.6444 - val_accuracy: 0.7336
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4103 - accuracy: 0.7301 - val_loss: 0.6519 - val_accuracy: 0.7103
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4450 - accuracy: 0.7532 - val_loss: 0.6756 - val_accuracy: 0.7196
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4135 - accuracy: 0.7429 - val_loss: 0.6573 - val_accuracy: 0.7196
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4382 - accuracy: 0.7198 - val_loss: 0.7052 - val_accuracy: 0.7336
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4528 - accuracy: 0.7378 - val_loss: 0.7165 - val_accuracy: 0.7243
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4224 - accuracy: 0.7275 - val_loss: 0.7190 - val_accuracy: 0.7290
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5107 - accuracy: 0.7506 - val_loss: 0.7403 - val_accuracy: 0.7290
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4342 - accuracy: 0.7455 - val_loss: 0.7453 - val_accuracy: 0.7243
Epoch 147/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3873 - accuracy: 0.7429 - val_loss: 0.7229 - val_accuracy: 0.7243
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4053 - accuracy: 0.7301 - val_loss: 0.7221 - val_accuracy: 0.7243
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4382 - accuracy: 0.7352 - val_loss: 0.7165 - val_accuracy: 0.7150
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4433 - accuracy: 0.7378 - val_loss: 0.7220 - val_accuracy: 0.7220

```

accuracy: 0.7290
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3794 - accuracy: 0.7249 - val_loss: 0.7250 - val_
accuracy: 0.7290
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3665 - accuracy: 0.7326 - val_loss: 0.7232 - val_
accuracy: 0.7243
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4197 - accuracy: 0.7275 - val_loss: 0.7758 - val_
accuracy: 0.7290
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3882 - accuracy: 0.7455 - val_loss: 0.7779 - val_
accuracy: 0.7150
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4485 - accuracy: 0.7147 - val_loss: 0.7988 - val_
accuracy: 0.7290
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3704 - accuracy: 0.7224 - val_loss: 0.7805 - val_
accuracy: 0.6869
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3956 - accuracy: 0.7121 - val_loss: 0.8079 - val_
accuracy: 0.6916
Epoch 158/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4978 - accuracy: 0.6915 - val_loss: 0.7568 - val_
accuracy: 0.6869
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5239 - accuracy: 0.7044 - val_loss: 0.7563 - val_
accuracy: 0.6822
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3914 - accuracy: 0.7147 - val_loss: 0.7551 - val_
accuracy: 0.7009
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4981 - accuracy: 0.7275 - val_loss: 0.7892 - val_
accuracy: 0.7103
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3660 - accuracy: 0.7172 - val_loss: 0.8249 - val_
accuracy: 0.7103
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3899 - accuracy: 0.7121 - val_loss: 0.8554 - val_
accuracy: 0.6776
Epoch 164/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3810 - accuracy: 0.6797Restoring model weights from th
e end of the best epoch: 14.
4/4 [=====] - 0s 14ms/step - loss: 0.4068 - accuracy: 0.6915 - val_loss: 0.8534 - val_
accuracy: 0.6729
Epoch 164: early stopping
2/2 [=====] - 1s 4ms/step - loss: 1.8259 - accuracy: 0.7442
[CV] END .....Dense1=50, Dense2=25; total time= 9.8s
Model: "sequential_59"

```

Layer (type)	Output Shape	Param #
dense_236 (Dense)	(None, 50)	350
batch_normalization_177 (BatchNormalization)	(None, 50)	200
activation_177 (Activation)	(None, 50)	0
dense_237 (Dense)	(None, 50)	2550
batch_normalization_178 (BatchNormalization)	(None, 50)	200
activation_178 (Activation)	(None, 50)	0
dense_238 (Dense)	(None, 10)	510
batch_normalization_179 (BatchNormalization)	(None, 10)	40
activation_179 (Activation)	(None, 10)	0
dense_239 (Dense)	(None, 2)	22

```

Total params: 3,872
Trainable params: 3,652
Non-trainable params: 220

```

```

Epoch 1/1000
4/4 [=====] - 1s 59ms/step - loss: 6.4558 - accuracy: 0.5361 - val_loss: 6.5331 - val_
accuracy: 0.4579
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 4.8994 - accuracy: 0.5490 - val_loss: 6.2494 - val_
accuracy: 0.4579
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 4.6394 - accuracy: 0.5361 - val_loss: 5.4109 - val_
accuracy: 0.4673

```

Epoch 4/1000
4/4 [=====] - 0s 15ms/step - loss: 4.1699 - accuracy: 0.5619 - val_loss: 4.3686 - val_accuracy: 0.4766
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 3.8212 - accuracy: 0.5644 - val_loss: 3.3902 - val_accuracy: 0.4766
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 3.8697 - accuracy: 0.5567 - val_loss: 3.1336 - val_accuracy: 0.4626
Epoch 7/1000
4/4 [=====] - 0s 15ms/step - loss: 3.4767 - accuracy: 0.5773 - val_loss: 2.9721 - val_accuracy: 0.4533
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2432 - accuracy: 0.5644 - val_loss: 2.9623 - val_accuracy: 0.4486
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 3.2207 - accuracy: 0.5670 - val_loss: 2.9177 - val_accuracy: 0.4486
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0559 - accuracy: 0.5954 - val_loss: 2.8663 - val_accuracy: 0.4486
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7955 - accuracy: 0.5825 - val_loss: 2.8536 - val_accuracy: 0.4439
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5551 - accuracy: 0.5902 - val_loss: 2.8105 - val_accuracy: 0.4486
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7676 - accuracy: 0.5825 - val_loss: 2.7266 - val_accuracy: 0.4486
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4949 - accuracy: 0.6108 - val_loss: 2.6818 - val_accuracy: 0.4486
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4825 - accuracy: 0.6031 - val_loss: 2.6343 - val_accuracy: 0.4533
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2104 - accuracy: 0.5876 - val_loss: 2.5197 - val_accuracy: 0.4626
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1736 - accuracy: 0.6005 - val_loss: 2.4539 - val_accuracy: 0.4626
Epoch 18/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1131 - accuracy: 0.5979 - val_loss: 2.3570 - val_accuracy: 0.4626
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0346 - accuracy: 0.6314 - val_loss: 2.3322 - val_accuracy: 0.4626
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0025 - accuracy: 0.6108 - val_loss: 2.3368 - val_accuracy: 0.4673
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7572 - accuracy: 0.6005 - val_loss: 2.2831 - val_accuracy: 0.4673
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8630 - accuracy: 0.6521 - val_loss: 2.2996 - val_accuracy: 0.4579
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8275 - accuracy: 0.6546 - val_loss: 2.2994 - val_accuracy: 0.4673
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6210 - accuracy: 0.6572 - val_loss: 2.2945 - val_accuracy: 0.4626
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6843 - accuracy: 0.6727 - val_loss: 2.2992 - val_accuracy: 0.4673
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7661 - accuracy: 0.6340 - val_loss: 2.2160 - val_accuracy: 0.4626
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8624 - accuracy: 0.6521 - val_loss: 2.1875 - val_accuracy: 0.4673
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5136 - accuracy: 0.6804 - val_loss: 2.1747 - val_accuracy: 0.4626
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6051 - accuracy: 0.6340 - val_loss: 2.1937 - val_accuracy: 0.4626
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5487 - accuracy: 0.6985 - val_loss: 2.1252 - val_accuracy: 0.4673
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4287 - accuracy: 0.6881 - val_loss: 2.0927 - val_accuracy: 0.4626
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3383 - accuracy: 0.6959 - val_loss: 1.9994 - val_accuracy: 0.4626
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4133 - accuracy: 0.6675 - val_loss: 1.9103 - val_accuracy: 0.4626

```
accuracy: 0.4579
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2466 - accuracy: 0.6598 - val_loss: 1.9089 - val_accuracy: 0.4533
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4169 - accuracy: 0.7062 - val_loss: 1.9482 - val_accuracy: 0.4579
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4519 - accuracy: 0.6856 - val_loss: 1.9714 - val_accuracy: 0.4579
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3842 - accuracy: 0.6907 - val_loss: 1.9975 - val_accuracy: 0.4579
Epoch 38/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3502 - accuracy: 0.6856 - val_loss: 1.9910 - val_accuracy: 0.4579
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2628 - accuracy: 0.6804 - val_loss: 1.9961 - val_accuracy: 0.4579
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3683 - accuracy: 0.6675 - val_loss: 1.9599 - val_accuracy: 0.4579
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2920 - accuracy: 0.6701 - val_loss: 1.9639 - val_accuracy: 0.4579
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2752 - accuracy: 0.6624 - val_loss: 1.9213 - val_accuracy: 0.4626
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1793 - accuracy: 0.6856 - val_loss: 1.9011 - val_accuracy: 0.4720
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1616 - accuracy: 0.6572 - val_loss: 1.8990 - val_accuracy: 0.4673
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1816 - accuracy: 0.6830 - val_loss: 1.8083 - val_accuracy: 0.4673
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1052 - accuracy: 0.6959 - val_loss: 1.7787 - val_accuracy: 0.4673
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0999 - accuracy: 0.6649 - val_loss: 1.7765 - val_accuracy: 0.4673
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9473 - accuracy: 0.6985 - val_loss: 1.7584 - val_accuracy: 0.4673
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0655 - accuracy: 0.7062 - val_loss: 1.7472 - val_accuracy: 0.4720
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0225 - accuracy: 0.7036 - val_loss: 1.7372 - val_accuracy: 0.4766
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9384 - accuracy: 0.7165 - val_loss: 1.6878 - val_accuracy: 0.4766
Epoch 52/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0286 - accuracy: 0.6804 - val_loss: 1.6605 - val_accuracy: 0.4813
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8711 - accuracy: 0.6933 - val_loss: 1.6561 - val_accuracy: 0.4813
Epoch 54/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0149 - accuracy: 0.6649 - val_loss: 1.7346 - val_accuracy: 0.4813
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8869 - accuracy: 0.7139 - val_loss: 1.7406 - val_accuracy: 0.4813
Epoch 56/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8689 - accuracy: 0.7216 - val_loss: 1.6657 - val_accuracy: 0.4953
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8939 - accuracy: 0.7113 - val_loss: 1.6390 - val_accuracy: 0.4813
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8369 - accuracy: 0.7268 - val_loss: 1.5652 - val_accuracy: 0.4907
Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8938 - accuracy: 0.7191 - val_loss: 1.5265 - val_accuracy: 0.4860
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9026 - accuracy: 0.7088 - val_loss: 1.5078 - val_accuracy: 0.4860
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7978 - accuracy: 0.7242 - val_loss: 1.4957 - val_accuracy: 0.4813
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9519 - accuracy: 0.7036 - val_loss: 1.4572 - val_accuracy: 0.4813
Epoch 63/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.9404 - accuracy: 0.6985 - val_loss: 1.3861 - val_accuracy: 0.4907
Epoch 64/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8316 - accuracy: 0.7242 - val_loss: 1.3830 - val_accuracy: 0.5000
Epoch 65/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8392 - accuracy: 0.7036 - val_loss: 1.3526 - val_accuracy: 0.5187
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7950 - accuracy: 0.6701 - val_loss: 1.3418 - val_accuracy: 0.5140
Epoch 67/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7963 - accuracy: 0.6959 - val_loss: 1.3427 - val_accuracy: 0.5140
Epoch 68/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8040 - accuracy: 0.7036 - val_loss: 1.3295 - val_accuracy: 0.5000
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8463 - accuracy: 0.6675 - val_loss: 1.2460 - val_accuracy: 0.5000
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7559 - accuracy: 0.7191 - val_loss: 1.2433 - val_accuracy: 0.5000
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8165 - accuracy: 0.6727 - val_loss: 1.2545 - val_accuracy: 0.5000
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7475 - accuracy: 0.7036 - val_loss: 1.2371 - val_accuracy: 0.5748
Epoch 73/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7208 - accuracy: 0.6933 - val_loss: 1.2337 - val_accuracy: 0.5748
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7305 - accuracy: 0.6907 - val_loss: 1.2189 - val_accuracy: 0.5981
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8043 - accuracy: 0.6856 - val_loss: 1.2156 - val_accuracy: 0.5888
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7433 - accuracy: 0.7088 - val_loss: 1.2164 - val_accuracy: 0.5981
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7573 - accuracy: 0.6985 - val_loss: 1.2475 - val_accuracy: 0.5981
Epoch 78/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6829 - accuracy: 0.7062 - val_loss: 1.2057 - val_accuracy: 0.6028
Epoch 79/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6697 - accuracy: 0.6933 - val_loss: 1.1953 - val_accuracy: 0.6075
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6013 - accuracy: 0.6907 - val_loss: 1.1738 - val_accuracy: 0.5935
Epoch 81/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5658 - accuracy: 0.7062 - val_loss: 1.1887 - val_accuracy: 0.6075
Epoch 82/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6238 - accuracy: 0.6985 - val_loss: 1.1079 - val_accuracy: 0.6682
Epoch 83/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5739 - accuracy: 0.6907 - val_loss: 1.1308 - val_accuracy: 0.6822
Epoch 84/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5122 - accuracy: 0.6907 - val_loss: 1.1180 - val_accuracy: 0.6963
Epoch 85/1000
4/4 [=====] - 0s 18ms/step - loss: 0.5571 - accuracy: 0.7371 - val_loss: 1.0718 - val_accuracy: 0.7103
Epoch 86/1000
4/4 [=====] - 0s 18ms/step - loss: 0.5421 - accuracy: 0.7088 - val_loss: 0.9828 - val_accuracy: 0.6963
Epoch 87/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5718 - accuracy: 0.7113 - val_loss: 0.9534 - val_accuracy: 0.7103
Epoch 88/1000
4/4 [=====] - 0s 17ms/step - loss: 0.5301 - accuracy: 0.6856 - val_loss: 0.9900 - val_accuracy: 0.7196
Epoch 89/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6017 - accuracy: 0.7010 - val_loss: 0.8498 - val_accuracy: 0.7336
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5456 - accuracy: 0.7088 - val_loss: 0.8237 - val_accuracy: 0.7196
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5543 - accuracy: 0.7139 - val_loss: 0.8878 - val_accuracy: 0.7336
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5018 - accuracy: 0.7191 - val_loss: 0.8310 - val_accuracy: 0.7336
```

Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5819 - accuracy: 0.6881 - val_loss: 0.8081 - val_accuracy: 0.7243
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4818 - accuracy: 0.6959 - val_loss: 0.8144 - val_accuracy: 0.7383
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6240 - accuracy: 0.6933 - val_loss: 0.8170 - val_accuracy: 0.7336
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6285 - accuracy: 0.6856 - val_loss: 0.8329 - val_accuracy: 0.7196
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5387 - accuracy: 0.7010 - val_loss: 0.8259 - val_accuracy: 0.7243
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6131 - accuracy: 0.6495 - val_loss: 0.8244 - val_accuracy: 0.7383
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5364 - accuracy: 0.7113 - val_loss: 0.7749 - val_accuracy: 0.7383
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4900 - accuracy: 0.6856 - val_loss: 0.7481 - val_accuracy: 0.7336
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6226 - accuracy: 0.6856 - val_loss: 0.6564 - val_accuracy: 0.7243
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6944 - accuracy: 0.6959 - val_loss: 0.7366 - val_accuracy: 0.7290
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5399 - accuracy: 0.7062 - val_loss: 0.7172 - val_accuracy: 0.7056
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5145 - accuracy: 0.7294 - val_loss: 0.7071 - val_accuracy: 0.7150
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5657 - accuracy: 0.7113 - val_loss: 0.8079 - val_accuracy: 0.7196
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5029 - accuracy: 0.7036 - val_loss: 0.7904 - val_accuracy: 0.7196
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4327 - accuracy: 0.7320 - val_loss: 0.8382 - val_accuracy: 0.7103
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5111 - accuracy: 0.7268 - val_loss: 0.7396 - val_accuracy: 0.6963
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5043 - accuracy: 0.7113 - val_loss: 0.7592 - val_accuracy: 0.7009
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6082 - accuracy: 0.7268 - val_loss: 0.8158 - val_accuracy: 0.6916
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4622 - accuracy: 0.7500 - val_loss: 0.7340 - val_accuracy: 0.6963
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4525 - accuracy: 0.7577 - val_loss: 0.6773 - val_accuracy: 0.7056
Epoch 113/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5213 - accuracy: 0.7474 - val_loss: 0.6786 - val_accuracy: 0.7056
Epoch 114/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5425 - accuracy: 0.7320 - val_loss: 0.6097 - val_accuracy: 0.7009
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5492 - accuracy: 0.7397 - val_loss: 0.5824 - val_accuracy: 0.6963
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4870 - accuracy: 0.7371 - val_loss: 0.6378 - val_accuracy: 0.7290
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4086 - accuracy: 0.7758 - val_loss: 0.6667 - val_accuracy: 0.7290
Epoch 118/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4049 - accuracy: 0.7552 - val_loss: 0.6753 - val_accuracy: 0.7477
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4524 - accuracy: 0.7320 - val_loss: 0.6968 - val_accuracy: 0.7383
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5149 - accuracy: 0.7345 - val_loss: 0.7530 - val_accuracy: 0.7243
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4542 - accuracy: 0.7526 - val_loss: 0.7611 - val_accuracy: 0.7056
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3778 - accuracy: 0.7448 - val_loss: 0.7604 - val_accuracy: 0.7383

```
accuracy: 0.6869
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3679 - accuracy: 0.7603 - val_loss: 0.7253 - val_accuracy: 0.6729
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4512 - accuracy: 0.7552 - val_loss: 0.8043 - val_accuracy: 0.6682
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5269 - accuracy: 0.7526 - val_loss: 0.7679 - val_accuracy: 0.6822
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3933 - accuracy: 0.7216 - val_loss: 0.7594 - val_accuracy: 0.6822
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4695 - accuracy: 0.7320 - val_loss: 0.7421 - val_accuracy: 0.6822
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3541 - accuracy: 0.7397 - val_loss: 0.7411 - val_accuracy: 0.6916
Epoch 129/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4142 - accuracy: 0.7216 - val_loss: 0.7461 - val_accuracy: 0.6822
Epoch 130/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4292 - accuracy: 0.7268 - val_loss: 0.7188 - val_accuracy: 0.7056
Epoch 131/1000
4/4 [=====] - 0s 20ms/step - loss: 0.3268 - accuracy: 0.7629 - val_loss: 0.7270 - val_accuracy: 0.6916
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3735 - accuracy: 0.7088 - val_loss: 0.7577 - val_accuracy: 0.6963
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4205 - accuracy: 0.7216 - val_loss: 0.7466 - val_accuracy: 0.7056
Epoch 134/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2947 - accuracy: 0.7448 - val_loss: 0.7478 - val_accuracy: 0.7056
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4005 - accuracy: 0.7371 - val_loss: 0.8126 - val_accuracy: 0.7009
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3722 - accuracy: 0.7088 - val_loss: 0.8375 - val_accuracy: 0.7056
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3558 - accuracy: 0.7242 - val_loss: 0.8696 - val_accuracy: 0.7196
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4267 - accuracy: 0.7294 - val_loss: 0.8813 - val_accuracy: 0.7290
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3818 - accuracy: 0.7242 - val_loss: 0.8436 - val_accuracy: 0.7243
Epoch 140/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3023 - accuracy: 0.7423 - val_loss: 0.8379 - val_accuracy: 0.7009
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2830 - accuracy: 0.7294 - val_loss: 0.8425 - val_accuracy: 0.7056
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3349 - accuracy: 0.7113 - val_loss: 0.8319 - val_accuracy: 0.6729
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3214 - accuracy: 0.7139 - val_loss: 0.8988 - val_accuracy: 0.6682
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2919 - accuracy: 0.7062 - val_loss: 0.8233 - val_accuracy: 0.6682
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4068 - accuracy: 0.6959 - val_loss: 0.7923 - val_accuracy: 0.6822
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3923 - accuracy: 0.7010 - val_loss: 0.8457 - val_accuracy: 0.6682
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2998 - accuracy: 0.7165 - val_loss: 0.8412 - val_accuracy: 0.6869
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3314 - accuracy: 0.6959 - val_loss: 0.8720 - val_accuracy: 0.6729
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3374 - accuracy: 0.7345 - val_loss: 0.8695 - val_accuracy: 0.6776
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3473 - accuracy: 0.7165 - val_loss: 0.9260 - val_accuracy: 0.7290
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3395 - accuracy: 0.7423 - val_loss: 0.8804 - val_accuracy: 0.7336
Epoch 152/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.2990 - accuracy: 0.7526 - val_loss: 0.8948 - val_accuracy: 0.7290
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4227 - accuracy: 0.7371 - val_loss: 0.8638 - val_accuracy: 0.7150
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2901 - accuracy: 0.7526 - val_loss: 0.9009 - val_accuracy: 0.7196
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2589 - accuracy: 0.7552 - val_loss: 0.8902 - val_accuracy: 0.7383
Epoch 156/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2757 - accuracy: 0.7500 - val_loss: 0.8505 - val_accuracy: 0.7523
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3304 - accuracy: 0.7706 - val_loss: 0.9082 - val_accuracy: 0.7430
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3538 - accuracy: 0.7577 - val_loss: 0.9287 - val_accuracy: 0.7243
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3447 - accuracy: 0.7680 - val_loss: 0.9516 - val_accuracy: 0.7103
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3943 - accuracy: 0.7552 - val_loss: 0.9176 - val_accuracy: 0.7196
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2687 - accuracy: 0.7758 - val_loss: 0.9214 - val_accuracy: 0.7290
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4344 - accuracy: 0.7629 - val_loss: 0.9222 - val_accuracy: 0.7196
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3992 - accuracy: 0.7732 - val_loss: 0.9072 - val_accuracy: 0.7243
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2836 - accuracy: 0.7706 - val_loss: 0.9336 - val_accuracy: 0.7150
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2954 - accuracy: 0.7861 - val_loss: 0.9264 - val_accuracy: 0.7243
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3015 - accuracy: 0.7500 - val_loss: 0.9190 - val_accuracy: 0.7103
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2710 - accuracy: 0.8015 - val_loss: 0.9253 - val_accuracy: 0.7196
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3221 - accuracy: 0.7680 - val_loss: 0.9188 - val_accuracy: 0.6916
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3737 - accuracy: 0.7216 - val_loss: 0.8865 - val_accuracy: 0.7196
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2335 - accuracy: 0.7397 - val_loss: 0.9154 - val_accuracy: 0.6963
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2932 - accuracy: 0.7216 - val_loss: 0.9327 - val_accuracy: 0.7336
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3425 - accuracy: 0.7784 - val_loss: 1.0531 - val_accuracy: 0.6916
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2853 - accuracy: 0.7448 - val_loss: 1.0233 - val_accuracy: 0.6916
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3245 - accuracy: 0.7397 - val_loss: 1.0259 - val_accuracy: 0.6916
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2835 - accuracy: 0.7268 - val_loss: 1.1377 - val_accuracy: 0.6682
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2976 - accuracy: 0.7320 - val_loss: 1.1416 - val_accuracy: 0.6822
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2710 - accuracy: 0.7320 - val_loss: 1.1522 - val_accuracy: 0.6776
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3063 - accuracy: 0.7165 - val_loss: 1.1997 - val_accuracy: 0.6916
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2548 - accuracy: 0.7320 - val_loss: 1.2185 - val_accuracy: 0.7056
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3334 - accuracy: 0.7345 - val_loss: 1.2176 - val_accuracy: 0.7009
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4058 - accuracy: 0.7397 - val_loss: 1.1925 - val_accuracy: 0.6916
```

Epoch 182/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3165 - accuracy: 0.7474 - val_loss: 1.1772 - val_accuracy: 0.6963
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3365 - accuracy: 0.7268 - val_loss: 1.1259 - val_accuracy: 0.7009
Epoch 184/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3328 - accuracy: 0.7216 - val_loss: 1.0691 - val_accuracy: 0.6869
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3661 - accuracy: 0.7397 - val_loss: 1.0698 - val_accuracy: 0.6869
Epoch 186/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2580 - accuracy: 0.7345 - val_loss: 1.0470 - val_accuracy: 0.6822
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4223 - accuracy: 0.6907 - val_loss: 1.2198 - val_accuracy: 0.6636
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4087 - accuracy: 0.7139 - val_loss: 1.1811 - val_accuracy: 0.6636
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4619 - accuracy: 0.7036 - val_loss: 1.1778 - val_accuracy: 0.6636
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4434 - accuracy: 0.7088 - val_loss: 1.2748 - val_accuracy: 0.6682
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3698 - accuracy: 0.7191 - val_loss: 1.3243 - val_accuracy: 0.6636
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4846 - accuracy: 0.7010 - val_loss: 1.3298 - val_accuracy: 0.6729
Epoch 193/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2921 - accuracy: 0.7191 - val_loss: 1.3018 - val_accuracy: 0.6729
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3010 - accuracy: 0.7165 - val_loss: 1.2432 - val_accuracy: 0.6729
Epoch 195/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4140 - accuracy: 0.7139 - val_loss: 1.1663 - val_accuracy: 0.6822
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3623 - accuracy: 0.7397 - val_loss: 1.1651 - val_accuracy: 0.6869
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3030 - accuracy: 0.7320 - val_loss: 1.1388 - val_accuracy: 0.6869
Epoch 198/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2954 - accuracy: 0.7191 - val_loss: 1.1780 - val_accuracy: 0.6822
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2407 - accuracy: 0.7371 - val_loss: 1.1884 - val_accuracy: 0.6916
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3510 - accuracy: 0.7320 - val_loss: 1.2014 - val_accuracy: 0.6822
Epoch 201/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2770 - accuracy: 0.7010 - val_loss: 1.2141 - val_accuracy: 0.6916
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2728 - accuracy: 0.7268 - val_loss: 1.2232 - val_accuracy: 0.6776
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2850 - accuracy: 0.7139 - val_loss: 1.2464 - val_accuracy: 0.6776
Epoch 204/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3347 - accuracy: 0.7036 - val_loss: 1.1473 - val_accuracy: 0.6636
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3102 - accuracy: 0.6959 - val_loss: 1.1957 - val_accuracy: 0.6449
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3677 - accuracy: 0.6881 - val_loss: 1.1584 - val_accuracy: 0.6355
Epoch 207/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3596 - accuracy: 0.6959 - val_loss: 1.1877 - val_accuracy: 0.6542
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2541 - accuracy: 0.6907 - val_loss: 1.1606 - val_accuracy: 0.6636
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4794 - accuracy: 0.7062 - val_loss: 1.1718 - val_accuracy: 0.6449
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3813 - accuracy: 0.7474 - val_loss: 1.1391 - val_accuracy: 0.6355
Epoch 211/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2814 - accuracy: 0.7268 - val_loss: 1.1367 - val_accuracy: 0.6355

```
accuracy: 0.6449
Epoch 212/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3509 - accuracy: 0.7268 - val_loss: 1.1409 - val_accuracy: 0.6495
Epoch 213/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2617 - accuracy: 0.7036 - val_loss: 1.1005 - val_accuracy: 0.6682
Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2901 - accuracy: 0.7191 - val_loss: 1.1559 - val_accuracy: 0.6636
Epoch 215/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2749 - accuracy: 0.7526 - val_loss: 1.1830 - val_accuracy: 0.6449
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2383 - accuracy: 0.6675 - val_loss: 1.1691 - val_accuracy: 0.6636
Epoch 217/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2409 - accuracy: 0.6856 - val_loss: 1.0920 - val_accuracy: 0.6729
Epoch 218/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2198 - accuracy: 0.6933 - val_loss: 1.1152 - val_accuracy: 0.6636
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3110 - accuracy: 0.7113 - val_loss: 1.0819 - val_accuracy: 0.6542
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2803 - accuracy: 0.6881 - val_loss: 1.0808 - val_accuracy: 0.6589
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2974 - accuracy: 0.6881 - val_loss: 1.0826 - val_accuracy: 0.6636
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4055 - accuracy: 0.7088 - val_loss: 1.0226 - val_accuracy: 0.6682
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3468 - accuracy: 0.7036 - val_loss: 1.0761 - val_accuracy: 0.6542
Epoch 224/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2110 - accuracy: 0.6753 - val_loss: 1.0776 - val_accuracy: 0.6542
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2396 - accuracy: 0.7036 - val_loss: 1.1366 - val_accuracy: 0.6542
Epoch 226/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2773 - accuracy: 0.7062 - val_loss: 1.1122 - val_accuracy: 0.6542
Epoch 227/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2457 - accuracy: 0.7423 - val_loss: 1.1464 - val_accuracy: 0.6682
Epoch 228/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3019 - accuracy: 0.7474 - val_loss: 1.1449 - val_accuracy: 0.6636
Epoch 229/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3708 - accuracy: 0.6985 - val_loss: 1.1156 - val_accuracy: 0.6869
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2972 - accuracy: 0.7448 - val_loss: 1.0770 - val_accuracy: 0.6963
Epoch 231/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2867 - accuracy: 0.7784 - val_loss: 1.0979 - val_accuracy: 0.6776
Epoch 232/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2222 - accuracy: 0.7139 - val_loss: 1.0925 - val_accuracy: 0.6822
Epoch 233/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2784 - accuracy: 0.6727 - val_loss: 1.0828 - val_accuracy: 0.6916
Epoch 234/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2333 - accuracy: 0.7242 - val_loss: 1.0778 - val_accuracy: 0.6729
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2821 - accuracy: 0.7113 - val_loss: 1.1101 - val_accuracy: 0.6869
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2514 - accuracy: 0.7552 - val_loss: 1.1087 - val_accuracy: 0.6776
Epoch 237/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2667 - accuracy: 0.7500 - val_loss: 1.1105 - val_accuracy: 0.6542
Epoch 238/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2644 - accuracy: 0.7500 - val_loss: 1.1365 - val_accuracy: 0.6682
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2126 - accuracy: 0.7500 - val_loss: 1.0768 - val_accuracy: 0.6776
Epoch 240/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2396 - accuracy: 0.7242 - val_loss: 1.1017 - val_accuracy: 0.6636
Epoch 241/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.2045 - accuracy: 0.7268 - val_loss: 1.1047 - val_accuracy: 0.6636
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2567 - accuracy: 0.7294 - val_loss: 1.0366 - val_accuracy: 0.6542
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2888 - accuracy: 0.7345 - val_loss: 1.0660 - val_accuracy: 0.6495
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2974 - accuracy: 0.7500 - val_loss: 1.0127 - val_accuracy: 0.6682
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2807 - accuracy: 0.7423 - val_loss: 1.0163 - val_accuracy: 0.6542
Epoch 246/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2135 - accuracy: 0.7603 - val_loss: 1.0771 - val_accuracy: 0.6636
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2616 - accuracy: 0.7397 - val_loss: 1.1284 - val_accuracy: 0.6869
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2187 - accuracy: 0.7706 - val_loss: 1.1530 - val_accuracy: 0.6869
Epoch 249/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2146 - accuracy: 0.7500 - val_loss: 1.1294 - val_accuracy: 0.6589
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2990 - accuracy: 0.7320 - val_loss: 1.1657 - val_accuracy: 0.6636
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2437 - accuracy: 0.7603 - val_loss: 1.2448 - val_accuracy: 0.6542
Epoch 252/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2019 - accuracy: 0.7680 - val_loss: 1.1950 - val_accuracy: 0.6963
Epoch 253/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2829 - accuracy: 0.7552 - val_loss: 1.1365 - val_accuracy: 0.6869
Epoch 254/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3303 - accuracy: 0.7758 - val_loss: 1.2395 - val_accuracy: 0.6636
Epoch 255/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1971 - accuracy: 0.7732 - val_loss: 1.2080 - val_accuracy: 0.6589
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2789 - accuracy: 0.7552 - val_loss: 1.1915 - val_accuracy: 0.6589
Epoch 257/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2434 - accuracy: 0.7371 - val_loss: 1.2405 - val_accuracy: 0.6449
Epoch 258/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2761 - accuracy: 0.7655 - val_loss: 1.2584 - val_accuracy: 0.6495
Epoch 259/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2364 - accuracy: 0.7655 - val_loss: 1.2631 - val_accuracy: 0.6589
Epoch 260/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2063 - accuracy: 0.7758 - val_loss: 1.0641 - val_accuracy: 0.6542
Epoch 261/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3056 - accuracy: 0.7809 - val_loss: 1.1736 - val_accuracy: 0.6449
Epoch 262/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2171 - accuracy: 0.6959 - val_loss: 1.1031 - val_accuracy: 0.6542
Epoch 263/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2132 - accuracy: 0.7088 - val_loss: 1.0681 - val_accuracy: 0.6449
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2906 - accuracy: 0.6959 - val_loss: 1.0082 - val_accuracy: 0.6402
Epoch 265/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2183 - accuracy: 0.6959 - val_loss: 1.0324 - val_accuracy: 0.6449
Epoch 266/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2295 - accuracy: 0.6856 - val_loss: 0.9818 - val_accuracy: 0.6636
Epoch 267/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1944 - accuracy: 0.6727 - val_loss: 1.0039 - val_accuracy: 0.6542
Epoch 268/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2092 - accuracy: 0.7062 - val_loss: 1.0411 - val_accuracy: 0.6542
Epoch 269/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1893 - accuracy: 0.6778 - val_loss: 1.0403 - val_accuracy: 0.6589
Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2326 - accuracy: 0.7191 - val_loss: 1.0040 - val_accuracy: 0.6636
```

Epoch 271/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1927 - accuracy: 0.6907 - val_loss: 1.0111 - val_accuracy: 0.6682
Epoch 272/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2764 - accuracy: 0.7062 - val_loss: 0.9992 - val_accuracy: 0.6495
Epoch 273/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1998 - accuracy: 0.6933 - val_loss: 1.1072 - val_accuracy: 0.6589
Epoch 274/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2322 - accuracy: 0.7139 - val_loss: 1.2929 - val_accuracy: 0.7009
Epoch 275/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2095 - accuracy: 0.7320 - val_loss: 1.2362 - val_accuracy: 0.6822
Epoch 276/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2018 - accuracy: 0.7242 - val_loss: 1.3006 - val_accuracy: 0.6869
Epoch 277/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2052 - accuracy: 0.7242 - val_loss: 1.2522 - val_accuracy: 0.7056
Epoch 278/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1926 - accuracy: 0.7062 - val_loss: 1.3328 - val_accuracy: 0.6776
Epoch 279/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1814 - accuracy: 0.7448 - val_loss: 1.4225 - val_accuracy: 0.6729
Epoch 280/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2380 - accuracy: 0.7268 - val_loss: 1.3267 - val_accuracy: 0.6776
Epoch 281/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3114 - accuracy: 0.6959 - val_loss: 1.3213 - val_accuracy: 0.6495
Epoch 282/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3246 - accuracy: 0.6830 - val_loss: 1.4238 - val_accuracy: 0.6495
Epoch 283/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3240 - accuracy: 0.7242 - val_loss: 1.3938 - val_accuracy: 0.6822
Epoch 284/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3075 - accuracy: 0.7732 - val_loss: 1.4861 - val_accuracy: 0.6589
Epoch 285/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2499 - accuracy: 0.7242 - val_loss: 1.3114 - val_accuracy: 0.6636
Epoch 286/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2227 - accuracy: 0.7062 - val_loss: 1.2980 - val_accuracy: 0.6729
Epoch 287/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2860 - accuracy: 0.7165 - val_loss: 1.0368 - val_accuracy: 0.6822
Epoch 288/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3515 - accuracy: 0.7655 - val_loss: 1.1002 - val_accuracy: 0.6822
Epoch 289/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2979 - accuracy: 0.7577 - val_loss: 1.1106 - val_accuracy: 0.6916
Epoch 290/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1704 - accuracy: 0.7655 - val_loss: 1.1142 - val_accuracy: 0.6869
Epoch 291/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3131 - accuracy: 0.7629 - val_loss: 1.2402 - val_accuracy: 0.6729
Epoch 292/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3601 - accuracy: 0.7113 - val_loss: 1.2901 - val_accuracy: 0.6636
Epoch 293/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2726 - accuracy: 0.6804 - val_loss: 1.2623 - val_accuracy: 0.6776
Epoch 294/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2397 - accuracy: 0.7758 - val_loss: 1.2648 - val_accuracy: 0.6869
Epoch 295/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2153 - accuracy: 0.7655 - val_loss: 1.3335 - val_accuracy: 0.6776
Epoch 296/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3029 - accuracy: 0.7552 - val_loss: 1.3014 - val_accuracy: 0.6916
Epoch 297/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2645 - accuracy: 0.7603 - val_loss: 1.2746 - val_accuracy: 0.6916
Epoch 298/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2126 - accuracy: 0.7320 - val_loss: 1.1575 - val_accuracy: 0.6729
Epoch 299/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2012 - accuracy: 0.7526 - val_loss: 1.0931 - val_accuracy: 0.6822
Epoch 300/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1835 - accuracy: 0.7371 - val_loss: 1.0976 - val_accuracy: 0.6822

```

accuracy: 0.6682
Epoch 301/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2377 - accuracy: 0.7629 - val_loss: 1.1480 - val_accuracy: 0.6355
Epoch 302/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2038 - accuracy: 0.6546 - val_loss: 1.2035 - val_accuracy: 0.6402
Epoch 303/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3393 - accuracy: 0.6675 - val_loss: 1.2404 - val_accuracy: 0.6636
Epoch 304/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2600 - accuracy: 0.6675 - val_loss: 1.1164 - val_accuracy: 0.6449
Epoch 305/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1916 - accuracy: 0.6804 - val_loss: 1.0979 - val_accuracy: 0.6495
Epoch 306/1000
1/4 [====>.....] - ETA: 0s - loss: 0.1329 - accuracy: 0.7031Restoring model weights from th
e end of the best epoch: 156.
4/4 [=====] - 0s 15ms/step - loss: 0.1720 - accuracy: 0.6804 - val_loss: 1.1184 - val_accuracy: 0.6589
Epoch 306: early stopping
2/2 [=====] - 0s 5ms/step - loss: 1.7075 - accuracy: 0.8182
[CV] END .....Dense1=50, Dense2=50; total time= 16.2s
Model: "sequential_60"

```

Layer (type)	Output Shape	Param #
dense_240 (Dense)	(None, 50)	350
batch_normalization_180 (BatchNormalization)	(None, 50)	200
activation_180 (Activation)	(None, 50)	0
dense_241 (Dense)	(None, 50)	2550
batch_normalization_181 (BatchNormalization)	(None, 50)	200
activation_181 (Activation)	(None, 50)	0
dense_242 (Dense)	(None, 10)	510
batch_normalization_182 (BatchNormalization)	(None, 10)	40
activation_182 (Activation)	(None, 10)	0
dense_243 (Dense)	(None, 2)	22

Total params: 3,872
Trainable params: 3,652
Non-trainable params: 220

```

Epoch 1/1000
4/4 [=====] - 1s 58ms/step - loss: 5.4149 - accuracy: 0.6160 - val_loss: 5.0341 - val_accuracy: 0.6308
Epoch 2/1000
4/4 [=====] - 0s 15ms/step - loss: 4.8392 - accuracy: 0.6314 - val_loss: 3.6152 - val_accuracy: 0.6028
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 4.2823 - accuracy: 0.5851 - val_loss: 3.3041 - val_accuracy: 0.6262
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 4.1402 - accuracy: 0.6186 - val_loss: 3.0898 - val_accuracy: 0.6121
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9753 - accuracy: 0.5876 - val_loss: 2.8433 - val_accuracy: 0.6028
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 3.9907 - accuracy: 0.5979 - val_loss: 2.8190 - val_accuracy: 0.6075
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7097 - accuracy: 0.5954 - val_loss: 2.7029 - val_accuracy: 0.5794
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 3.6067 - accuracy: 0.5979 - val_loss: 2.6199 - val_accuracy: 0.5421
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 3.6771 - accuracy: 0.6031 - val_loss: 2.5447 - val_accuracy: 0.4766
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4742 - accuracy: 0.5902 - val_loss: 2.3759 - val_accuracy: 0.4533
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 3.3409 - accuracy: 0.5747 - val_loss: 2.2893 - val_accuracy: 0.4346

```

Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1620 - accuracy: 0.5644 - val_loss: 2.2166 - val_accuracy: 0.4206
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1071 - accuracy: 0.5876 - val_loss: 2.1252 - val_accuracy: 0.4252
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0925 - accuracy: 0.5515 - val_loss: 2.0775 - val_accuracy: 0.3879
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0153 - accuracy: 0.5309 - val_loss: 2.0536 - val_accuracy: 0.3925
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1171 - accuracy: 0.5747 - val_loss: 2.0183 - val_accuracy: 0.3832
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0288 - accuracy: 0.5515 - val_loss: 1.9902 - val_accuracy: 0.4159
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1316 - accuracy: 0.5438 - val_loss: 1.9739 - val_accuracy: 0.4159
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8499 - accuracy: 0.5438 - val_loss: 1.9907 - val_accuracy: 0.3738
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8482 - accuracy: 0.5515 - val_loss: 1.9754 - val_accuracy: 0.3037
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7328 - accuracy: 0.5129 - val_loss: 1.9336 - val_accuracy: 0.3084
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7398 - accuracy: 0.5026 - val_loss: 1.9158 - val_accuracy: 0.3084
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7519 - accuracy: 0.5129 - val_loss: 1.8820 - val_accuracy: 0.4486
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5849 - accuracy: 0.5515 - val_loss: 1.8653 - val_accuracy: 0.3131
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7734 - accuracy: 0.4871 - val_loss: 1.8503 - val_accuracy: 0.2944
Epoch 26/1000
4/4 [=====] - 0s 15ms/step - loss: 2.7128 - accuracy: 0.5103 - val_loss: 1.8626 - val_accuracy: 0.3271
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5042 - accuracy: 0.5206 - val_loss: 1.8065 - val_accuracy: 0.4579
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7060 - accuracy: 0.5567 - val_loss: 1.8179 - val_accuracy: 0.3178
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5453 - accuracy: 0.5000 - val_loss: 1.8270 - val_accuracy: 0.3131
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5235 - accuracy: 0.4923 - val_loss: 1.8000 - val_accuracy: 0.3037
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3924 - accuracy: 0.4974 - val_loss: 1.7880 - val_accuracy: 0.3037
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3940 - accuracy: 0.4691 - val_loss: 1.7655 - val_accuracy: 0.3178
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3744 - accuracy: 0.4923 - val_loss: 1.7393 - val_accuracy: 0.2710
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3612 - accuracy: 0.4665 - val_loss: 1.7200 - val_accuracy: 0.2991
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2688 - accuracy: 0.4536 - val_loss: 1.7103 - val_accuracy: 0.3084
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1230 - accuracy: 0.4485 - val_loss: 1.6979 - val_accuracy: 0.3178
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2318 - accuracy: 0.4742 - val_loss: 1.6784 - val_accuracy: 0.3084
Epoch 38/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1510 - accuracy: 0.4536 - val_loss: 1.6673 - val_accuracy: 0.2991
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1060 - accuracy: 0.4381 - val_loss: 1.6449 - val_accuracy: 0.3037
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0348 - accuracy: 0.4356 - val_loss: 1.6282 - val_accuracy: 0.2804
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0232 - accuracy: 0.4201 - val_loss: 1.6139 - val_accuracy: 0.2804

```
accuracy: 0.2804
Epoch 42/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7763 - accuracy: 0.4459 - val_loss: 1.5956 - val_accuracy: 0.2804
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8853 - accuracy: 0.4175 - val_loss: 1.5869 - val_accuracy: 0.3037
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6528 - accuracy: 0.3866 - val_loss: 1.5677 - val_accuracy: 0.2991
Epoch 45/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6105 - accuracy: 0.4201 - val_loss: 1.5575 - val_accuracy: 0.2991
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4896 - accuracy: 0.4072 - val_loss: 1.5287 - val_accuracy: 0.3037
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6116 - accuracy: 0.4046 - val_loss: 1.5195 - val_accuracy: 0.3131
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6220 - accuracy: 0.4098 - val_loss: 1.5321 - val_accuracy: 0.3084
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5005 - accuracy: 0.4098 - val_loss: 1.5069 - val_accuracy: 0.2991
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3983 - accuracy: 0.4175 - val_loss: 1.4958 - val_accuracy: 0.2850
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2869 - accuracy: 0.4227 - val_loss: 1.4802 - val_accuracy: 0.3037
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2722 - accuracy: 0.4175 - val_loss: 1.4555 - val_accuracy: 0.2850
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2272 - accuracy: 0.4098 - val_loss: 1.4382 - val_accuracy: 0.2850
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2588 - accuracy: 0.3918 - val_loss: 1.4120 - val_accuracy: 0.2944
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3103 - accuracy: 0.3789 - val_loss: 1.3993 - val_accuracy: 0.2991
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1535 - accuracy: 0.3918 - val_loss: 1.4151 - val_accuracy: 0.2897
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0631 - accuracy: 0.4149 - val_loss: 1.3909 - val_accuracy: 0.4673
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0767 - accuracy: 0.4742 - val_loss: 1.3534 - val_accuracy: 0.4579
Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1406 - accuracy: 0.5026 - val_loss: 1.3797 - val_accuracy: 0.4486
Epoch 60/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0550 - accuracy: 0.4536 - val_loss: 1.3650 - val_accuracy: 0.3131
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0172 - accuracy: 0.4046 - val_loss: 1.3544 - val_accuracy: 0.3178
Epoch 62/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0572 - accuracy: 0.4021 - val_loss: 1.3531 - val_accuracy: 0.3224
Epoch 63/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9444 - accuracy: 0.3711 - val_loss: 1.3398 - val_accuracy: 0.3271
Epoch 64/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9995 - accuracy: 0.3531 - val_loss: 1.3251 - val_accuracy: 0.3364
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0128 - accuracy: 0.3814 - val_loss: 1.3154 - val_accuracy: 0.3318
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9682 - accuracy: 0.4021 - val_loss: 1.3080 - val_accuracy: 0.3224
Epoch 67/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9215 - accuracy: 0.3969 - val_loss: 1.3012 - val_accuracy: 0.3271
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9778 - accuracy: 0.3866 - val_loss: 1.2920 - val_accuracy: 0.3411
Epoch 69/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9988 - accuracy: 0.4175 - val_loss: 1.2846 - val_accuracy: 0.3318
Epoch 70/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9036 - accuracy: 0.3892 - val_loss: 1.2387 - val_accuracy: 0.3505
Epoch 71/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 1.0481 - accuracy: 0.4201 - val_loss: 1.1943 - val_accuracy: 0.3598
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8842 - accuracy: 0.3737 - val_loss: 1.1874 - val_accuracy: 0.3738
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9201 - accuracy: 0.3918 - val_loss: 1.1718 - val_accuracy: 0.3785
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9177 - accuracy: 0.3943 - val_loss: 1.1348 - val_accuracy: 0.3738
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8586 - accuracy: 0.3892 - val_loss: 1.1160 - val_accuracy: 0.3692
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7854 - accuracy: 0.3969 - val_loss: 1.0459 - val_accuracy: 0.3645
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9336 - accuracy: 0.4021 - val_loss: 1.0319 - val_accuracy: 0.3598
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8053 - accuracy: 0.4175 - val_loss: 1.0452 - val_accuracy: 0.3598
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8421 - accuracy: 0.3918 - val_loss: 1.0473 - val_accuracy: 0.3692
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8881 - accuracy: 0.3892 - val_loss: 1.0532 - val_accuracy: 0.3645
Epoch 81/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8225 - accuracy: 0.4021 - val_loss: 1.0504 - val_accuracy: 0.3645
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7622 - accuracy: 0.4124 - val_loss: 1.0114 - val_accuracy: 0.3738
Epoch 83/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7992 - accuracy: 0.3892 - val_loss: 0.9773 - val_accuracy: 0.3645
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9326 - accuracy: 0.4021 - val_loss: 0.9643 - val_accuracy: 0.3738
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8932 - accuracy: 0.4046 - val_loss: 0.9892 - val_accuracy: 0.3879
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7654 - accuracy: 0.3969 - val_loss: 0.9670 - val_accuracy: 0.3832
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7630 - accuracy: 0.3943 - val_loss: 0.9198 - val_accuracy: 0.3692
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7847 - accuracy: 0.4098 - val_loss: 0.9231 - val_accuracy: 0.3738
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7911 - accuracy: 0.4356 - val_loss: 0.9234 - val_accuracy: 0.3832
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7059 - accuracy: 0.4124 - val_loss: 0.9161 - val_accuracy: 0.4065
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7153 - accuracy: 0.4253 - val_loss: 0.9106 - val_accuracy: 0.4112
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7292 - accuracy: 0.4201 - val_loss: 0.9065 - val_accuracy: 0.4112
Epoch 93/1000
4/4 [=====] - 0s 21ms/step - loss: 0.8160 - accuracy: 0.4562 - val_loss: 0.8782 - val_accuracy: 0.3925
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7861 - accuracy: 0.4227 - val_loss: 0.8737 - val_accuracy: 0.3879
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6914 - accuracy: 0.3969 - val_loss: 0.9238 - val_accuracy: 0.3972
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6860 - accuracy: 0.4098 - val_loss: 0.9084 - val_accuracy: 0.4019
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6686 - accuracy: 0.4278 - val_loss: 0.9005 - val_accuracy: 0.4065
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7062 - accuracy: 0.4124 - val_loss: 0.8882 - val_accuracy: 0.3972
Epoch 99/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7430 - accuracy: 0.3814 - val_loss: 0.8747 - val_accuracy: 0.4065
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6489 - accuracy: 0.4227 - val_loss: 0.8218 - val_accuracy: 0.4159
```

Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6582 - accuracy: 0.4330 - val_loss: 0.8229 - val_accuracy: 0.4252
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6822 - accuracy: 0.4381 - val_loss: 0.7342 - val_accuracy: 0.4159
Epoch 103/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7168 - accuracy: 0.4175 - val_loss: 0.6930 - val_accuracy: 0.4112
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6413 - accuracy: 0.4201 - val_loss: 0.7059 - val_accuracy: 0.4112
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5617 - accuracy: 0.4201 - val_loss: 0.6751 - val_accuracy: 0.4299
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5788 - accuracy: 0.4046 - val_loss: 0.7142 - val_accuracy: 0.4346
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5755 - accuracy: 0.3995 - val_loss: 0.7333 - val_accuracy: 0.4393
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5244 - accuracy: 0.4149 - val_loss: 0.7255 - val_accuracy: 0.4579
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5919 - accuracy: 0.4330 - val_loss: 0.7193 - val_accuracy: 0.4486
Epoch 110/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5387 - accuracy: 0.4149 - val_loss: 0.7093 - val_accuracy: 0.4579
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5526 - accuracy: 0.4175 - val_loss: 0.7043 - val_accuracy: 0.4626
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5275 - accuracy: 0.4124 - val_loss: 0.7364 - val_accuracy: 0.4579
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5943 - accuracy: 0.4253 - val_loss: 0.7574 - val_accuracy: 0.4766
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5447 - accuracy: 0.4356 - val_loss: 0.7566 - val_accuracy: 0.4860
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6122 - accuracy: 0.4098 - val_loss: 0.7214 - val_accuracy: 0.4860
Epoch 116/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5037 - accuracy: 0.4175 - val_loss: 0.7768 - val_accuracy: 0.4813
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5111 - accuracy: 0.4330 - val_loss: 0.7428 - val_accuracy: 0.4907
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5611 - accuracy: 0.4304 - val_loss: 0.7436 - val_accuracy: 0.4953
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5482 - accuracy: 0.4407 - val_loss: 0.7114 - val_accuracy: 0.5047
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5286 - accuracy: 0.4201 - val_loss: 0.7053 - val_accuracy: 0.4953
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5928 - accuracy: 0.4098 - val_loss: 0.7045 - val_accuracy: 0.4813
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4643 - accuracy: 0.4278 - val_loss: 0.7260 - val_accuracy: 0.4860
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4492 - accuracy: 0.4072 - val_loss: 0.7777 - val_accuracy: 0.4907
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5059 - accuracy: 0.4253 - val_loss: 0.7877 - val_accuracy: 0.5234
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4909 - accuracy: 0.4175 - val_loss: 0.7869 - val_accuracy: 0.5467
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4542 - accuracy: 0.4330 - val_loss: 0.8994 - val_accuracy: 0.5234
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4393 - accuracy: 0.4665 - val_loss: 0.8762 - val_accuracy: 0.5280
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4404 - accuracy: 0.4716 - val_loss: 0.8421 - val_accuracy: 0.5234
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4402 - accuracy: 0.4046 - val_loss: 0.8119 - val_accuracy: 0.5327
Epoch 130/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4754 - accuracy: 0.4149 - val_loss: 0.8433 - val_accuracy: 0.5327

accuracy: 0.5140
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4443 - accuracy: 0.4330 - val_loss: 0.8427 - val_accuracy: 0.5327
Epoch 132/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4746 - accuracy: 0.4278 - val_loss: 0.8770 - val_accuracy: 0.5467
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5207 - accuracy: 0.4381 - val_loss: 0.8271 - val_accuracy: 0.5327
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4436 - accuracy: 0.4278 - val_loss: 0.8270 - val_accuracy: 0.5327
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4337 - accuracy: 0.4124 - val_loss: 0.7476 - val_accuracy: 0.5467
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4126 - accuracy: 0.4253 - val_loss: 0.7358 - val_accuracy: 0.5607
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4892 - accuracy: 0.4304 - val_loss: 0.7358 - val_accuracy: 0.5794
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4959 - accuracy: 0.3943 - val_loss: 0.7376 - val_accuracy: 0.6121
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4070 - accuracy: 0.4381 - val_loss: 0.7271 - val_accuracy: 0.6168
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3902 - accuracy: 0.4124 - val_loss: 0.6953 - val_accuracy: 0.6262
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4667 - accuracy: 0.4227 - val_loss: 0.6987 - val_accuracy: 0.6215
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4317 - accuracy: 0.4227 - val_loss: 0.7292 - val_accuracy: 0.6215
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4009 - accuracy: 0.4149 - val_loss: 0.7335 - val_accuracy: 0.5981
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4128 - accuracy: 0.4356 - val_loss: 0.7357 - val_accuracy: 0.5981
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4268 - accuracy: 0.4536 - val_loss: 0.7604 - val_accuracy: 0.5794
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4168 - accuracy: 0.4149 - val_loss: 0.7340 - val_accuracy: 0.5701
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3876 - accuracy: 0.3969 - val_loss: 0.7354 - val_accuracy: 0.5654
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4327 - accuracy: 0.3943 - val_loss: 0.7364 - val_accuracy: 0.5701
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4357 - accuracy: 0.4046 - val_loss: 0.7341 - val_accuracy: 0.5374
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4762 - accuracy: 0.4175 - val_loss: 0.7574 - val_accuracy: 0.5561
Epoch 151/1000
1/4 [====>.....] - ETA: 0s - loss: 0.4732 - accuracy: 0.3672Restoring model weights from the end of the best epoch: 1.
4/4 [=====] - 0s 14ms/step - loss: 0.4176 - accuracy: 0.4149 - val_loss: 0.7633 - val_accuracy: 0.5654
Epoch 151: early stopping
2/2 [=====] - 0s 5ms/step - loss: 4.0094 - accuracy: 0.5000
[CV] ENDDense1=50, Dense2=50; total time= 8.6s
Model: "sequential_61"

Layer (type)	Output Shape	Param #
dense_244 (Dense)	(None, 50)	350
batch_normalization_183 (BatchNormalization)	(None, 50)	200
activation_183 (Activation)	(None, 50)	0
dense_245 (Dense)	(None, 50)	2550
batch_normalization_184 (BatchNormalization)	(None, 50)	200
activation_184 (Activation)	(None, 50)	0
dense_246 (Dense)	(None, 10)	510

```
batch_normalization_185 (BatchNormalization)        40
activation_185 (Activation)      (None, 10)          0
dense_247 (Dense)              (None, 2)             22
```

```
=====
Total params: 3,872
Trainable params: 3,652
Non-trainable params: 220
```

```
Epoch 1/1000
4/4 [=====] - 1s 55ms/step - loss: 5.5783 - accuracy: 0.5450 - val_loss: 3.6625 - val_accuracy: 0.5140
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 4.1447 - accuracy: 0.6118 - val_loss: 3.1259 - val_accuracy: 0.5607
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5517 - accuracy: 0.5861 - val_loss: 2.7255 - val_accuracy: 0.5841
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2560 - accuracy: 0.6324 - val_loss: 2.3825 - val_accuracy: 0.5794
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0408 - accuracy: 0.6221 - val_loss: 2.2549 - val_accuracy: 0.5841
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8850 - accuracy: 0.6041 - val_loss: 2.3036 - val_accuracy: 0.5421
Epoch 7/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8088 - accuracy: 0.6170 - val_loss: 2.2212 - val_accuracy: 0.5607
Epoch 8/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6232 - accuracy: 0.6324 - val_loss: 2.2094 - val_accuracy: 0.5561
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3057 - accuracy: 0.6350 - val_loss: 2.0097 - val_accuracy: 0.6308
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2121 - accuracy: 0.6324 - val_loss: 1.9014 - val_accuracy: 0.6168
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2008 - accuracy: 0.6401 - val_loss: 1.8214 - val_accuracy: 0.6402
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8967 - accuracy: 0.6684 - val_loss: 1.7755 - val_accuracy: 0.6308
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8457 - accuracy: 0.6555 - val_loss: 1.7230 - val_accuracy: 0.6542
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6621 - accuracy: 0.6889 - val_loss: 1.6403 - val_accuracy: 0.6822
Epoch 15/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4882 - accuracy: 0.6812 - val_loss: 1.6294 - val_accuracy: 0.6822
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5660 - accuracy: 0.6658 - val_loss: 1.4655 - val_accuracy: 0.7196
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5436 - accuracy: 0.6684 - val_loss: 1.4312 - val_accuracy: 0.7056
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3665 - accuracy: 0.6401 - val_loss: 1.3853 - val_accuracy: 0.7290
Epoch 19/1000
4/4 [=====] - 0s 11ms/step - loss: 1.3819 - accuracy: 0.6581 - val_loss: 1.4068 - val_accuracy: 0.7243
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3042 - accuracy: 0.6889 - val_loss: 1.3824 - val_accuracy: 0.7290
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1390 - accuracy: 0.6787 - val_loss: 1.3417 - val_accuracy: 0.7243
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9008 - accuracy: 0.6632 - val_loss: 1.2985 - val_accuracy: 0.7290
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1062 - accuracy: 0.6967 - val_loss: 1.2806 - val_accuracy: 0.7290
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0241 - accuracy: 0.7018 - val_loss: 1.2197 - val_accuracy: 0.7336
Epoch 25/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8478 - accuracy: 0.7069 - val_loss: 1.2013 - val_accuracy: 0.7477
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8990 - accuracy: 0.7095 - val_loss: 1.1741 - val_accuracy: 0.7477
```

```
accuracy: 0.7196
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7066 - accuracy: 0.7121 - val_loss: 1.1595 - val_
accuracy: 0.7196
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8291 - accuracy: 0.7018 - val_loss: 1.1485 - val_
accuracy: 0.7056
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7531 - accuracy: 0.7275 - val_loss: 1.1163 - val_
accuracy: 0.7103
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6985 - accuracy: 0.7352 - val_loss: 1.0997 - val_
accuracy: 0.7056
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7582 - accuracy: 0.7224 - val_loss: 1.0835 - val_
accuracy: 0.6869
Epoch 32/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7341 - accuracy: 0.7147 - val_loss: 1.0804 - val_
accuracy: 0.6822
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6748 - accuracy: 0.7378 - val_loss: 1.0658 - val_
accuracy: 0.6869
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6512 - accuracy: 0.7352 - val_loss: 1.0377 - val_
accuracy: 0.6776
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6512 - accuracy: 0.7301 - val_loss: 1.0249 - val_
accuracy: 0.6822
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5687 - accuracy: 0.7326 - val_loss: 1.0052 - val_
accuracy: 0.6776
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6554 - accuracy: 0.7044 - val_loss: 0.9769 - val_
accuracy: 0.6776
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6294 - accuracy: 0.7429 - val_loss: 0.9729 - val_
accuracy: 0.6963
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5829 - accuracy: 0.7249 - val_loss: 0.9510 - val_
accuracy: 0.7056
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4962 - accuracy: 0.7326 - val_loss: 0.9051 - val_
accuracy: 0.7103
Epoch 41/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5964 - accuracy: 0.7095 - val_loss: 0.9184 - val_
accuracy: 0.7056
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5646 - accuracy: 0.7121 - val_loss: 0.8903 - val_
accuracy: 0.7056
Epoch 43/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5558 - accuracy: 0.7044 - val_loss: 0.8794 - val_
accuracy: 0.7009
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5302 - accuracy: 0.7172 - val_loss: 0.9053 - val_
accuracy: 0.6822
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4778 - accuracy: 0.7198 - val_loss: 0.8887 - val_
accuracy: 0.6963
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5654 - accuracy: 0.7455 - val_loss: 0.8669 - val_
accuracy: 0.7243
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4812 - accuracy: 0.7429 - val_loss: 0.8553 - val_
accuracy: 0.7056
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5699 - accuracy: 0.7404 - val_loss: 0.8547 - val_
accuracy: 0.7196
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5414 - accuracy: 0.7224 - val_loss: 0.8036 - val_
accuracy: 0.7290
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5485 - accuracy: 0.7147 - val_loss: 0.7944 - val_
accuracy: 0.7336
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5095 - accuracy: 0.7224 - val_loss: 0.7882 - val_
accuracy: 0.7150
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5365 - accuracy: 0.7275 - val_loss: 0.7725 - val_
accuracy: 0.7056
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4788 - accuracy: 0.7301 - val_loss: 0.7589 - val_
accuracy: 0.7056
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5523 - accuracy: 0.7147 - val_loss: 0.7418 - val_
accuracy: 0.7150
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4849 - accuracy: 0.7147 - val_loss: 0.7271 - val_
accuracy: 0.7056
Epoch 56/1000
```

4/4 [=====] - 0s 12ms/step - loss: 0.4905 - accuracy: 0.7301 - val_loss: 0.7175 - val_accuracy: 0.7056
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4962 - accuracy: 0.7275 - val_loss: 0.7250 - val_accuracy: 0.7056
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4726 - accuracy: 0.7198 - val_loss: 0.6863 - val_accuracy: 0.7196
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5528 - accuracy: 0.7352 - val_loss: 0.6862 - val_accuracy: 0.7150
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4925 - accuracy: 0.7763 - val_loss: 0.6659 - val_accuracy: 0.7009
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5433 - accuracy: 0.7635 - val_loss: 0.6158 - val_accuracy: 0.7243
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5280 - accuracy: 0.7609 - val_loss: 0.6035 - val_accuracy: 0.7290
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4333 - accuracy: 0.7558 - val_loss: 0.6054 - val_accuracy: 0.7290
Epoch 64/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5365 - accuracy: 0.7661 - val_loss: 0.5880 - val_accuracy: 0.7196
Epoch 65/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5041 - accuracy: 0.7866 - val_loss: 0.6189 - val_accuracy: 0.7150
Epoch 66/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5036 - accuracy: 0.7609 - val_loss: 0.5952 - val_accuracy: 0.7196
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5344 - accuracy: 0.7841 - val_loss: 0.6120 - val_accuracy: 0.7009
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5081 - accuracy: 0.7712 - val_loss: 0.6036 - val_accuracy: 0.6869
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4355 - accuracy: 0.7404 - val_loss: 0.5941 - val_accuracy: 0.6963
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4115 - accuracy: 0.7763 - val_loss: 0.5929 - val_accuracy: 0.6963
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4321 - accuracy: 0.7506 - val_loss: 0.5880 - val_accuracy: 0.7056
Epoch 72/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4068 - accuracy: 0.7738 - val_loss: 0.5875 - val_accuracy: 0.6355
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4165 - accuracy: 0.6658 - val_loss: 0.6339 - val_accuracy: 0.6355
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4104 - accuracy: 0.6632 - val_loss: 0.6530 - val_accuracy: 0.6729
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5277 - accuracy: 0.6992 - val_loss: 0.6468 - val_accuracy: 0.6776
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4883 - accuracy: 0.6941 - val_loss: 0.6529 - val_accuracy: 0.6682
Epoch 77/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3769 - accuracy: 0.7018 - val_loss: 0.6415 - val_accuracy: 0.6776
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4941 - accuracy: 0.6889 - val_loss: 0.7102 - val_accuracy: 0.6729
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4836 - accuracy: 0.7044 - val_loss: 0.7082 - val_accuracy: 0.7196
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3751 - accuracy: 0.7686 - val_loss: 0.7050 - val_accuracy: 0.7243
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4109 - accuracy: 0.7789 - val_loss: 0.7066 - val_accuracy: 0.6636
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4548 - accuracy: 0.6967 - val_loss: 0.6946 - val_accuracy: 0.6589
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4928 - accuracy: 0.7095 - val_loss: 0.7218 - val_accuracy: 0.6495
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4626 - accuracy: 0.7147 - val_loss: 0.6536 - val_accuracy: 0.6495
Epoch 85/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5503 - accuracy: 0.7326 - val_loss: 0.6767 - val_accuracy: 0.6355

Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4178 - accuracy: 0.6941 - val_loss: 0.7251 - val_accuracy: 0.6542
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5037 - accuracy: 0.6812 - val_loss: 0.7273 - val_accuracy: 0.6542
Epoch 88/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3933 - accuracy: 0.7044 - val_loss: 0.7249 - val_accuracy: 0.6589
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4528 - accuracy: 0.6838 - val_loss: 0.7484 - val_accuracy: 0.6589
Epoch 90/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4511 - accuracy: 0.6967 - val_loss: 0.7473 - val_accuracy: 0.6963
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5047 - accuracy: 0.7352 - val_loss: 0.6723 - val_accuracy: 0.6776
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3339 - accuracy: 0.7789 - val_loss: 0.6764 - val_accuracy: 0.6822
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3916 - accuracy: 0.7661 - val_loss: 0.7021 - val_accuracy: 0.6776
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4205 - accuracy: 0.7609 - val_loss: 0.7888 - val_accuracy: 0.6869
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4954 - accuracy: 0.7532 - val_loss: 0.7850 - val_accuracy: 0.6822
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4475 - accuracy: 0.7558 - val_loss: 0.7643 - val_accuracy: 0.6822
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4369 - accuracy: 0.7378 - val_loss: 0.8107 - val_accuracy: 0.6636
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4658 - accuracy: 0.7789 - val_loss: 0.7896 - val_accuracy: 0.6589
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3806 - accuracy: 0.7532 - val_loss: 0.8334 - val_accuracy: 0.6682
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3456 - accuracy: 0.7635 - val_loss: 0.8316 - val_accuracy: 0.6682
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3907 - accuracy: 0.7686 - val_loss: 0.8579 - val_accuracy: 0.6682
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3971 - accuracy: 0.7481 - val_loss: 0.8719 - val_accuracy: 0.6682
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4322 - accuracy: 0.7712 - val_loss: 0.8954 - val_accuracy: 0.5935
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3572 - accuracy: 0.6992 - val_loss: 0.8695 - val_accuracy: 0.5935
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4483 - accuracy: 0.6864 - val_loss: 0.8930 - val_accuracy: 0.6168
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4315 - accuracy: 0.7429 - val_loss: 0.8968 - val_accuracy: 0.6495
Epoch 107/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3570 - accuracy: 0.7686 - val_loss: 0.8822 - val_accuracy: 0.6589
Epoch 108/1000
4/4 [=====] - 0s 17ms/step - loss: 0.3850 - accuracy: 0.7558 - val_loss: 0.8585 - val_accuracy: 0.6542
Epoch 109/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4561 - accuracy: 0.7275 - val_loss: 0.9123 - val_accuracy: 0.6028
Epoch 110/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4690 - accuracy: 0.7326 - val_loss: 0.9180 - val_accuracy: 0.6495
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4340 - accuracy: 0.7558 - val_loss: 0.9102 - val_accuracy: 0.6402
Epoch 112/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3976 - accuracy: 0.7352 - val_loss: 0.9270 - val_accuracy: 0.6402
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4253 - accuracy: 0.7532 - val_loss: 0.9829 - val_accuracy: 0.6729
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4258 - accuracy: 0.7815 - val_loss: 0.9824 - val_accuracy: 0.6495
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4252 - accuracy: 0.7738 - val_loss: 0.9485 - val_accuracy: 0.6495

```
accuracy: 0.6449
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4100 - accuracy: 0.7815 - val_loss: 0.9509 - val_accuracy: 0.6776
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4355 - accuracy: 0.8303 - val_loss: 0.9643 - val_accuracy: 0.6449
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4869 - accuracy: 0.7789 - val_loss: 0.9445 - val_accuracy: 0.6822
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3960 - accuracy: 0.7866 - val_loss: 0.9303 - val_accuracy: 0.7009
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3508 - accuracy: 0.8098 - val_loss: 0.9914 - val_accuracy: 0.6963
Epoch 121/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3825 - accuracy: 0.8149 - val_loss: 1.0305 - val_accuracy: 0.6822
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4819 - accuracy: 0.8021 - val_loss: 1.0009 - val_accuracy: 0.6308
Epoch 123/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4655 - accuracy: 0.7301 - val_loss: 1.0294 - val_accuracy: 0.6262
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4753 - accuracy: 0.7224 - val_loss: 0.9996 - val_accuracy: 0.6682
Epoch 125/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4023 - accuracy: 0.7866 - val_loss: 0.9714 - val_accuracy: 0.6449
Epoch 126/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3698 - accuracy: 0.7404 - val_loss: 0.9393 - val_accuracy: 0.6495
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4009 - accuracy: 0.7326 - val_loss: 0.9520 - val_accuracy: 0.6495
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3513 - accuracy: 0.7686 - val_loss: 0.9476 - val_accuracy: 0.6729
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3211 - accuracy: 0.8072 - val_loss: 0.9471 - val_accuracy: 0.6963
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3898 - accuracy: 0.7918 - val_loss: 0.9407 - val_accuracy: 0.7009
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3207 - accuracy: 0.8046 - val_loss: 0.9670 - val_accuracy: 0.6963
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3444 - accuracy: 0.8021 - val_loss: 0.9389 - val_accuracy: 0.6916
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4683 - accuracy: 0.8252 - val_loss: 0.9637 - val_accuracy: 0.7009
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3269 - accuracy: 0.8201 - val_loss: 0.9647 - val_accuracy: 0.6963
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4327 - accuracy: 0.7995 - val_loss: 0.9692 - val_accuracy: 0.7150
Epoch 136/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4044 - accuracy: 0.8226 - val_loss: 0.9709 - val_accuracy: 0.7150
Epoch 137/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5814 - accuracy: 0.7969 - val_loss: 0.9695 - val_accuracy: 0.7103
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4123 - accuracy: 0.8072 - val_loss: 0.9414 - val_accuracy: 0.7009
Epoch 139/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4012 - accuracy: 0.7686 - val_loss: 0.9406 - val_accuracy: 0.7009
Epoch 140/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3047 - accuracy: 0.7661 - val_loss: 0.9416 - val_accuracy: 0.7056
Epoch 141/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4606 - accuracy: 0.7532 - val_loss: 0.9376 - val_accuracy: 0.7150
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3836 - accuracy: 0.7712 - val_loss: 0.9059 - val_accuracy: 0.7196
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4444 - accuracy: 0.7686 - val_loss: 0.9351 - val_accuracy: 0.7056
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3990 - accuracy: 0.7249 - val_loss: 0.9069 - val_accuracy: 0.7103
Epoch 145/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3637 - accuracy: 0.7661 - val_loss: 0.9295 - val_accuracy: 0.7103
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3710 - accuracy: 0.7738 - val_loss: 0.9032 - val_accuracy: 0.7383
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3166 - accuracy: 0.8355 - val_loss: 0.9034 - val_accuracy: 0.7243
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3474 - accuracy: 0.8123 - val_loss: 0.8988 - val_accuracy: 0.7056
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3546 - accuracy: 0.7455 - val_loss: 0.9310 - val_accuracy: 0.7150
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3506 - accuracy: 0.7301 - val_loss: 0.9320 - val_accuracy: 0.7196
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2950 - accuracy: 0.7738 - val_loss: 0.9583 - val_accuracy: 0.7150
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3713 - accuracy: 0.7481 - val_loss: 0.9363 - val_accuracy: 0.7290
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3697 - accuracy: 0.7532 - val_loss: 0.9320 - val_accuracy: 0.7103
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3335 - accuracy: 0.7326 - val_loss: 0.9402 - val_accuracy: 0.7056
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3424 - accuracy: 0.7635 - val_loss: 0.8900 - val_accuracy: 0.7103
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3265 - accuracy: 0.7532 - val_loss: 0.8962 - val_accuracy: 0.7103
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3481 - accuracy: 0.7584 - val_loss: 0.7960 - val_accuracy: 0.7103
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3289 - accuracy: 0.8329 - val_loss: 0.8700 - val_accuracy: 0.7150
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4343 - accuracy: 0.7789 - val_loss: 0.9139 - val_accuracy: 0.7243
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3096 - accuracy: 0.8252 - val_loss: 0.9161 - val_accuracy: 0.7196
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4353 - accuracy: 0.7943 - val_loss: 0.9114 - val_accuracy: 0.7103
Epoch 162/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3378 - accuracy: 0.7943 - val_loss: 0.9143 - val_accuracy: 0.7196
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2897 - accuracy: 0.8098 - val_loss: 0.9368 - val_accuracy: 0.7150
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4081 - accuracy: 0.7969 - val_loss: 0.9512 - val_accuracy: 0.6729
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3745 - accuracy: 0.7532 - val_loss: 0.9808 - val_accuracy: 0.6729
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3474 - accuracy: 0.7455 - val_loss: 0.8898 - val_accuracy: 0.6776
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4129 - accuracy: 0.7378 - val_loss: 0.8967 - val_accuracy: 0.6963
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4548 - accuracy: 0.7301 - val_loss: 0.8771 - val_accuracy: 0.6776
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4653 - accuracy: 0.7352 - val_loss: 0.8418 - val_accuracy: 0.6682
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3187 - accuracy: 0.7326 - val_loss: 0.8373 - val_accuracy: 0.6729
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3279 - accuracy: 0.7301 - val_loss: 0.8785 - val_accuracy: 0.6729
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2977 - accuracy: 0.7198 - val_loss: 0.8113 - val_accuracy: 0.6682
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3769 - accuracy: 0.7301 - val_loss: 0.8657 - val_accuracy: 0.6682
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3845 - accuracy: 0.7275 - val_loss: 1.0360 - val_accuracy: 0.6636
```

```

Epoch 175/1000
1/4 [=====>.....] - ETA: 0s - loss: 0.2900 - accuracy: 0.7812Restoring model weights from th
e end of the best epoch: 25.
4/4 [=====] - 0s 13ms/step - loss: 0.3632 - accuracy: 0.7224 - val_loss: 1.0112 - val_
accuracy: 0.6682
Epoch 175: early stopping
2/2 [=====] - 0s 4ms/step - loss: 1.1051 - accuracy: 0.7674
[CV] END .....Dense1=50, Dense2=50; total time= 9.3s
Model: "sequential_62"

```

Layer (type)	Output Shape	Param #
dense_248 (Dense)	(None, 50)	350
batch_normalization_186 (BatchNormalization)	(None, 50)	200
activation_186 (Activation)	(None, 50)	0
dense_249 (Dense)	(None, 50)	2550
batch_normalization_187 (BatchNormalization)	(None, 50)	200
activation_187 (Activation)	(None, 50)	0
dense_250 (Dense)	(None, 10)	510
batch_normalization_188 (BatchNormalization)	(None, 10)	40
activation_188 (Activation)	(None, 10)	0
dense_251 (Dense)	(None, 2)	22

```

=====
Total params: 3,872
Trainable params: 3,652
Non-trainable params: 220

```

```

Epoch 1/1000
4/4 [=====] - 2s 59ms/step - loss: 4.8943 - accuracy: 0.4936 - val_loss: 2.4448 - val_
accuracy: 0.4439
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4009 - accuracy: 0.5116 - val_loss: 2.4492 - val_
accuracy: 0.4579
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7772 - accuracy: 0.4961 - val_loss: 2.4110 - val_
accuracy: 0.4533
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6647 - accuracy: 0.4910 - val_loss: 2.4070 - val_
accuracy: 0.3925
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5322 - accuracy: 0.4524 - val_loss: 2.2578 - val_
accuracy: 0.3505
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5481 - accuracy: 0.4139 - val_loss: 2.2725 - val_
accuracy: 0.3411
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6763 - accuracy: 0.3907 - val_loss: 2.1905 - val_
accuracy: 0.3879
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5857 - accuracy: 0.3830 - val_loss: 2.1224 - val_
accuracy: 0.4019
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4317 - accuracy: 0.4704 - val_loss: 2.1683 - val_
accuracy: 0.4533
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3482 - accuracy: 0.4396 - val_loss: 2.1504 - val_
accuracy: 0.4673
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4231 - accuracy: 0.4087 - val_loss: 2.1122 - val_
accuracy: 0.4673
Epoch 12/1000
4/4 [=====] - 0s 15ms/step - loss: 2.2980 - accuracy: 0.4113 - val_loss: 1.9904 - val_
accuracy: 0.4813
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1625 - accuracy: 0.4756 - val_loss: 1.9809 - val_
accuracy: 0.4907
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9615 - accuracy: 0.4422 - val_loss: 1.9325 - val_
accuracy: 0.4907
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8401 - accuracy: 0.4499 - val_loss: 1.9284 - val_
accuracy: 0.4953
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8862 - accuracy: 0.4524 - val_loss: 1.8582 - val_
accuracy: 0.4860
Epoch 17/1000

```

```
4/4 [=====] - 0s 13ms/step - loss: 1.8305 - accuracy: 0.4422 - val_loss: 1.8047 - val_accuracy: 0.4860
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7695 - accuracy: 0.4602 - val_loss: 1.7675 - val_accuracy: 0.4907
Epoch 19/1000
4/4 [=====] - 0s 15ms/step - loss: 1.6640 - accuracy: 0.4370 - val_loss: 1.7175 - val_accuracy: 0.5000
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4586 - accuracy: 0.4704 - val_loss: 1.7165 - val_accuracy: 0.4907
Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3720 - accuracy: 0.4679 - val_loss: 1.6850 - val_accuracy: 0.4766
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4616 - accuracy: 0.4473 - val_loss: 1.6134 - val_accuracy: 0.4813
Epoch 23/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3634 - accuracy: 0.4010 - val_loss: 1.5774 - val_accuracy: 0.5187
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4450 - accuracy: 0.4627 - val_loss: 1.6294 - val_accuracy: 0.5421
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0502 - accuracy: 0.4781 - val_loss: 1.5645 - val_accuracy: 0.5234
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2436 - accuracy: 0.4884 - val_loss: 1.4944 - val_accuracy: 0.5374
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0107 - accuracy: 0.5090 - val_loss: 1.4579 - val_accuracy: 0.5327
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2571 - accuracy: 0.4781 - val_loss: 1.4136 - val_accuracy: 0.5093
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0402 - accuracy: 0.4627 - val_loss: 1.3606 - val_accuracy: 0.5327
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9989 - accuracy: 0.4910 - val_loss: 1.3306 - val_accuracy: 0.5280
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9612 - accuracy: 0.4550 - val_loss: 1.3086 - val_accuracy: 0.5421
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0845 - accuracy: 0.4781 - val_loss: 1.3114 - val_accuracy: 0.5607
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9317 - accuracy: 0.4807 - val_loss: 1.2734 - val_accuracy: 0.5701
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9721 - accuracy: 0.4833 - val_loss: 1.2634 - val_accuracy: 0.5701
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9458 - accuracy: 0.4807 - val_loss: 1.2638 - val_accuracy: 0.5561
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8681 - accuracy: 0.5244 - val_loss: 1.2584 - val_accuracy: 0.5607
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6943 - accuracy: 0.5398 - val_loss: 1.2547 - val_accuracy: 0.6028
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7167 - accuracy: 0.5450 - val_loss: 1.2408 - val_accuracy: 0.5654
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7498 - accuracy: 0.5141 - val_loss: 1.2011 - val_accuracy: 0.5701
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7842 - accuracy: 0.5193 - val_loss: 1.1952 - val_accuracy: 0.5561
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6422 - accuracy: 0.4987 - val_loss: 1.2343 - val_accuracy: 0.5841
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6886 - accuracy: 0.5270 - val_loss: 1.2546 - val_accuracy: 0.5841
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7025 - accuracy: 0.5013 - val_loss: 1.2501 - val_accuracy: 0.5888
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6613 - accuracy: 0.4910 - val_loss: 1.2034 - val_accuracy: 0.5888
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6024 - accuracy: 0.4884 - val_loss: 1.1983 - val_accuracy: 0.5935
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6786 - accuracy: 0.4936 - val_loss: 1.2368 - val_accuracy: 0.5935
```

Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5941 - accuracy: 0.5116 - val_loss: 1.2173 - val_accuracy: 0.6075
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6459 - accuracy: 0.5244 - val_loss: 1.1761 - val_accuracy: 0.6402
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6118 - accuracy: 0.5424 - val_loss: 1.1772 - val_accuracy: 0.6168
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6805 - accuracy: 0.5270 - val_loss: 1.1609 - val_accuracy: 0.6308
Epoch 51/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5523 - accuracy: 0.5604 - val_loss: 1.1406 - val_accuracy: 0.6355
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5255 - accuracy: 0.5116 - val_loss: 1.1348 - val_accuracy: 0.6355
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6500 - accuracy: 0.5450 - val_loss: 1.1491 - val_accuracy: 0.6449
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6984 - accuracy: 0.5553 - val_loss: 1.1106 - val_accuracy: 0.6355
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5988 - accuracy: 0.5347 - val_loss: 1.1293 - val_accuracy: 0.6215
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5596 - accuracy: 0.5270 - val_loss: 1.1159 - val_accuracy: 0.6168
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5386 - accuracy: 0.5296 - val_loss: 1.0991 - val_accuracy: 0.6215
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5859 - accuracy: 0.5039 - val_loss: 1.0886 - val_accuracy: 0.6215
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4999 - accuracy: 0.5219 - val_loss: 1.0823 - val_accuracy: 0.6075
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5982 - accuracy: 0.5064 - val_loss: 1.0734 - val_accuracy: 0.6075
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5863 - accuracy: 0.5450 - val_loss: 1.0729 - val_accuracy: 0.5841
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5465 - accuracy: 0.5219 - val_loss: 1.0659 - val_accuracy: 0.5888
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4988 - accuracy: 0.5167 - val_loss: 1.0528 - val_accuracy: 0.5841
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5900 - accuracy: 0.4884 - val_loss: 1.0573 - val_accuracy: 0.5748
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4888 - accuracy: 0.5167 - val_loss: 1.0717 - val_accuracy: 0.5935
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5212 - accuracy: 0.5270 - val_loss: 1.0714 - val_accuracy: 0.5841
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5626 - accuracy: 0.5347 - val_loss: 1.0284 - val_accuracy: 0.5981
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5902 - accuracy: 0.5347 - val_loss: 1.0173 - val_accuracy: 0.5935
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4081 - accuracy: 0.5450 - val_loss: 1.0160 - val_accuracy: 0.6215
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4671 - accuracy: 0.5835 - val_loss: 1.0921 - val_accuracy: 0.5888
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4976 - accuracy: 0.5681 - val_loss: 1.0538 - val_accuracy: 0.5935
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5074 - accuracy: 0.5835 - val_loss: 1.0264 - val_accuracy: 0.5935
Epoch 73/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6453 - accuracy: 0.5707 - val_loss: 1.0109 - val_accuracy: 0.5935
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6298 - accuracy: 0.5835 - val_loss: 0.9650 - val_accuracy: 0.5841
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4272 - accuracy: 0.5810 - val_loss: 1.0214 - val_accuracy: 0.5514
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5108 - accuracy: 0.5913 - val_loss: 1.0044 - val_accuracy: 0.5913

accuracy: 0.5093
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4693 - accuracy: 0.5733 - val_loss: 0.9944 - val_accuracy: 0.5140
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6276 - accuracy: 0.5733 - val_loss: 1.0112 - val_accuracy: 0.5000
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5384 - accuracy: 0.5964 - val_loss: 0.9424 - val_accuracy: 0.5327
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4352 - accuracy: 0.5630 - val_loss: 0.9889 - val_accuracy: 0.5561
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5541 - accuracy: 0.5604 - val_loss: 0.9838 - val_accuracy: 0.5607
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4419 - accuracy: 0.5835 - val_loss: 0.9703 - val_accuracy: 0.5421
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3740 - accuracy: 0.5810 - val_loss: 0.9806 - val_accuracy: 0.5561
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3906 - accuracy: 0.5630 - val_loss: 0.9583 - val_accuracy: 0.5654
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4245 - accuracy: 0.5733 - val_loss: 0.9367 - val_accuracy: 0.5794
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5309 - accuracy: 0.5938 - val_loss: 0.9629 - val_accuracy: 0.5654
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3501 - accuracy: 0.5887 - val_loss: 0.9531 - val_accuracy: 0.5794
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4904 - accuracy: 0.5707 - val_loss: 0.9514 - val_accuracy: 0.5748
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4859 - accuracy: 0.5810 - val_loss: 0.9475 - val_accuracy: 0.5701
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4607 - accuracy: 0.5887 - val_loss: 0.8735 - val_accuracy: 0.5748
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3673 - accuracy: 0.5784 - val_loss: 0.8863 - val_accuracy: 0.5514
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4038 - accuracy: 0.5810 - val_loss: 0.8927 - val_accuracy: 0.5654
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3457 - accuracy: 0.5758 - val_loss: 0.8727 - val_accuracy: 0.5888
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3725 - accuracy: 0.5784 - val_loss: 0.8384 - val_accuracy: 0.5888
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3642 - accuracy: 0.5887 - val_loss: 0.8183 - val_accuracy: 0.5935
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4682 - accuracy: 0.6118 - val_loss: 0.8273 - val_accuracy: 0.5935
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4613 - accuracy: 0.5758 - val_loss: 0.8093 - val_accuracy: 0.5794
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3841 - accuracy: 0.5887 - val_loss: 0.7991 - val_accuracy: 0.5374
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4518 - accuracy: 0.5656 - val_loss: 0.8158 - val_accuracy: 0.5327
Epoch 100/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4705 - accuracy: 0.6015 - val_loss: 0.7863 - val_accuracy: 0.5234
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4140 - accuracy: 0.5964 - val_loss: 0.8621 - val_accuracy: 0.5607
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4026 - accuracy: 0.6015 - val_loss: 0.8136 - val_accuracy: 0.5327
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4095 - accuracy: 0.5835 - val_loss: 0.8518 - val_accuracy: 0.5234
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4056 - accuracy: 0.6015 - val_loss: 0.8295 - val_accuracy: 0.5561
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4304 - accuracy: 0.5913 - val_loss: 0.8938 - val_accuracy: 0.5327
Epoch 106/1000

```
4/4 [=====] - 0s 13ms/step - loss: 0.3996 - accuracy: 0.5758 - val_loss: 0.8281 - val_accuracy: 0.4766
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3477 - accuracy: 0.5835 - val_loss: 0.7490 - val_accuracy: 0.4860
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4357 - accuracy: 0.5527 - val_loss: 0.7900 - val_accuracy: 0.4953
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5196 - accuracy: 0.5784 - val_loss: 0.8570 - val_accuracy: 0.4766
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3420 - accuracy: 0.5861 - val_loss: 0.8389 - val_accuracy: 0.4860
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4203 - accuracy: 0.5913 - val_loss: 0.9253 - val_accuracy: 0.4766
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4430 - accuracy: 0.5630 - val_loss: 0.8342 - val_accuracy: 0.4907
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4218 - accuracy: 0.5733 - val_loss: 0.8828 - val_accuracy: 0.4673
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3529 - accuracy: 0.5861 - val_loss: 0.8894 - val_accuracy: 0.4720
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3588 - accuracy: 0.5630 - val_loss: 0.7818 - val_accuracy: 0.4626
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3840 - accuracy: 0.5578 - val_loss: 0.8394 - val_accuracy: 0.4393
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3463 - accuracy: 0.5758 - val_loss: 0.8317 - val_accuracy: 0.4346
Epoch 118/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4831 - accuracy: 0.5450 - val_loss: 0.8025 - val_accuracy: 0.4393
Epoch 119/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3849 - accuracy: 0.5424 - val_loss: 0.8031 - val_accuracy: 0.4486
Epoch 120/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4652 - accuracy: 0.5501 - val_loss: 0.8283 - val_accuracy: 0.4486
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3542 - accuracy: 0.5527 - val_loss: 0.7408 - val_accuracy: 0.4533
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4200 - accuracy: 0.5476 - val_loss: 0.8540 - val_accuracy: 0.4720
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3351 - accuracy: 0.5604 - val_loss: 0.8503 - val_accuracy: 0.4673
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3605 - accuracy: 0.5810 - val_loss: 0.8572 - val_accuracy: 0.4626
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4266 - accuracy: 0.5887 - val_loss: 0.8855 - val_accuracy: 0.4533
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3466 - accuracy: 0.5810 - val_loss: 0.8839 - val_accuracy: 0.4626
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4362 - accuracy: 0.5733 - val_loss: 0.9636 - val_accuracy: 0.4533
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4141 - accuracy: 0.5938 - val_loss: 0.9871 - val_accuracy: 0.4533
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3613 - accuracy: 0.5681 - val_loss: 0.9827 - val_accuracy: 0.4206
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2864 - accuracy: 0.5450 - val_loss: 0.9898 - val_accuracy: 0.4579
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3732 - accuracy: 0.5527 - val_loss: 0.9747 - val_accuracy: 0.4766
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4506 - accuracy: 0.5630 - val_loss: 1.0230 - val_accuracy: 0.4579
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3805 - accuracy: 0.5861 - val_loss: 1.0646 - val_accuracy: 0.4626
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3350 - accuracy: 0.5835 - val_loss: 1.1136 - val_accuracy: 0.4673
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4728 - accuracy: 0.5604 - val_loss: 1.1121 - val_accuracy: 0.4579
```

Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3827 - accuracy: 0.5810 - val_loss: 1.0640 - val_accuracy: 0.4766
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3605 - accuracy: 0.5398 - val_loss: 1.1062 - val_accuracy: 0.4533
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3718 - accuracy: 0.5501 - val_loss: 1.1240 - val_accuracy: 0.4533
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3734 - accuracy: 0.5321 - val_loss: 1.1175 - val_accuracy: 0.4393
Epoch 140/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3281 - accuracy: 0.5270 - val_loss: 1.1401 - val_accuracy: 0.4439
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3186 - accuracy: 0.5219 - val_loss: 1.1123 - val_accuracy: 0.4673
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4709 - accuracy: 0.5758 - val_loss: 1.1106 - val_accuracy: 0.4860
Epoch 143/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3999 - accuracy: 0.5193 - val_loss: 1.1464 - val_accuracy: 0.4673
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3098 - accuracy: 0.5219 - val_loss: 1.1486 - val_accuracy: 0.4533
Epoch 145/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4144 - accuracy: 0.5013 - val_loss: 1.1260 - val_accuracy: 0.4579
Epoch 146/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3403 - accuracy: 0.5501 - val_loss: 1.1564 - val_accuracy: 0.4626
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3592 - accuracy: 0.5553 - val_loss: 1.2132 - val_accuracy: 0.4393
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4164 - accuracy: 0.5244 - val_loss: 1.2332 - val_accuracy: 0.4346
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3510 - accuracy: 0.5501 - val_loss: 1.2271 - val_accuracy: 0.4346
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2951 - accuracy: 0.5193 - val_loss: 1.1514 - val_accuracy: 0.4486
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3288 - accuracy: 0.5347 - val_loss: 1.0975 - val_accuracy: 0.4486
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3508 - accuracy: 0.5373 - val_loss: 1.1968 - val_accuracy: 0.4533
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3742 - accuracy: 0.5553 - val_loss: 1.2076 - val_accuracy: 0.4720
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3847 - accuracy: 0.5578 - val_loss: 1.3186 - val_accuracy: 0.5280
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3444 - accuracy: 0.5707 - val_loss: 1.2774 - val_accuracy: 0.5280
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3077 - accuracy: 0.5681 - val_loss: 1.1849 - val_accuracy: 0.5187
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3559 - accuracy: 0.5604 - val_loss: 1.1915 - val_accuracy: 0.5234
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3307 - accuracy: 0.5707 - val_loss: 1.1812 - val_accuracy: 0.5234
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4213 - accuracy: 0.5758 - val_loss: 1.1442 - val_accuracy: 0.5093
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3521 - accuracy: 0.5835 - val_loss: 1.1141 - val_accuracy: 0.5093
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3665 - accuracy: 0.5733 - val_loss: 1.1391 - val_accuracy: 0.5093
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4062 - accuracy: 0.5964 - val_loss: 1.1527 - val_accuracy: 0.5234
Epoch 163/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2988 - accuracy: 0.6041 - val_loss: 1.2192 - val_accuracy: 0.5140
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2847 - accuracy: 0.6067 - val_loss: 1.2420 - val_accuracy: 0.5140
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2790 - accuracy: 0.6093 - val_loss: 1.2324 - val_accuracy: 0.5140

```
accuracy: 0.5421
Epoch 166/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3091 - accuracy: 0.6015 - val_loss: 1.2557 - val_
accuracy: 0.5561
Epoch 167/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2767 - accuracy: 0.6118 - val_loss: 1.2202 - val_
accuracy: 0.5654
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4830 - accuracy: 0.5861 - val_loss: 1.2301 - val_
accuracy: 0.5561
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2723 - accuracy: 0.5913 - val_loss: 1.2354 - val_
accuracy: 0.5421
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3754 - accuracy: 0.5373 - val_loss: 1.1971 - val_
accuracy: 0.5000
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3796 - accuracy: 0.5476 - val_loss: 1.1893 - val_
accuracy: 0.5187
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2870 - accuracy: 0.5810 - val_loss: 1.2499 - val_
accuracy: 0.5140
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3482 - accuracy: 0.5810 - val_loss: 1.1758 - val_
accuracy: 0.5327
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3186 - accuracy: 0.5578 - val_loss: 1.1759 - val_
accuracy: 0.5234
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2959 - accuracy: 0.5913 - val_loss: 1.1714 - val_
accuracy: 0.5187
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3851 - accuracy: 0.5681 - val_loss: 1.2493 - val_
accuracy: 0.4813
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2826 - accuracy: 0.5835 - val_loss: 1.1979 - val_
accuracy: 0.4860
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3842 - accuracy: 0.6093 - val_loss: 1.1560 - val_
accuracy: 0.4907
Epoch 179/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3957 - accuracy: 0.5373 - val_loss: 1.1402 - val_
accuracy: 0.4907
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3009 - accuracy: 0.5604 - val_loss: 1.2266 - val_
accuracy: 0.4907
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4605 - accuracy: 0.5450 - val_loss: 1.1618 - val_
accuracy: 0.4860
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3155 - accuracy: 0.5835 - val_loss: 1.1210 - val_
accuracy: 0.4860
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3125 - accuracy: 0.5810 - val_loss: 1.0922 - val_
accuracy: 0.4766
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3482 - accuracy: 0.5784 - val_loss: 1.2940 - val_
accuracy: 0.4766
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3340 - accuracy: 0.6041 - val_loss: 1.2211 - val_
accuracy: 0.4907
Epoch 186/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3615 - accuracy: 0.5733 - val_loss: 1.1395 - val_
accuracy: 0.4720
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3184 - accuracy: 0.5887 - val_loss: 1.1275 - val_
accuracy: 0.4626
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3352 - accuracy: 0.6015 - val_loss: 1.0717 - val_
accuracy: 0.4720
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3303 - accuracy: 0.5938 - val_loss: 1.0944 - val_
accuracy: 0.4766
Epoch 190/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3210 - accuracy: 0.5887 - val_loss: 1.0694 - val_
accuracy: 0.4766
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3169 - accuracy: 0.5938 - val_loss: 0.9891 - val_
accuracy: 0.4626
Epoch 192/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2820 - accuracy: 0.5938 - val_loss: 1.0770 - val_
accuracy: 0.4813
Epoch 193/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4476 - accuracy: 0.5913 - val_loss: 1.0441 - val_
accuracy: 0.4813
Epoch 194/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2769 - accuracy: 0.5810 - val_loss: 1.0628 - val_
accuracy: 0.4673
Epoch 195/1000
```

```

4/4 [=====] - 0s 13ms/step - loss: 0.3133 - accuracy: 0.5501 - val_loss: 1.0666 - val_accuracy: 0.4720
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3179 - accuracy: 0.5450 - val_loss: 1.0193 - val_accuracy: 0.4860
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3355 - accuracy: 0.5835 - val_loss: 1.0231 - val_accuracy: 0.4907
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2766 - accuracy: 0.5861 - val_loss: 1.0290 - val_accuracy: 0.4907
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3212 - accuracy: 0.5887 - val_loss: 1.0804 - val_accuracy: 0.4953
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2892 - accuracy: 0.5810 - val_loss: 1.0822 - val_accuracy: 0.4860
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3733 - accuracy: 0.5733 - val_loss: 0.9834 - val_accuracy: 0.5000
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3914 - accuracy: 0.5784 - val_loss: 1.0189 - val_accuracy: 0.5000
Epoch 203/1000
1/4 [====>.....] - ETA: 0s - loss: 0.2529 - accuracy: 0.6016Restoring model weights from the end of the best epoch: 53.
4/4 [=====] - 0s 14ms/step - loss: 0.3735 - accuracy: 0.5887 - val_loss: 0.9725 - val_accuracy: 0.5000
Epoch 203: early stopping
2/2 [=====] - 0s 3ms/step - loss: 0.7533 - accuracy: 0.6047
[CV] END .....Dense1=50, Dense2=50; total time= 11.1s
Model: "sequential_63"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_252 (Dense)	(None, 50)	350
batch_normalization_189 (BatchNormalization)	(None, 50)	200
activation_189 (Activation)	(None, 50)	0
dense_253 (Dense)	(None, 50)	2550
batch_normalization_190 (BatchNormalization)	(None, 50)	200
activation_190 (Activation)	(None, 50)	0
dense_254 (Dense)	(None, 10)	510
batch_normalization_191 (BatchNormalization)	(None, 10)	40
activation_191 (Activation)	(None, 10)	0
dense_255 (Dense)	(None, 2)	22
<hr/>		

Total params: 3,872
Trainable params: 3,652
Non-trainable params: 220

```

Epoch 1/1000
4/4 [=====] - 1s 56ms/step - loss: 4.7369 - accuracy: 0.4576 - val_loss: 4.4384 - val_accuracy: 0.5421
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 3.2258 - accuracy: 0.4422 - val_loss: 4.3378 - val_accuracy: 0.5421
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9099 - accuracy: 0.4524 - val_loss: 3.9813 - val_accuracy: 0.5467
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6156 - accuracy: 0.4627 - val_loss: 2.9518 - val_accuracy: 0.4953
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6143 - accuracy: 0.4113 - val_loss: 2.4992 - val_accuracy: 0.3972
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3726 - accuracy: 0.4216 - val_loss: 2.2860 - val_accuracy: 0.3037
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1916 - accuracy: 0.4627 - val_loss: 1.9768 - val_accuracy: 0.3505
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3020 - accuracy: 0.4473 - val_loss: 1.8414 - val_accuracy: 0.3364
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0673 - accuracy: 0.4267 - val_loss: 1.8494 - val_

```

```
accuracy: 0.3692
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9857 - accuracy: 0.4447 - val_loss: 1.7922 - val_accuracy: 0.3785
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9127 - accuracy: 0.4267 - val_loss: 1.7917 - val_accuracy: 0.4112
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9985 - accuracy: 0.4319 - val_loss: 1.7815 - val_accuracy: 0.4206
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9856 - accuracy: 0.4550 - val_loss: 1.7567 - val_accuracy: 0.4159
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8439 - accuracy: 0.4422 - val_loss: 1.7439 - val_accuracy: 0.4299
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8374 - accuracy: 0.4602 - val_loss: 1.7244 - val_accuracy: 0.4486
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8813 - accuracy: 0.4781 - val_loss: 1.7217 - val_accuracy: 0.4533
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5712 - accuracy: 0.4627 - val_loss: 1.7404 - val_accuracy: 0.4533
Epoch 18/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7289 - accuracy: 0.4781 - val_loss: 1.7243 - val_accuracy: 0.4346
Epoch 19/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6819 - accuracy: 0.4576 - val_loss: 1.7278 - val_accuracy: 0.4907
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5498 - accuracy: 0.4499 - val_loss: 1.7229 - val_accuracy: 0.5280
Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5088 - accuracy: 0.4627 - val_loss: 1.6866 - val_accuracy: 0.5187
Epoch 22/1000
4/4 [=====] - 0s 15ms/step - loss: 1.4440 - accuracy: 0.4730 - val_loss: 1.6599 - val_accuracy: 0.5607
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5065 - accuracy: 0.4653 - val_loss: 1.6287 - val_accuracy: 0.5421
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4566 - accuracy: 0.4653 - val_loss: 1.6035 - val_accuracy: 0.5327
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5149 - accuracy: 0.4550 - val_loss: 1.5954 - val_accuracy: 0.4206
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4814 - accuracy: 0.4627 - val_loss: 1.5935 - val_accuracy: 0.4206
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2755 - accuracy: 0.4807 - val_loss: 1.5617 - val_accuracy: 0.4206
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2981 - accuracy: 0.4859 - val_loss: 1.5275 - val_accuracy: 0.4206
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2680 - accuracy: 0.4653 - val_loss: 1.4908 - val_accuracy: 0.4252
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2665 - accuracy: 0.4884 - val_loss: 1.4680 - val_accuracy: 0.4206
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2262 - accuracy: 0.4576 - val_loss: 1.4442 - val_accuracy: 0.4299
Epoch 32/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1041 - accuracy: 0.4653 - val_loss: 1.4268 - val_accuracy: 0.4393
Epoch 33/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0435 - accuracy: 0.4781 - val_loss: 1.4240 - val_accuracy: 0.4346
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0934 - accuracy: 0.4884 - val_loss: 1.4057 - val_accuracy: 0.4393
Epoch 35/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9216 - accuracy: 0.4627 - val_loss: 1.3855 - val_accuracy: 0.4299
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8990 - accuracy: 0.4627 - val_loss: 1.3784 - val_accuracy: 0.4252
Epoch 37/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7936 - accuracy: 0.4884 - val_loss: 1.3795 - val_accuracy: 0.4252
Epoch 38/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8662 - accuracy: 0.4781 - val_loss: 1.3784 - val_accuracy: 0.4206
Epoch 39/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 0.7601 - accuracy: 0.4936 - val_loss: 1.3650 - val_accuracy: 0.4252
Epoch 40/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8097 - accuracy: 0.5013 - val_loss: 1.3521 - val_accuracy: 0.4252
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7764 - accuracy: 0.5219 - val_loss: 1.3328 - val_accuracy: 0.4299
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6898 - accuracy: 0.4910 - val_loss: 1.3224 - val_accuracy: 0.4346
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7184 - accuracy: 0.5167 - val_loss: 1.2973 - val_accuracy: 0.4486
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6150 - accuracy: 0.5373 - val_loss: 1.2740 - val_accuracy: 0.4439
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7051 - accuracy: 0.5193 - val_loss: 1.2219 - val_accuracy: 0.4673
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7092 - accuracy: 0.5244 - val_loss: 1.2077 - val_accuracy: 0.4720
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6274 - accuracy: 0.5476 - val_loss: 1.2237 - val_accuracy: 0.4579
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5990 - accuracy: 0.5373 - val_loss: 1.2273 - val_accuracy: 0.4486
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6388 - accuracy: 0.5681 - val_loss: 1.2049 - val_accuracy: 0.4533
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6359 - accuracy: 0.5219 - val_loss: 1.1910 - val_accuracy: 0.4439
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5925 - accuracy: 0.5604 - val_loss: 1.1823 - val_accuracy: 0.4393
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5809 - accuracy: 0.5424 - val_loss: 1.1704 - val_accuracy: 0.4252
Epoch 53/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5764 - accuracy: 0.5347 - val_loss: 1.1158 - val_accuracy: 0.4299
Epoch 54/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5558 - accuracy: 0.5219 - val_loss: 1.1587 - val_accuracy: 0.4299
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6343 - accuracy: 0.5578 - val_loss: 1.1071 - val_accuracy: 0.4299
Epoch 56/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5742 - accuracy: 0.5501 - val_loss: 1.0844 - val_accuracy: 0.4346
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5050 - accuracy: 0.5578 - val_loss: 1.0685 - val_accuracy: 0.4439
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5050 - accuracy: 0.5835 - val_loss: 1.0558 - val_accuracy: 0.4533
Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5096 - accuracy: 0.5630 - val_loss: 1.0231 - val_accuracy: 0.4393
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5173 - accuracy: 0.5527 - val_loss: 1.0011 - val_accuracy: 0.4346
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5172 - accuracy: 0.5527 - val_loss: 0.9886 - val_accuracy: 0.4393
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5510 - accuracy: 0.5501 - val_loss: 0.9815 - val_accuracy: 0.4393
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4627 - accuracy: 0.5527 - val_loss: 0.9629 - val_accuracy: 0.4393
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5265 - accuracy: 0.5630 - val_loss: 0.9442 - val_accuracy: 0.4393
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5632 - accuracy: 0.5527 - val_loss: 0.9230 - val_accuracy: 0.4346
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4976 - accuracy: 0.5553 - val_loss: 0.9072 - val_accuracy: 0.4346
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4655 - accuracy: 0.5835 - val_loss: 0.9096 - val_accuracy: 0.4439
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4821 - accuracy: 0.5656 - val_loss: 0.8882 - val_accuracy: 0.4439
```

Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4435 - accuracy: 0.5656 - val_loss: 0.8421 - val_accuracy: 0.4579
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5239 - accuracy: 0.5861 - val_loss: 0.8327 - val_accuracy: 0.4533
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4946 - accuracy: 0.5681 - val_loss: 0.8241 - val_accuracy: 0.4439
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4756 - accuracy: 0.6015 - val_loss: 0.7889 - val_accuracy: 0.4439
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4584 - accuracy: 0.5835 - val_loss: 0.7963 - val_accuracy: 0.4486
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4616 - accuracy: 0.5398 - val_loss: 0.8045 - val_accuracy: 0.4346
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4602 - accuracy: 0.5578 - val_loss: 0.7705 - val_accuracy: 0.4252
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5078 - accuracy: 0.5810 - val_loss: 0.7447 - val_accuracy: 0.4533
Epoch 77/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4384 - accuracy: 0.5913 - val_loss: 0.7188 - val_accuracy: 0.4579
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5563 - accuracy: 0.5810 - val_loss: 0.6951 - val_accuracy: 0.4533
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4661 - accuracy: 0.5656 - val_loss: 0.6562 - val_accuracy: 0.4439
Epoch 80/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4893 - accuracy: 0.5990 - val_loss: 0.6168 - val_accuracy: 0.4439
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3886 - accuracy: 0.5758 - val_loss: 0.6539 - val_accuracy: 0.4673
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4581 - accuracy: 0.5835 - val_loss: 0.6299 - val_accuracy: 0.4533
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3975 - accuracy: 0.5887 - val_loss: 0.6822 - val_accuracy: 0.4579
Epoch 84/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3944 - accuracy: 0.5938 - val_loss: 0.6739 - val_accuracy: 0.4579
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4420 - accuracy: 0.5553 - val_loss: 0.6150 - val_accuracy: 0.4579
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4167 - accuracy: 0.5733 - val_loss: 0.6173 - val_accuracy: 0.4720
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4262 - accuracy: 0.5758 - val_loss: 0.6054 - val_accuracy: 0.4393
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3676 - accuracy: 0.5990 - val_loss: 0.6233 - val_accuracy: 0.4626
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3966 - accuracy: 0.5913 - val_loss: 0.6032 - val_accuracy: 0.4626
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4248 - accuracy: 0.5810 - val_loss: 0.6320 - val_accuracy: 0.4626
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4508 - accuracy: 0.5656 - val_loss: 0.5742 - val_accuracy: 0.4626
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4263 - accuracy: 0.5861 - val_loss: 0.5619 - val_accuracy: 0.4626
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3799 - accuracy: 0.6015 - val_loss: 0.5590 - val_accuracy: 0.4720
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4248 - accuracy: 0.5630 - val_loss: 0.5827 - val_accuracy: 0.4720
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3824 - accuracy: 0.5630 - val_loss: 0.5772 - val_accuracy: 0.4673
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4666 - accuracy: 0.5578 - val_loss: 0.5619 - val_accuracy: 0.4673
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4122 - accuracy: 0.6093 - val_loss: 0.5285 - val_accuracy: 0.4766
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4079 - accuracy: 0.5835 - val_loss: 0.5213 - val_accuracy: 0.4766

```
accuracy: 0.4720
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4019 - accuracy: 0.5861 - val_loss: 0.5234 - val_
accuracy: 0.4813
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5033 - accuracy: 0.5861 - val_loss: 0.5247 - val_
accuracy: 0.4766
Epoch 101/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3614 - accuracy: 0.5990 - val_loss: 0.5223 - val_
accuracy: 0.4907
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4456 - accuracy: 0.5835 - val_loss: 0.5130 - val_
accuracy: 0.4907
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3756 - accuracy: 0.5784 - val_loss: 0.5057 - val_
accuracy: 0.4720
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3576 - accuracy: 0.5861 - val_loss: 0.5107 - val_
accuracy: 0.5047
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3842 - accuracy: 0.5784 - val_loss: 0.5062 - val_
accuracy: 0.5093
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4229 - accuracy: 0.6015 - val_loss: 0.5006 - val_
accuracy: 0.5187
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3728 - accuracy: 0.6221 - val_loss: 0.4942 - val_
accuracy: 0.5327
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4137 - accuracy: 0.6170 - val_loss: 0.5397 - val_
accuracy: 0.5187
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4326 - accuracy: 0.5810 - val_loss: 0.5618 - val_
accuracy: 0.5093
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3839 - accuracy: 0.5835 - val_loss: 0.5365 - val_
accuracy: 0.5000
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3330 - accuracy: 0.5861 - val_loss: 0.5774 - val_
accuracy: 0.5093
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4045 - accuracy: 0.5887 - val_loss: 0.5625 - val_
accuracy: 0.5000
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3976 - accuracy: 0.5553 - val_loss: 0.5405 - val_
accuracy: 0.5093
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4132 - accuracy: 0.5990 - val_loss: 0.5286 - val_
accuracy: 0.5327
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3442 - accuracy: 0.5656 - val_loss: 0.5216 - val_
accuracy: 0.5327
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3602 - accuracy: 0.5913 - val_loss: 0.5037 - val_
accuracy: 0.5514
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4786 - accuracy: 0.5784 - val_loss: 0.5258 - val_
accuracy: 0.5140
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3451 - accuracy: 0.5913 - val_loss: 0.5513 - val_
accuracy: 0.5280
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3861 - accuracy: 0.5887 - val_loss: 0.5198 - val_
accuracy: 0.5234
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3840 - accuracy: 0.5887 - val_loss: 0.5105 - val_
accuracy: 0.5140
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3669 - accuracy: 0.5733 - val_loss: 0.5357 - val_
accuracy: 0.5140
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3617 - accuracy: 0.5861 - val_loss: 0.5222 - val_
accuracy: 0.5093
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4406 - accuracy: 0.5681 - val_loss: 0.5659 - val_
accuracy: 0.5093
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3530 - accuracy: 0.5861 - val_loss: 0.5708 - val_
accuracy: 0.5327
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3709 - accuracy: 0.5578 - val_loss: 0.5689 - val_
accuracy: 0.5327
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3460 - accuracy: 0.6093 - val_loss: 0.5959 - val_
accuracy: 0.5280
Epoch 127/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3390 - accuracy: 0.5913 - val_loss: 0.5425 - val_
accuracy: 0.5374
Epoch 128/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.3464 - accuracy: 0.6144 - val_loss: 0.6055 - val_accuracy: 0.5280
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3595 - accuracy: 0.6170 - val_loss: 0.6059 - val_accuracy: 0.5327
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3667 - accuracy: 0.6015 - val_loss: 0.5694 - val_accuracy: 0.5421
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3508 - accuracy: 0.5835 - val_loss: 0.5062 - val_accuracy: 0.5327
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2841 - accuracy: 0.5964 - val_loss: 0.5714 - val_accuracy: 0.5421
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3557 - accuracy: 0.6144 - val_loss: 0.5741 - val_accuracy: 0.5374
Epoch 134/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4385 - accuracy: 0.5553 - val_loss: 0.6014 - val_accuracy: 0.5374
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3668 - accuracy: 0.5758 - val_loss: 0.6398 - val_accuracy: 0.5093
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4056 - accuracy: 0.5758 - val_loss: 0.6430 - val_accuracy: 0.5327
Epoch 137/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3996 - accuracy: 0.5938 - val_loss: 0.7313 - val_accuracy: 0.5467
Epoch 138/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3132 - accuracy: 0.5861 - val_loss: 0.7701 - val_accuracy: 0.5421
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2726 - accuracy: 0.5861 - val_loss: 0.7331 - val_accuracy: 0.5280
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3369 - accuracy: 0.5784 - val_loss: 0.9562 - val_accuracy: 0.5607
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3589 - accuracy: 0.6067 - val_loss: 0.9445 - val_accuracy: 0.5607
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3541 - accuracy: 0.6118 - val_loss: 0.9466 - val_accuracy: 0.5561
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3546 - accuracy: 0.6041 - val_loss: 0.8934 - val_accuracy: 0.5981
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3754 - accuracy: 0.5810 - val_loss: 0.8459 - val_accuracy: 0.5888
Epoch 145/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2820 - accuracy: 0.6247 - val_loss: 0.8007 - val_accuracy: 0.6121
Epoch 146/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3364 - accuracy: 0.6093 - val_loss: 0.7768 - val_accuracy: 0.6495
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4067 - accuracy: 0.6272 - val_loss: 0.8310 - val_accuracy: 0.6168
Epoch 148/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3800 - accuracy: 0.6324 - val_loss: 0.7309 - val_accuracy: 0.6589
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2687 - accuracy: 0.6350 - val_loss: 0.7023 - val_accuracy: 0.6449
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3485 - accuracy: 0.6478 - val_loss: 0.7503 - val_accuracy: 0.6308
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2795 - accuracy: 0.6350 - val_loss: 0.6782 - val_accuracy: 0.6636
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2778 - accuracy: 0.6427 - val_loss: 0.6840 - val_accuracy: 0.6636
Epoch 153/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3682 - accuracy: 0.6504 - val_loss: 0.6897 - val_accuracy: 0.6916
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2786 - accuracy: 0.6632 - val_loss: 0.8128 - val_accuracy: 0.7150
Epoch 155/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3444 - accuracy: 0.7275 - val_loss: 0.8439 - val_accuracy: 0.7009
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2835 - accuracy: 0.7147 - val_loss: 0.8391 - val_accuracy: 0.7009
Epoch 157/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3309 - accuracy: 0.7095 - val_loss: 0.8106 - val_accuracy: 0.6262
```

Epoch 158/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2624 - accuracy: 0.6247 - val_loss: 0.8189 - val_accuracy: 0.6075
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3250 - accuracy: 0.6324 - val_loss: 0.9178 - val_accuracy: 0.6215
Epoch 160/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3147 - accuracy: 0.6375 - val_loss: 0.9678 - val_accuracy: 0.6121
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3486 - accuracy: 0.6195 - val_loss: 0.8971 - val_accuracy: 0.6589
Epoch 162/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3041 - accuracy: 0.6761 - val_loss: 1.0037 - val_accuracy: 0.6262
Epoch 163/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3025 - accuracy: 0.6350 - val_loss: 1.0055 - val_accuracy: 0.6729
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2805 - accuracy: 0.6735 - val_loss: 0.9323 - val_accuracy: 0.7150
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2750 - accuracy: 0.7147 - val_loss: 1.0652 - val_accuracy: 0.6589
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2636 - accuracy: 0.6632 - val_loss: 1.0103 - val_accuracy: 0.6542
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3395 - accuracy: 0.6658 - val_loss: 1.1507 - val_accuracy: 0.6916
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2473 - accuracy: 0.7224 - val_loss: 1.1085 - val_accuracy: 0.7150
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3079 - accuracy: 0.7095 - val_loss: 1.0185 - val_accuracy: 0.7009
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3293 - accuracy: 0.6812 - val_loss: 1.1292 - val_accuracy: 0.7009
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3750 - accuracy: 0.7429 - val_loss: 1.0809 - val_accuracy: 0.7103
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2569 - accuracy: 0.7044 - val_loss: 1.0604 - val_accuracy: 0.6449
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2811 - accuracy: 0.6555 - val_loss: 1.0589 - val_accuracy: 0.6168
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2915 - accuracy: 0.6350 - val_loss: 1.1455 - val_accuracy: 0.6075
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3006 - accuracy: 0.6452 - val_loss: 1.1362 - val_accuracy: 0.6355
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3693 - accuracy: 0.6555 - val_loss: 1.0699 - val_accuracy: 0.6075
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2631 - accuracy: 0.6787 - val_loss: 1.0761 - val_accuracy: 0.6262
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2409 - accuracy: 0.6761 - val_loss: 1.1536 - val_accuracy: 0.6495
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2989 - accuracy: 0.6658 - val_loss: 1.1574 - val_accuracy: 0.6402
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2870 - accuracy: 0.6658 - val_loss: 1.1221 - val_accuracy: 0.7383
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2789 - accuracy: 0.7121 - val_loss: 1.1120 - val_accuracy: 0.7196
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3708 - accuracy: 0.6967 - val_loss: 1.0721 - val_accuracy: 0.7150
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2531 - accuracy: 0.6992 - val_loss: 1.1257 - val_accuracy: 0.7150
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2910 - accuracy: 0.6967 - val_loss: 1.1212 - val_accuracy: 0.7243
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2715 - accuracy: 0.7326 - val_loss: 1.1496 - val_accuracy: 0.7290
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3077 - accuracy: 0.7301 - val_loss: 1.1104 - val_accuracy: 0.7383
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3612 - accuracy: 0.7326 - val_loss: 1.1663 - val_accuracy: 0.7383

```
accuracy: 0.7383
Epoch 188/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2608 - accuracy: 0.7121 - val_loss: 1.1874 - val_
accuracy: 0.7336
Epoch 189/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3024 - accuracy: 0.7301 - val_loss: 1.1337 - val_
accuracy: 0.7430
Epoch 190/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3348 - accuracy: 0.7121 - val_loss: 1.1737 - val_
accuracy: 0.7477
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2751 - accuracy: 0.7326 - val_loss: 1.1438 - val_
accuracy: 0.7383
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2848 - accuracy: 0.7249 - val_loss: 1.1611 - val_
accuracy: 0.7383
Epoch 193/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2828 - accuracy: 0.7378 - val_loss: 1.0833 - val_
accuracy: 0.7570
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3011 - accuracy: 0.6889 - val_loss: 1.0673 - val_
accuracy: 0.7570
Epoch 195/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2662 - accuracy: 0.7481 - val_loss: 1.0609 - val_
accuracy: 0.7617
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2926 - accuracy: 0.7275 - val_loss: 1.0765 - val_
accuracy: 0.7523
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2624 - accuracy: 0.7249 - val_loss: 1.1466 - val_
accuracy: 0.7757
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3265 - accuracy: 0.7198 - val_loss: 1.1245 - val_
accuracy: 0.7710
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2909 - accuracy: 0.7378 - val_loss: 1.1263 - val_
accuracy: 0.7570
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2664 - accuracy: 0.7172 - val_loss: 1.1183 - val_
accuracy: 0.7664
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3133 - accuracy: 0.7378 - val_loss: 1.1213 - val_
accuracy: 0.7430
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2752 - accuracy: 0.7172 - val_loss: 1.1521 - val_
accuracy: 0.7617
Epoch 203/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2519 - accuracy: 0.7121 - val_loss: 1.1341 - val_
accuracy: 0.7523
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2895 - accuracy: 0.7301 - val_loss: 1.1526 - val_
accuracy: 0.7570
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2326 - accuracy: 0.7224 - val_loss: 1.1295 - val_
accuracy: 0.7617
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2662 - accuracy: 0.7147 - val_loss: 1.0994 - val_
accuracy: 0.7617
Epoch 207/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2955 - accuracy: 0.7404 - val_loss: 1.1250 - val_
accuracy: 0.7570
Epoch 208/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3002 - accuracy: 0.7404 - val_loss: 1.1309 - val_
accuracy: 0.7477
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2286 - accuracy: 0.7301 - val_loss: 1.1481 - val_
accuracy: 0.7430
Epoch 210/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2180 - accuracy: 0.7352 - val_loss: 1.1528 - val_
accuracy: 0.7570
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2198 - accuracy: 0.7275 - val_loss: 1.1506 - val_
accuracy: 0.7477
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2115 - accuracy: 0.7301 - val_loss: 1.1255 - val_
accuracy: 0.7523
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2721 - accuracy: 0.7224 - val_loss: 1.1230 - val_
accuracy: 0.7383
Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2932 - accuracy: 0.7326 - val_loss: 1.0822 - val_
accuracy: 0.7430
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2577 - accuracy: 0.7224 - val_loss: 1.1250 - val_
accuracy: 0.7430
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2587 - accuracy: 0.7352 - val_loss: 1.0961 - val_
accuracy: 0.7383
Epoch 217/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.2626 - accuracy: 0.7249 - val_loss: 1.1280 - val_accuracy: 0.7430
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2460 - accuracy: 0.7378 - val_loss: 1.1703 - val_accuracy: 0.7383
Epoch 219/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2780 - accuracy: 0.7198 - val_loss: 1.1655 - val_accuracy: 0.7290
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2742 - accuracy: 0.7455 - val_loss: 1.1539 - val_accuracy: 0.7290
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3072 - accuracy: 0.7455 - val_loss: 1.1216 - val_accuracy: 0.7570
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2670 - accuracy: 0.7326 - val_loss: 1.1961 - val_accuracy: 0.7523
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2566 - accuracy: 0.7326 - val_loss: 1.5212 - val_accuracy: 0.7383
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2115 - accuracy: 0.7481 - val_loss: 1.5788 - val_accuracy: 0.7430
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2768 - accuracy: 0.7378 - val_loss: 1.6332 - val_accuracy: 0.7477
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3229 - accuracy: 0.7738 - val_loss: 1.5530 - val_accuracy: 0.7477
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2489 - accuracy: 0.7352 - val_loss: 1.5047 - val_accuracy: 0.7430
Epoch 228/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2969 - accuracy: 0.7532 - val_loss: 1.4002 - val_accuracy: 0.7477
Epoch 229/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2227 - accuracy: 0.7429 - val_loss: 1.5071 - val_accuracy: 0.7477
Epoch 230/1000
4/4 [=====] - 0s 18ms/step - loss: 0.2427 - accuracy: 0.7455 - val_loss: 1.4341 - val_accuracy: 0.7430
Epoch 231/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2124 - accuracy: 0.7738 - val_loss: 1.4793 - val_accuracy: 0.7383
Epoch 232/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2987 - accuracy: 0.7301 - val_loss: 1.5916 - val_accuracy: 0.7290
Epoch 233/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2504 - accuracy: 0.7506 - val_loss: 1.5132 - val_accuracy: 0.7150
Epoch 234/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2639 - accuracy: 0.7558 - val_loss: 1.4065 - val_accuracy: 0.7290
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2993 - accuracy: 0.7558 - val_loss: 1.3386 - val_accuracy: 0.7290
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2163 - accuracy: 0.7584 - val_loss: 1.3931 - val_accuracy: 0.7336
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2687 - accuracy: 0.7481 - val_loss: 1.4436 - val_accuracy: 0.7430
Epoch 238/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2359 - accuracy: 0.7378 - val_loss: 1.2802 - val_accuracy: 0.7103
Epoch 239/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2951 - accuracy: 0.7429 - val_loss: 1.3116 - val_accuracy: 0.7056
Epoch 240/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2539 - accuracy: 0.7404 - val_loss: 1.3011 - val_accuracy: 0.7009
Epoch 241/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3008 - accuracy: 0.7275 - val_loss: 1.2703 - val_accuracy: 0.7056
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2497 - accuracy: 0.7635 - val_loss: 1.3099 - val_accuracy: 0.6963
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2465 - accuracy: 0.7378 - val_loss: 1.3130 - val_accuracy: 0.7009
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2221 - accuracy: 0.7352 - val_loss: 1.2982 - val_accuracy: 0.7009
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2761 - accuracy: 0.7378 - val_loss: 1.2886 - val_accuracy: 0.6916
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2407 - accuracy: 0.7429 - val_loss: 1.2941 - val_accuracy: 0.7056
```

Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2876 - accuracy: 0.7609 - val_loss: 1.2806 - val_accuracy: 0.7056
Epoch 248/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2860 - accuracy: 0.7198 - val_loss: 1.2604 - val_accuracy: 0.6869
Epoch 249/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2680 - accuracy: 0.7301 - val_loss: 1.3127 - val_accuracy: 0.6963
Epoch 250/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2320 - accuracy: 0.7378 - val_loss: 1.5127 - val_accuracy: 0.7103
Epoch 251/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2411 - accuracy: 0.7635 - val_loss: 1.3929 - val_accuracy: 0.7056
Epoch 252/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2303 - accuracy: 0.7558 - val_loss: 1.3132 - val_accuracy: 0.7056
Epoch 253/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2198 - accuracy: 0.7275 - val_loss: 1.2473 - val_accuracy: 0.6636
Epoch 254/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2801 - accuracy: 0.7095 - val_loss: 1.1486 - val_accuracy: 0.7056
Epoch 255/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2464 - accuracy: 0.7249 - val_loss: 1.2528 - val_accuracy: 0.6729
Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2700 - accuracy: 0.6684 - val_loss: 1.3042 - val_accuracy: 0.6542
Epoch 257/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2195 - accuracy: 0.6324 - val_loss: 1.2925 - val_accuracy: 0.6729
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2855 - accuracy: 0.6452 - val_loss: 1.4305 - val_accuracy: 0.6402
Epoch 259/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3147 - accuracy: 0.6452 - val_loss: 1.2873 - val_accuracy: 0.6589
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2407 - accuracy: 0.6324 - val_loss: 1.3075 - val_accuracy: 0.6636
Epoch 261/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2981 - accuracy: 0.7121 - val_loss: 1.2631 - val_accuracy: 0.7056
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2280 - accuracy: 0.7249 - val_loss: 1.2402 - val_accuracy: 0.7383
Epoch 263/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2882 - accuracy: 0.7326 - val_loss: 1.2218 - val_accuracy: 0.7150
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3278 - accuracy: 0.7301 - val_loss: 1.1965 - val_accuracy: 0.7056
Epoch 265/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2030 - accuracy: 0.7609 - val_loss: 1.2162 - val_accuracy: 0.7243
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2365 - accuracy: 0.7429 - val_loss: 1.2582 - val_accuracy: 0.7196
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1949 - accuracy: 0.7558 - val_loss: 1.2685 - val_accuracy: 0.7196
Epoch 268/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3104 - accuracy: 0.7301 - val_loss: 1.2248 - val_accuracy: 0.7383
Epoch 269/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2041 - accuracy: 0.7686 - val_loss: 1.2138 - val_accuracy: 0.7196
Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2886 - accuracy: 0.7635 - val_loss: 1.2396 - val_accuracy: 0.7196
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3501 - accuracy: 0.7455 - val_loss: 1.3004 - val_accuracy: 0.7103
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1954 - accuracy: 0.7558 - val_loss: 1.3020 - val_accuracy: 0.7103
Epoch 273/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2170 - accuracy: 0.7172 - val_loss: 1.3357 - val_accuracy: 0.7056
Epoch 274/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2200 - accuracy: 0.7532 - val_loss: 1.3532 - val_accuracy: 0.7103
Epoch 275/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2437 - accuracy: 0.7352 - val_loss: 1.3296 - val_accuracy: 0.7103
Epoch 276/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1876 - accuracy: 0.7481 - val_loss: 1.3482 - val_accuracy: 0.7103

```
accuracy: 0.7196
Epoch 277/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2176 - accuracy: 0.7301 - val_loss: 1.5258 - val_
accuracy: 0.7103
Epoch 278/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2333 - accuracy: 0.7532 - val_loss: 1.4944 - val_
accuracy: 0.7243
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2360 - accuracy: 0.7635 - val_loss: 1.6951 - val_
accuracy: 0.7383
Epoch 280/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2865 - accuracy: 0.7584 - val_loss: 1.7742 - val_
accuracy: 0.7290
Epoch 281/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2760 - accuracy: 0.7532 - val_loss: 1.6922 - val_
accuracy: 0.7383
Epoch 282/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2520 - accuracy: 0.7558 - val_loss: 1.6935 - val_
accuracy: 0.7430
Epoch 283/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2580 - accuracy: 0.7686 - val_loss: 1.7367 - val_
accuracy: 0.7430
Epoch 284/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2297 - accuracy: 0.7558 - val_loss: 1.6483 - val_
accuracy: 0.7477
Epoch 285/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2346 - accuracy: 0.7506 - val_loss: 1.6116 - val_
accuracy: 0.7290
Epoch 286/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1985 - accuracy: 0.7686 - val_loss: 1.5968 - val_
accuracy: 0.7290
Epoch 287/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2658 - accuracy: 0.7506 - val_loss: 1.5859 - val_
accuracy: 0.7336
Epoch 288/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2225 - accuracy: 0.7506 - val_loss: 1.6163 - val_
accuracy: 0.7290
Epoch 289/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2560 - accuracy: 0.7609 - val_loss: 1.5564 - val_
accuracy: 0.7290
Epoch 290/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2658 - accuracy: 0.7763 - val_loss: 1.4366 - val_
accuracy: 0.7383
Epoch 291/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2062 - accuracy: 0.7609 - val_loss: 1.5750 - val_
accuracy: 0.7430
Epoch 292/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2424 - accuracy: 0.7661 - val_loss: 1.5428 - val_
accuracy: 0.7430
Epoch 293/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2703 - accuracy: 0.7481 - val_loss: 1.5053 - val_
accuracy: 0.7523
Epoch 294/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1905 - accuracy: 0.7481 - val_loss: 1.6249 - val_
accuracy: 0.7383
Epoch 295/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3267 - accuracy: 0.7686 - val_loss: 1.3700 - val_
accuracy: 0.7477
Epoch 296/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3029 - accuracy: 0.7532 - val_loss: 1.2987 - val_
accuracy: 0.7383
Epoch 297/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2433 - accuracy: 0.7506 - val_loss: 1.1819 - val_
accuracy: 0.7336
Epoch 298/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3516 - accuracy: 0.7686 - val_loss: 1.3467 - val_
accuracy: 0.7336
Epoch 299/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2227 - accuracy: 0.7738 - val_loss: 1.2927 - val_
accuracy: 0.7290
Epoch 300/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2863 - accuracy: 0.7763 - val_loss: 1.2241 - val_
accuracy: 0.7430
Epoch 301/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2794 - accuracy: 0.7635 - val_loss: 1.1760 - val_
accuracy: 0.7477
Epoch 302/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2413 - accuracy: 0.7635 - val_loss: 1.1828 - val_
accuracy: 0.7617
Epoch 303/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2875 - accuracy: 0.7686 - val_loss: 1.2236 - val_
accuracy: 0.7617
Epoch 304/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3114 - accuracy: 0.7506 - val_loss: 1.1696 - val_
accuracy: 0.7477
Epoch 305/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2706 - accuracy: 0.7661 - val_loss: 1.1764 - val_
accuracy: 0.7523
Epoch 306/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3771 - accuracy: 0.7661 - val_loss: 1.0808 - val_accuracy: 0.7664
Epoch 307/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1931 - accuracy: 0.7738 - val_loss: 1.0726 - val_accuracy: 0.7710
Epoch 308/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2116 - accuracy: 0.7738 - val_loss: 1.0971 - val_accuracy: 0.7664
Epoch 309/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2563 - accuracy: 0.7763 - val_loss: 1.0975 - val_accuracy: 0.7664
Epoch 310/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2292 - accuracy: 0.7661 - val_loss: 1.1287 - val_accuracy: 0.7664
Epoch 311/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2032 - accuracy: 0.7532 - val_loss: 1.1271 - val_accuracy: 0.7617
Epoch 312/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2372 - accuracy: 0.7635 - val_loss: 1.2594 - val_accuracy: 0.7664
Epoch 313/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2454 - accuracy: 0.7584 - val_loss: 1.2367 - val_accuracy: 0.7710
Epoch 314/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2786 - accuracy: 0.7738 - val_loss: 1.1319 - val_accuracy: 0.7570
Epoch 315/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2401 - accuracy: 0.7481 - val_loss: 1.1053 - val_accuracy: 0.7523
Epoch 316/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2599 - accuracy: 0.7584 - val_loss: 1.1607 - val_accuracy: 0.7523
Epoch 317/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2154 - accuracy: 0.7661 - val_loss: 1.1798 - val_accuracy: 0.7523
Epoch 318/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2384 - accuracy: 0.7866 - val_loss: 1.1414 - val_accuracy: 0.7570
Epoch 319/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2373 - accuracy: 0.7686 - val_loss: 1.1636 - val_accuracy: 0.7430
Epoch 320/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2239 - accuracy: 0.7789 - val_loss: 1.1022 - val_accuracy: 0.7383
Epoch 321/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1931 - accuracy: 0.7609 - val_loss: 1.2041 - val_accuracy: 0.7523
Epoch 322/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2873 - accuracy: 0.7635 - val_loss: 1.1928 - val_accuracy: 0.7336
Epoch 323/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2319 - accuracy: 0.7352 - val_loss: 1.1847 - val_accuracy: 0.7523
Epoch 324/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2056 - accuracy: 0.7455 - val_loss: 1.1727 - val_accuracy: 0.7477
Epoch 325/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2356 - accuracy: 0.7635 - val_loss: 1.1213 - val_accuracy: 0.7477
Epoch 326/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2275 - accuracy: 0.7532 - val_loss: 1.1519 - val_accuracy: 0.7523
Epoch 327/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2437 - accuracy: 0.7506 - val_loss: 1.1426 - val_accuracy: 0.7430
Epoch 328/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1944 - accuracy: 0.7558 - val_loss: 1.1995 - val_accuracy: 0.7103
Epoch 329/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1829 - accuracy: 0.6915 - val_loss: 1.2220 - val_accuracy: 0.7103
Epoch 330/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2742 - accuracy: 0.6787 - val_loss: 1.1481 - val_accuracy: 0.7103
Epoch 331/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2522 - accuracy: 0.6761 - val_loss: 1.1407 - val_accuracy: 0.7056
Epoch 332/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2836 - accuracy: 0.6684 - val_loss: 1.1748 - val_accuracy: 0.7290
Epoch 333/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2437 - accuracy: 0.7172 - val_loss: 1.2136 - val_accuracy: 0.7477
Epoch 334/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2810 - accuracy: 0.7147 - val_loss: 1.1964 - val_accuracy: 0.7196
Epoch 335/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2060 - accuracy: 0.6761 - val_loss: 1.2427 - val_accuracy: 0.7196
```

Epoch 336/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.1827 - accuracy: 0.7326 - val_loss: 1.1589 - val_accuracy: 0.7196
 Epoch 337/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2409 - accuracy: 0.7429 - val_loss: 1.1723 - val_accuracy: 0.7056
 Epoch 338/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2410 - accuracy: 0.7121 - val_loss: 1.1445 - val_accuracy: 0.7336
 Epoch 339/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2237 - accuracy: 0.7378 - val_loss: 1.1471 - val_accuracy: 0.7290
 Epoch 340/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.1993 - accuracy: 0.7352 - val_loss: 1.1634 - val_accuracy: 0.7383
 Epoch 341/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.2477 - accuracy: 0.7455 - val_loss: 1.1682 - val_accuracy: 0.7383
 Epoch 342/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.2123 - accuracy: 0.7532 - val_loss: 1.0809 - val_accuracy: 0.7243
 Epoch 343/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.2228 - accuracy: 0.7661 - val_loss: 1.2001 - val_accuracy: 0.7336
 Epoch 344/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2557 - accuracy: 0.7455 - val_loss: 1.1776 - val_accuracy: 0.7477
 Epoch 345/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2196 - accuracy: 0.7686 - val_loss: 1.1149 - val_accuracy: 0.7383
 Epoch 346/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.1804 - accuracy: 0.7378 - val_loss: 1.0547 - val_accuracy: 0.7290
 Epoch 347/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.1881 - accuracy: 0.7344 Restoring model weights from the end of the best epoch: 197.
 4/4 [=====] - 0s 13ms/step - loss: 0.2332 - accuracy: 0.7661 - val_loss: 1.3269 - val_accuracy: 0.7196
 Epoch 347: early stopping
 2/2 [=====] - 0s 6ms/step - loss: 0.6779 - accuracy: 0.7442
 [CV] ENDDense1=50, Dense2=50; total time= 17.4s
 Model: "sequential_64"

Layer (type)	Output Shape	Param #
dense_256 (Dense)	(None, 50)	350
batch_normalization_192 (BatchNormalization)	(None, 50)	200
activation_192 (Activation)	(None, 50)	0
dense_257 (Dense)	(None, 50)	2550
batch_normalization_193 (BatchNormalization)	(None, 50)	200
activation_193 (Activation)	(None, 50)	0
dense_258 (Dense)	(None, 10)	510
batch_normalization_194 (BatchNormalization)	(None, 10)	40
activation_194 (Activation)	(None, 10)	0
dense_259 (Dense)	(None, 2)	22

Total params: 3,872
 Trainable params: 3,652
 Non-trainable params: 220

Epoch 1/1000
 4/4 [=====] - 1s 63ms/step - loss: 4.1696 - accuracy: 0.6170 - val_loss: 5.5878 - val_accuracy: 0.4439
 Epoch 2/1000
 4/4 [=====] - 0s 14ms/step - loss: 3.3325 - accuracy: 0.5964 - val_loss: 5.1758 - val_accuracy: 0.4439
 Epoch 3/1000
 4/4 [=====] - 0s 14ms/step - loss: 2.7081 - accuracy: 0.6350 - val_loss: 4.6206 - val_accuracy: 0.5140
 Epoch 4/1000
 4/4 [=====] - 0s 14ms/step - loss: 2.4959 - accuracy: 0.6581 - val_loss: 3.9864 - val_accuracy: 0.5514
 Epoch 5/1000
 4/4 [=====] - 0s 14ms/step - loss: 2.2573 - accuracy: 0.6375 - val_loss: 2.9648 - val_accuracy: 0.6449
 Epoch 6/1000

```
4/4 [=====] - 0s 14ms/step - loss: 2.0707 - accuracy: 0.6195 - val_loss: 2.5795 - val_accuracy: 0.6589
Epoch 7/1000
4/4 [=====] - 0s 15ms/step - loss: 1.9248 - accuracy: 0.6375 - val_loss: 2.3402 - val_accuracy: 0.6636
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8574 - accuracy: 0.6041 - val_loss: 2.2534 - val_accuracy: 0.6822
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7360 - accuracy: 0.6504 - val_loss: 2.2119 - val_accuracy: 0.6449
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6061 - accuracy: 0.6658 - val_loss: 2.1748 - val_accuracy: 0.6308
Epoch 11/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6649 - accuracy: 0.6530 - val_loss: 2.1092 - val_accuracy: 0.6262
Epoch 12/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5155 - accuracy: 0.6452 - val_loss: 2.0270 - val_accuracy: 0.5981
Epoch 13/1000
4/4 [=====] - 0s 11ms/step - loss: 1.5416 - accuracy: 0.6452 - val_loss: 1.9893 - val_accuracy: 0.5654
Epoch 14/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4926 - accuracy: 0.6324 - val_loss: 1.9689 - val_accuracy: 0.5421
Epoch 15/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3687 - accuracy: 0.6452 - val_loss: 1.9563 - val_accuracy: 0.4953
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2905 - accuracy: 0.6478 - val_loss: 1.9017 - val_accuracy: 0.5140
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3376 - accuracy: 0.6555 - val_loss: 1.8877 - val_accuracy: 0.5794
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3245 - accuracy: 0.6504 - val_loss: 1.8315 - val_accuracy: 0.5888
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1544 - accuracy: 0.6452 - val_loss: 1.8235 - val_accuracy: 0.5701
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1415 - accuracy: 0.6401 - val_loss: 1.7904 - val_accuracy: 0.6308
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1517 - accuracy: 0.6170 - val_loss: 1.7425 - val_accuracy: 0.6262
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1762 - accuracy: 0.6427 - val_loss: 1.7038 - val_accuracy: 0.6308
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0206 - accuracy: 0.6170 - val_loss: 1.6817 - val_accuracy: 0.6308
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0739 - accuracy: 0.6375 - val_loss: 1.6831 - val_accuracy: 0.6262
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1147 - accuracy: 0.6478 - val_loss: 1.6736 - val_accuracy: 0.6262
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1227 - accuracy: 0.6401 - val_loss: 1.6712 - val_accuracy: 0.6262
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0703 - accuracy: 0.6298 - val_loss: 1.6514 - val_accuracy: 0.6262
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0386 - accuracy: 0.6427 - val_loss: 1.6657 - val_accuracy: 0.6168
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0916 - accuracy: 0.6375 - val_loss: 1.6694 - val_accuracy: 0.6168
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1065 - accuracy: 0.6350 - val_loss: 1.6685 - val_accuracy: 0.6168
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0260 - accuracy: 0.6427 - val_loss: 1.6299 - val_accuracy: 0.6308
Epoch 32/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9472 - accuracy: 0.6350 - val_loss: 1.5955 - val_accuracy: 0.6075
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9362 - accuracy: 0.6710 - val_loss: 1.6085 - val_accuracy: 0.6028
Epoch 34/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9190 - accuracy: 0.6530 - val_loss: 1.6008 - val_accuracy: 0.6075
Epoch 35/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9797 - accuracy: 0.6427 - val_loss: 1.5526 - val_accuracy: 0.6168
```

Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9374 - accuracy: 0.6478 - val_loss: 1.5619 - val_accuracy: 0.6121
Epoch 37/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9449 - accuracy: 0.6350 - val_loss: 1.5451 - val_accuracy: 0.6028
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9766 - accuracy: 0.6401 - val_loss: 1.5440 - val_accuracy: 0.5981
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9500 - accuracy: 0.6375 - val_loss: 1.5347 - val_accuracy: 0.5981
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9907 - accuracy: 0.6555 - val_loss: 1.5441 - val_accuracy: 0.5981
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9136 - accuracy: 0.6478 - val_loss: 1.5332 - val_accuracy: 0.5935
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8399 - accuracy: 0.6632 - val_loss: 1.5006 - val_accuracy: 0.6028
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8634 - accuracy: 0.6889 - val_loss: 1.4465 - val_accuracy: 0.5981
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9570 - accuracy: 0.6581 - val_loss: 1.4272 - val_accuracy: 0.5888
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8665 - accuracy: 0.6581 - val_loss: 1.4175 - val_accuracy: 0.5935
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8899 - accuracy: 0.6787 - val_loss: 1.3889 - val_accuracy: 0.5841
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9038 - accuracy: 0.6684 - val_loss: 1.3778 - val_accuracy: 0.5794
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7976 - accuracy: 0.6632 - val_loss: 1.3536 - val_accuracy: 0.5841
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8558 - accuracy: 0.6555 - val_loss: 1.3065 - val_accuracy: 0.5888
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8088 - accuracy: 0.6452 - val_loss: 1.2693 - val_accuracy: 0.5841
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8503 - accuracy: 0.6555 - val_loss: 1.2420 - val_accuracy: 0.5654
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9353 - accuracy: 0.6504 - val_loss: 1.2373 - val_accuracy: 0.5794
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9470 - accuracy: 0.6787 - val_loss: 1.2049 - val_accuracy: 0.5841
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8371 - accuracy: 0.7018 - val_loss: 1.1688 - val_accuracy: 0.5981
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8799 - accuracy: 0.6915 - val_loss: 1.1761 - val_accuracy: 0.6121
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8783 - accuracy: 0.6787 - val_loss: 1.1425 - val_accuracy: 0.6075
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8110 - accuracy: 0.6967 - val_loss: 1.1479 - val_accuracy: 0.6075
Epoch 58/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7092 - accuracy: 0.6710 - val_loss: 1.1291 - val_accuracy: 0.6075
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6646 - accuracy: 0.7018 - val_loss: 1.1430 - val_accuracy: 0.5748
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7673 - accuracy: 0.6812 - val_loss: 1.1569 - val_accuracy: 0.5841
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7676 - accuracy: 0.6967 - val_loss: 1.1206 - val_accuracy: 0.5888
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7093 - accuracy: 0.6838 - val_loss: 1.1083 - val_accuracy: 0.5935
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6962 - accuracy: 0.6967 - val_loss: 1.0685 - val_accuracy: 0.5748
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6071 - accuracy: 0.6838 - val_loss: 1.0387 - val_accuracy: 0.5935
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6172 - accuracy: 0.6787 - val_loss: 1.0395 - val_accuracy: 0.5935

```
accuracy: 0.5841
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6259 - accuracy: 0.6787 - val_loss: 1.0676 - val_
accuracy: 0.5748
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6749 - accuracy: 0.6812 - val_loss: 1.0837 - val_
accuracy: 0.5841
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6450 - accuracy: 0.6812 - val_loss: 1.0861 - val_
accuracy: 0.5888
Epoch 69/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7066 - accuracy: 0.7095 - val_loss: 1.0681 - val_
accuracy: 0.5935
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6876 - accuracy: 0.6915 - val_loss: 1.0743 - val_
accuracy: 0.5561
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5666 - accuracy: 0.7018 - val_loss: 1.0928 - val_
accuracy: 0.5467
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6383 - accuracy: 0.7095 - val_loss: 1.0279 - val_
accuracy: 0.5654
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5945 - accuracy: 0.7147 - val_loss: 1.0139 - val_
accuracy: 0.5748
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5193 - accuracy: 0.7429 - val_loss: 0.9997 - val_
accuracy: 0.5981
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6587 - accuracy: 0.7404 - val_loss: 0.9884 - val_
accuracy: 0.6121
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7650 - accuracy: 0.7455 - val_loss: 0.9570 - val_
accuracy: 0.5981
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7105 - accuracy: 0.7326 - val_loss: 0.9674 - val_
accuracy: 0.6075
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5818 - accuracy: 0.7275 - val_loss: 0.9479 - val_
accuracy: 0.5935
Epoch 79/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6015 - accuracy: 0.7069 - val_loss: 0.9267 - val_
accuracy: 0.5888
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5716 - accuracy: 0.7404 - val_loss: 0.9065 - val_
accuracy: 0.6215
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5628 - accuracy: 0.7275 - val_loss: 0.9135 - val_
accuracy: 0.6215
Epoch 82/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6315 - accuracy: 0.7249 - val_loss: 0.9027 - val_
accuracy: 0.6308
Epoch 83/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4837 - accuracy: 0.7378 - val_loss: 0.8803 - val_
accuracy: 0.6542
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6117 - accuracy: 0.7018 - val_loss: 0.8458 - val_
accuracy: 0.6402
Epoch 85/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4886 - accuracy: 0.7352 - val_loss: 0.8796 - val_
accuracy: 0.6822
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6193 - accuracy: 0.7095 - val_loss: 0.8847 - val_
accuracy: 0.6869
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5383 - accuracy: 0.7326 - val_loss: 0.8703 - val_
accuracy: 0.6916
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5851 - accuracy: 0.7172 - val_loss: 0.8606 - val_
accuracy: 0.6916
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4813 - accuracy: 0.7147 - val_loss: 0.8549 - val_
accuracy: 0.6869
Epoch 90/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5140 - accuracy: 0.7121 - val_loss: 0.8514 - val_
accuracy: 0.7009
Epoch 91/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4597 - accuracy: 0.7249 - val_loss: 0.8555 - val_
accuracy: 0.7056
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5250 - accuracy: 0.7275 - val_loss: 0.8264 - val_
accuracy: 0.6776
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5563 - accuracy: 0.7326 - val_loss: 0.8230 - val_
accuracy: 0.6776
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4748 - accuracy: 0.7532 - val_loss: 0.8163 - val_
accuracy: 0.6822
Epoch 95/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.4532 - accuracy: 0.7506 - val_loss: 0.8004 - val_accuracy: 0.6869
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4389 - accuracy: 0.7378 - val_loss: 0.7422 - val_accuracy: 0.6869
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4920 - accuracy: 0.7404 - val_loss: 0.7387 - val_accuracy: 0.6776
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4797 - accuracy: 0.7147 - val_loss: 0.7367 - val_accuracy: 0.6916
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4323 - accuracy: 0.7352 - val_loss: 0.8086 - val_accuracy: 0.6963
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4294 - accuracy: 0.7404 - val_loss: 0.7928 - val_accuracy: 0.7056
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6435 - accuracy: 0.7661 - val_loss: 0.7592 - val_accuracy: 0.6822
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4661 - accuracy: 0.7481 - val_loss: 0.7906 - val_accuracy: 0.6963
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4381 - accuracy: 0.7481 - val_loss: 0.7792 - val_accuracy: 0.6869
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5176 - accuracy: 0.7352 - val_loss: 0.7833 - val_accuracy: 0.6963
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4759 - accuracy: 0.7763 - val_loss: 0.8116 - val_accuracy: 0.7150
Epoch 106/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4652 - accuracy: 0.7558 - val_loss: 0.8621 - val_accuracy: 0.7009
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4464 - accuracy: 0.7378 - val_loss: 0.8662 - val_accuracy: 0.7009
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3892 - accuracy: 0.7326 - val_loss: 0.8633 - val_accuracy: 0.7150
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4565 - accuracy: 0.7584 - val_loss: 0.9049 - val_accuracy: 0.6963
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4587 - accuracy: 0.7532 - val_loss: 0.9016 - val_accuracy: 0.6963
Epoch 111/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4423 - accuracy: 0.7609 - val_loss: 0.8991 - val_accuracy: 0.6729
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4621 - accuracy: 0.7532 - val_loss: 0.8427 - val_accuracy: 0.6636
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4756 - accuracy: 0.7609 - val_loss: 0.8033 - val_accuracy: 0.6589
Epoch 114/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4090 - accuracy: 0.7609 - val_loss: 0.8240 - val_accuracy: 0.6542
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3669 - accuracy: 0.7789 - val_loss: 0.8436 - val_accuracy: 0.6495
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5288 - accuracy: 0.7763 - val_loss: 0.7842 - val_accuracy: 0.6542
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5037 - accuracy: 0.7404 - val_loss: 0.8288 - val_accuracy: 0.6682
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3442 - accuracy: 0.7635 - val_loss: 0.7962 - val_accuracy: 0.6495
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4588 - accuracy: 0.7712 - val_loss: 0.8512 - val_accuracy: 0.6449
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4223 - accuracy: 0.7532 - val_loss: 0.8581 - val_accuracy: 0.6542
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3219 - accuracy: 0.7584 - val_loss: 0.9029 - val_accuracy: 0.6542
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4418 - accuracy: 0.7558 - val_loss: 0.9447 - val_accuracy: 0.6729
Epoch 123/1000
4/4 [=====] - 0s 18ms/step - loss: 0.3416 - accuracy: 0.7455 - val_loss: 0.9968 - val_accuracy: 0.6682
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4238 - accuracy: 0.7584 - val_loss: 0.9988 - val_accuracy: 0.6542
```

```
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3911 - accuracy: 0.7661 - val_loss: 0.9095 - val_accuracy: 0.6402
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4853 - accuracy: 0.7686 - val_loss: 0.9498 - val_accuracy: 0.6402
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4497 - accuracy: 0.7609 - val_loss: 0.9977 - val_accuracy: 0.6355
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3402 - accuracy: 0.7738 - val_loss: 0.9876 - val_accuracy: 0.6402
Epoch 129/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3512 - accuracy: 0.7481 - val_loss: 0.9639 - val_accuracy: 0.6262
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3649 - accuracy: 0.7506 - val_loss: 1.0910 - val_accuracy: 0.6355
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2991 - accuracy: 0.7635 - val_loss: 1.0902 - val_accuracy: 0.6215
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4183 - accuracy: 0.7506 - val_loss: 1.0046 - val_accuracy: 0.6168
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3657 - accuracy: 0.7635 - val_loss: 1.0319 - val_accuracy: 0.6308
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3222 - accuracy: 0.7609 - val_loss: 1.0297 - val_accuracy: 0.6262
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3864 - accuracy: 0.7686 - val_loss: 1.0603 - val_accuracy: 0.6308
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3419 - accuracy: 0.7661 - val_loss: 0.9456 - val_accuracy: 0.6308
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3929 - accuracy: 0.7712 - val_loss: 1.0060 - val_accuracy: 0.6262
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2983 - accuracy: 0.7558 - val_loss: 0.9389 - val_accuracy: 0.6449
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3422 - accuracy: 0.7763 - val_loss: 0.9610 - val_accuracy: 0.6215
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3519 - accuracy: 0.7635 - val_loss: 0.9740 - val_accuracy: 0.6355
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3436 - accuracy: 0.7712 - val_loss: 0.9327 - val_accuracy: 0.6402
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4215 - accuracy: 0.7506 - val_loss: 0.9360 - val_accuracy: 0.6355
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3687 - accuracy: 0.7404 - val_loss: 0.9853 - val_accuracy: 0.6449
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3049 - accuracy: 0.7506 - val_loss: 0.9260 - val_accuracy: 0.6449
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3666 - accuracy: 0.7326 - val_loss: 0.9447 - val_accuracy: 0.6495
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3733 - accuracy: 0.7609 - val_loss: 0.9497 - val_accuracy: 0.6542
Epoch 147/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3112 - accuracy: 0.7661 - val_loss: 0.9394 - val_accuracy: 0.6355
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2909 - accuracy: 0.7352 - val_loss: 0.9853 - val_accuracy: 0.6308
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4159 - accuracy: 0.7121 - val_loss: 0.9372 - val_accuracy: 0.6262
Epoch 150/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3581 - accuracy: 0.7404 - val_loss: 0.9227 - val_accuracy: 0.6355
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2753 - accuracy: 0.7481 - val_loss: 0.8946 - val_accuracy: 0.6495
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2783 - accuracy: 0.7224 - val_loss: 0.8342 - val_accuracy: 0.6308
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2775 - accuracy: 0.7404 - val_loss: 0.8337 - val_accuracy: 0.6449
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2589 - accuracy: 0.7249 - val_loss: 0.8677 - val_accuracy: 0.6449
```

accuracy: 0.6449
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3276 - accuracy: 0.7326 - val_loss: 1.0225 - val_accuracy: 0.6589
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3934 - accuracy: 0.7224 - val_loss: 0.9925 - val_accuracy: 0.6308
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3149 - accuracy: 0.7352 - val_loss: 1.0084 - val_accuracy: 0.6449
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3296 - accuracy: 0.7481 - val_loss: 0.9762 - val_accuracy: 0.6916
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3699 - accuracy: 0.7147 - val_loss: 1.0030 - val_accuracy: 0.6822
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3594 - accuracy: 0.7429 - val_loss: 1.0248 - val_accuracy: 0.6589
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2979 - accuracy: 0.7506 - val_loss: 1.0244 - val_accuracy: 0.6542
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3589 - accuracy: 0.7172 - val_loss: 0.9544 - val_accuracy: 0.6589
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3238 - accuracy: 0.7429 - val_loss: 1.0325 - val_accuracy: 0.6542
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3689 - accuracy: 0.7249 - val_loss: 1.0585 - val_accuracy: 0.6402
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2567 - accuracy: 0.7429 - val_loss: 1.1169 - val_accuracy: 0.6495
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2927 - accuracy: 0.7378 - val_loss: 1.0994 - val_accuracy: 0.6542
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2966 - accuracy: 0.7404 - val_loss: 1.1676 - val_accuracy: 0.6589
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2605 - accuracy: 0.7301 - val_loss: 1.1182 - val_accuracy: 0.6542
Epoch 169/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2726 - accuracy: 0.7378 - val_loss: 1.0691 - val_accuracy: 0.6636
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2555 - accuracy: 0.7378 - val_loss: 1.0512 - val_accuracy: 0.6636
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3129 - accuracy: 0.7224 - val_loss: 1.0649 - val_accuracy: 0.6402
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3076 - accuracy: 0.7275 - val_loss: 1.0713 - val_accuracy: 0.6449
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3433 - accuracy: 0.7069 - val_loss: 1.1176 - val_accuracy: 0.6308
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2540 - accuracy: 0.7249 - val_loss: 1.2282 - val_accuracy: 0.6495
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3148 - accuracy: 0.6915 - val_loss: 1.1027 - val_accuracy: 0.6449
Epoch 176/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2901 - accuracy: 0.7121 - val_loss: 1.1527 - val_accuracy: 0.6355
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3106 - accuracy: 0.7069 - val_loss: 1.1239 - val_accuracy: 0.6449
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3559 - accuracy: 0.7121 - val_loss: 1.2186 - val_accuracy: 0.6776
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2716 - accuracy: 0.7121 - val_loss: 1.4429 - val_accuracy: 0.6822
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2785 - accuracy: 0.7455 - val_loss: 1.5544 - val_accuracy: 0.6869
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3607 - accuracy: 0.7172 - val_loss: 1.6515 - val_accuracy: 0.6729
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3778 - accuracy: 0.7455 - val_loss: 1.6826 - val_accuracy: 0.7009
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3235 - accuracy: 0.7352 - val_loss: 1.6212 - val_accuracy: 0.6963
Epoch 184/1000

```
4/4 [=====] - 0s 14ms/step - loss: 0.2717 - accuracy: 0.7224 - val_loss: 1.6943 - val_accuracy: 0.6869
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3003 - accuracy: 0.7609 - val_loss: 1.6497 - val_accuracy: 0.6869
Epoch 186/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3337 - accuracy: 0.7429 - val_loss: 1.5636 - val_accuracy: 0.6822
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3260 - accuracy: 0.7326 - val_loss: 1.5247 - val_accuracy: 0.6729
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2883 - accuracy: 0.7275 - val_loss: 1.4066 - val_accuracy: 0.6682
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3815 - accuracy: 0.7198 - val_loss: 1.3845 - val_accuracy: 0.6682
Epoch 190/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3097 - accuracy: 0.7301 - val_loss: 1.3963 - val_accuracy: 0.6729
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2784 - accuracy: 0.7301 - val_loss: 1.3540 - val_accuracy: 0.6636
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2874 - accuracy: 0.7275 - val_loss: 1.3654 - val_accuracy: 0.6682
Epoch 193/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2701 - accuracy: 0.7275 - val_loss: 1.3841 - val_accuracy: 0.6589
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2847 - accuracy: 0.7378 - val_loss: 1.3826 - val_accuracy: 0.6776
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2584 - accuracy: 0.7635 - val_loss: 1.3529 - val_accuracy: 0.6869
Epoch 196/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3306 - accuracy: 0.7686 - val_loss: 1.3290 - val_accuracy: 0.6869
Epoch 197/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2969 - accuracy: 0.7429 - val_loss: 1.3424 - val_accuracy: 0.6776
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2781 - accuracy: 0.7686 - val_loss: 1.3481 - val_accuracy: 0.6636
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4002 - accuracy: 0.7224 - val_loss: 1.3004 - val_accuracy: 0.6589
Epoch 200/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2939 - accuracy: 0.7326 - val_loss: 1.3416 - val_accuracy: 0.6495
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2216 - accuracy: 0.7584 - val_loss: 1.4182 - val_accuracy: 0.6402
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2568 - accuracy: 0.7455 - val_loss: 1.3592 - val_accuracy: 0.6449
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2748 - accuracy: 0.7481 - val_loss: 1.3854 - val_accuracy: 0.6449
Epoch 204/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2643 - accuracy: 0.7147 - val_loss: 1.3803 - val_accuracy: 0.6542
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2113 - accuracy: 0.7172 - val_loss: 1.4298 - val_accuracy: 0.6682
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3422 - accuracy: 0.6992 - val_loss: 1.4152 - val_accuracy: 0.6542
Epoch 207/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2006 - accuracy: 0.7198 - val_loss: 1.3818 - val_accuracy: 0.6589
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2959 - accuracy: 0.7249 - val_loss: 1.4156 - val_accuracy: 0.6589
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2464 - accuracy: 0.7429 - val_loss: 1.4164 - val_accuracy: 0.6589
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3263 - accuracy: 0.7275 - val_loss: 1.3923 - val_accuracy: 0.6542
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2865 - accuracy: 0.7404 - val_loss: 1.3081 - val_accuracy: 0.6402
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2302 - accuracy: 0.7275 - val_loss: 1.2249 - val_accuracy: 0.6402
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2975 - accuracy: 0.7301 - val_loss: 1.3265 - val_accuracy: 0.6589
```

Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2795 - accuracy: 0.7378 - val_loss: 1.2725 - val_accuracy: 0.6589
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3777 - accuracy: 0.7018 - val_loss: 1.2444 - val_accuracy: 0.6636
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2671 - accuracy: 0.7429 - val_loss: 1.3055 - val_accuracy: 0.6542
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2635 - accuracy: 0.7275 - val_loss: 1.5381 - val_accuracy: 0.6916
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4128 - accuracy: 0.7301 - val_loss: 1.4581 - val_accuracy: 0.6682
Epoch 219/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2522 - accuracy: 0.7378 - val_loss: 1.3481 - val_accuracy: 0.6636
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3981 - accuracy: 0.7481 - val_loss: 1.3353 - val_accuracy: 0.6682
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2725 - accuracy: 0.7352 - val_loss: 1.2835 - val_accuracy: 0.6776
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2602 - accuracy: 0.7635 - val_loss: 1.2009 - val_accuracy: 0.6916
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4289 - accuracy: 0.7532 - val_loss: 1.2208 - val_accuracy: 0.6869
Epoch 224/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2381 - accuracy: 0.7635 - val_loss: 1.2046 - val_accuracy: 0.7056
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2300 - accuracy: 0.7532 - val_loss: 1.2767 - val_accuracy: 0.6869
Epoch 226/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2306 - accuracy: 0.7584 - val_loss: 1.2665 - val_accuracy: 0.6869
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2835 - accuracy: 0.7635 - val_loss: 1.2623 - val_accuracy: 0.6682
Epoch 228/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2130 - accuracy: 0.7789 - val_loss: 1.2886 - val_accuracy: 0.6776
Epoch 229/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3237 - accuracy: 0.7301 - val_loss: 1.2506 - val_accuracy: 0.6776
Epoch 230/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3055 - accuracy: 0.7506 - val_loss: 1.2810 - val_accuracy: 0.6963
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2604 - accuracy: 0.7378 - val_loss: 1.3763 - val_accuracy: 0.7103
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2381 - accuracy: 0.7661 - val_loss: 1.2895 - val_accuracy: 0.7103
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2979 - accuracy: 0.7481 - val_loss: 1.3701 - val_accuracy: 0.7056
Epoch 234/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2387 - accuracy: 0.7352 - val_loss: 1.3161 - val_accuracy: 0.6963
Epoch 235/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2123 - accuracy: 0.7455 - val_loss: 1.2324 - val_accuracy: 0.6869
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2613 - accuracy: 0.7815 - val_loss: 1.1192 - val_accuracy: 0.6682
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2914 - accuracy: 0.7635 - val_loss: 1.1929 - val_accuracy: 0.6729
Epoch 238/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2494 - accuracy: 0.7558 - val_loss: 1.1858 - val_accuracy: 0.6589
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2537 - accuracy: 0.7661 - val_loss: 1.2280 - val_accuracy: 0.6589
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3241 - accuracy: 0.7609 - val_loss: 1.2639 - val_accuracy: 0.6776
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2593 - accuracy: 0.7635 - val_loss: 1.3196 - val_accuracy: 0.6589
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2733 - accuracy: 0.7609 - val_loss: 1.3238 - val_accuracy: 0.6589
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2067 - accuracy: 0.7558 - val_loss: 1.2627 - val_accuracy: 0.6589

```

accuracy: 0.6916
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2551 - accuracy: 0.7609 - val_loss: 1.3844 - val_accuracy: 0.6449
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3492 - accuracy: 0.7429 - val_loss: 1.3537 - val_accuracy: 0.6636
Epoch 246/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2788 - accuracy: 0.7506 - val_loss: 1.4180 - val_accuracy: 0.6682
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4067 - accuracy: 0.7352 - val_loss: 1.3772 - val_accuracy: 0.6636
Epoch 248/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3265 - accuracy: 0.7609 - val_loss: 1.3334 - val_accuracy: 0.6589
Epoch 249/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2044 - accuracy: 0.7789 - val_loss: 1.2995 - val_accuracy: 0.6636
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2607 - accuracy: 0.7352 - val_loss: 1.3020 - val_accuracy: 0.6729
Epoch 251/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3721 - accuracy: 0.7481 - val_loss: 1.2986 - val_accuracy: 0.6542
Epoch 252/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1870 - accuracy: 0.7738 - val_loss: 1.2948 - val_accuracy: 0.6589
Epoch 253/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2705 - accuracy: 0.7609 - val_loss: 1.2441 - val_accuracy: 0.6495
Epoch 254/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2379 - accuracy: 0.7249 - val_loss: 1.3090 - val_accuracy: 0.6776
Epoch 255/1000
1/4 [====>.....] - ETA: 0s - loss: 0.1440 - accuracy: 0.7891Restoring model weights from the end of the best epoch: 105.
4/4 [=====] - 0s 15ms/step - loss: 0.2016 - accuracy: 0.7584 - val_loss: 1.2152 - val_accuracy: 0.6636
Epoch 255: early stopping
2/2 [=====] - 0s 4ms/step - loss: 0.8096 - accuracy: 0.8140
[CV] END .....Dense1=50, Dense2=50; total time= 12.9s
Model: "sequential_65"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_260 (Dense)	(None, 50)	350
batch_normalization_195 (BatchNormalization)	(None, 50)	200
activation_195 (Activation)	(None, 50)	0
dense_261 (Dense)	(None, 50)	2550
batch_normalization_196 (BatchNormalization)	(None, 50)	200
activation_196 (Activation)	(None, 50)	0
dense_262 (Dense)	(None, 10)	510
batch_normalization_197 (BatchNormalization)	(None, 10)	40
activation_197 (Activation)	(None, 10)	0
dense_263 (Dense)	(None, 2)	22
<hr/>		

Total params: 3,872
Trainable params: 3,652
Non-trainable params: 220

```

Epoch 1/1000
4/4 [=====] - 1s 55ms/step - loss: 4.8759 - accuracy: 0.5193 - val_loss: 2.4159 - val_accuracy: 0.4393
Epoch 2/1000
4/4 [=====] - 0s 15ms/step - loss: 3.4355 - accuracy: 0.5296 - val_loss: 2.2812 - val_accuracy: 0.4439
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1772 - accuracy: 0.5476 - val_loss: 2.1195 - val_accuracy: 0.4626
Epoch 4/1000
4/4 [=====] - 0s 15ms/step - loss: 2.8349 - accuracy: 0.5527 - val_loss: 2.1038 - val_accuracy: 0.4766
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6589 - accuracy: 0.5373 - val_loss: 2.0610 - val_accuracy: 0.4860

```

Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6001 - accuracy: 0.5373 - val_loss: 2.0527 - val_accuracy: 0.4860
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4055 - accuracy: 0.5321 - val_loss: 2.1198 - val_accuracy: 0.4860
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3697 - accuracy: 0.5424 - val_loss: 2.0215 - val_accuracy: 0.4720
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1499 - accuracy: 0.5450 - val_loss: 1.9477 - val_accuracy: 0.4766
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0501 - accuracy: 0.5707 - val_loss: 1.9096 - val_accuracy: 0.4626
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1080 - accuracy: 0.5861 - val_loss: 1.8623 - val_accuracy: 0.4766
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0947 - accuracy: 0.5810 - val_loss: 1.8320 - val_accuracy: 0.4720
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9660 - accuracy: 0.5501 - val_loss: 1.7953 - val_accuracy: 0.4579
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7605 - accuracy: 0.5398 - val_loss: 1.8146 - val_accuracy: 0.4533
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7004 - accuracy: 0.5604 - val_loss: 1.7993 - val_accuracy: 0.4533
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5201 - accuracy: 0.5296 - val_loss: 1.7602 - val_accuracy: 0.4486
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4649 - accuracy: 0.5578 - val_loss: 1.7467 - val_accuracy: 0.4486
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5507 - accuracy: 0.5656 - val_loss: 1.7340 - val_accuracy: 0.4439
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2918 - accuracy: 0.5398 - val_loss: 1.7365 - val_accuracy: 0.4486
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2160 - accuracy: 0.5810 - val_loss: 1.6780 - val_accuracy: 0.4533
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4010 - accuracy: 0.5733 - val_loss: 1.6573 - val_accuracy: 0.4579
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0688 - accuracy: 0.5964 - val_loss: 1.6086 - val_accuracy: 0.4579
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1310 - accuracy: 0.5784 - val_loss: 1.5652 - val_accuracy: 0.4533
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0604 - accuracy: 0.5913 - val_loss: 1.5659 - val_accuracy: 0.4720
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0374 - accuracy: 0.6118 - val_loss: 1.5263 - val_accuracy: 0.4673
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1058 - accuracy: 0.6118 - val_loss: 1.5135 - val_accuracy: 0.4860
Epoch 27/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0641 - accuracy: 0.5887 - val_loss: 1.5204 - val_accuracy: 0.4907
Epoch 28/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8917 - accuracy: 0.5990 - val_loss: 1.5154 - val_accuracy: 0.5140
Epoch 29/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0210 - accuracy: 0.6067 - val_loss: 1.4890 - val_accuracy: 0.5607
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8816 - accuracy: 0.6144 - val_loss: 1.4779 - val_accuracy: 0.5467
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8259 - accuracy: 0.6298 - val_loss: 1.4665 - val_accuracy: 0.5374
Epoch 32/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8694 - accuracy: 0.6504 - val_loss: 1.5037 - val_accuracy: 0.5935
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8465 - accuracy: 0.6530 - val_loss: 1.4911 - val_accuracy: 0.5841
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9548 - accuracy: 0.6221 - val_loss: 1.4786 - val_accuracy: 0.6028
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8015 - accuracy: 0.6427 - val_loss: 1.4451 - val_accuracy: 0.5935

```
accuracy: 0.6028
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9301 - accuracy: 0.6401 - val_loss: 1.4309 - val_accuracy: 0.5981
Epoch 37/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7395 - accuracy: 0.6607 - val_loss: 1.3967 - val_accuracy: 0.6028
Epoch 38/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8903 - accuracy: 0.6530 - val_loss: 1.3792 - val_accuracy: 0.5841
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8642 - accuracy: 0.6478 - val_loss: 1.3287 - val_accuracy: 0.5981
Epoch 40/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7165 - accuracy: 0.6452 - val_loss: 1.3257 - val_accuracy: 0.5981
Epoch 41/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6816 - accuracy: 0.6401 - val_loss: 1.3020 - val_accuracy: 0.6075
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7682 - accuracy: 0.6555 - val_loss: 1.2647 - val_accuracy: 0.6168
Epoch 43/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6840 - accuracy: 0.6555 - val_loss: 1.2713 - val_accuracy: 0.6028
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7521 - accuracy: 0.6478 - val_loss: 1.2658 - val_accuracy: 0.5981
Epoch 45/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5911 - accuracy: 0.6427 - val_loss: 1.2280 - val_accuracy: 0.6121
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7776 - accuracy: 0.6504 - val_loss: 1.2358 - val_accuracy: 0.6121
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6684 - accuracy: 0.6555 - val_loss: 1.2165 - val_accuracy: 0.6121
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6982 - accuracy: 0.6427 - val_loss: 1.2054 - val_accuracy: 0.6168
Epoch 49/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6389 - accuracy: 0.6555 - val_loss: 1.2067 - val_accuracy: 0.6215
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7274 - accuracy: 0.6478 - val_loss: 1.1666 - val_accuracy: 0.6215
Epoch 51/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5404 - accuracy: 0.6581 - val_loss: 1.1612 - val_accuracy: 0.6168
Epoch 52/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5968 - accuracy: 0.6298 - val_loss: 1.1247 - val_accuracy: 0.6121
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7938 - accuracy: 0.6812 - val_loss: 1.1050 - val_accuracy: 0.6121
Epoch 54/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6578 - accuracy: 0.6787 - val_loss: 1.0736 - val_accuracy: 0.6168
Epoch 55/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6060 - accuracy: 0.6607 - val_loss: 1.0473 - val_accuracy: 0.6355
Epoch 56/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6002 - accuracy: 0.6607 - val_loss: 1.0265 - val_accuracy: 0.6495
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5932 - accuracy: 0.6684 - val_loss: 1.0150 - val_accuracy: 0.6449
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5780 - accuracy: 0.6658 - val_loss: 0.9841 - val_accuracy: 0.6682
Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5224 - accuracy: 0.6812 - val_loss: 0.9569 - val_accuracy: 0.6729
Epoch 60/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5031 - accuracy: 0.6812 - val_loss: 0.9298 - val_accuracy: 0.6729
Epoch 61/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6889 - accuracy: 0.6915 - val_loss: 0.9113 - val_accuracy: 0.6776
Epoch 62/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5379 - accuracy: 0.6992 - val_loss: 0.8961 - val_accuracy: 0.6916
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5686 - accuracy: 0.6838 - val_loss: 0.8810 - val_accuracy: 0.6589
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5712 - accuracy: 0.6478 - val_loss: 0.8470 - val_accuracy: 0.6682
Epoch 65/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.5078 - accuracy: 0.6735 - val_loss: 0.8633 - val_accuracy: 0.6636
Epoch 66/1000
4/4 [=====] - 0s 17ms/step - loss: 0.6747 - accuracy: 0.6452 - val_loss: 0.8122 - val_accuracy: 0.6589
Epoch 67/1000
4/4 [=====] - 0s 16ms/step - loss: 0.6416 - accuracy: 0.6787 - val_loss: 0.8081 - val_accuracy: 0.6542
Epoch 68/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4994 - accuracy: 0.6864 - val_loss: 0.8121 - val_accuracy: 0.6589
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5317 - accuracy: 0.6838 - val_loss: 0.8009 - val_accuracy: 0.6636
Epoch 70/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4950 - accuracy: 0.6915 - val_loss: 0.7989 - val_accuracy: 0.6495
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5198 - accuracy: 0.6761 - val_loss: 0.8051 - val_accuracy: 0.6542
Epoch 72/1000
4/4 [=====] - 0s 21ms/step - loss: 0.4864 - accuracy: 0.6735 - val_loss: 0.7910 - val_accuracy: 0.6449
Epoch 73/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5134 - accuracy: 0.6478 - val_loss: 0.7852 - val_accuracy: 0.6495
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5371 - accuracy: 0.6889 - val_loss: 0.7826 - val_accuracy: 0.6402
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4444 - accuracy: 0.6838 - val_loss: 0.7718 - val_accuracy: 0.6355
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5128 - accuracy: 0.6710 - val_loss: 0.7655 - val_accuracy: 0.6542
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4255 - accuracy: 0.6941 - val_loss: 0.7553 - val_accuracy: 0.6542
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4737 - accuracy: 0.6889 - val_loss: 0.7463 - val_accuracy: 0.6495
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5629 - accuracy: 0.6915 - val_loss: 0.7424 - val_accuracy: 0.6542
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4600 - accuracy: 0.6889 - val_loss: 0.7382 - val_accuracy: 0.5654
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5113 - accuracy: 0.6195 - val_loss: 0.7273 - val_accuracy: 0.5701
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4800 - accuracy: 0.6118 - val_loss: 0.7202 - val_accuracy: 0.5841
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5012 - accuracy: 0.6452 - val_loss: 0.7161 - val_accuracy: 0.5841
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5169 - accuracy: 0.6093 - val_loss: 0.7060 - val_accuracy: 0.5935
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4393 - accuracy: 0.6555 - val_loss: 0.6948 - val_accuracy: 0.5935
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4918 - accuracy: 0.6452 - val_loss: 0.6721 - val_accuracy: 0.5981
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4357 - accuracy: 0.6504 - val_loss: 0.6680 - val_accuracy: 0.5935
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4272 - accuracy: 0.6375 - val_loss: 0.6851 - val_accuracy: 0.6121
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5427 - accuracy: 0.6324 - val_loss: 0.6680 - val_accuracy: 0.6028
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4695 - accuracy: 0.6504 - val_loss: 0.6991 - val_accuracy: 0.6822
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4679 - accuracy: 0.7275 - val_loss: 0.6864 - val_accuracy: 0.6916
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4612 - accuracy: 0.6812 - val_loss: 0.7045 - val_accuracy: 0.6682
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5093 - accuracy: 0.7121 - val_loss: 0.7052 - val_accuracy: 0.6589
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5143 - accuracy: 0.6864 - val_loss: 0.6928 - val_accuracy: 0.6589
```

Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4024 - accuracy: 0.7069 - val_loss: 0.6716 - val_accuracy: 0.6729
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5468 - accuracy: 0.6967 - val_loss: 0.6326 - val_accuracy: 0.6916
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5407 - accuracy: 0.6992 - val_loss: 0.6284 - val_accuracy: 0.6916
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5488 - accuracy: 0.7121 - val_loss: 0.6503 - val_accuracy: 0.6729
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4828 - accuracy: 0.6735 - val_loss: 0.6562 - val_accuracy: 0.6636
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5182 - accuracy: 0.6889 - val_loss: 0.6192 - val_accuracy: 0.6682
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3742 - accuracy: 0.7069 - val_loss: 0.6164 - val_accuracy: 0.6589
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4578 - accuracy: 0.7044 - val_loss: 0.6419 - val_accuracy: 0.6589
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4160 - accuracy: 0.6838 - val_loss: 0.6637 - val_accuracy: 0.6636
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4090 - accuracy: 0.7172 - val_loss: 0.6366 - val_accuracy: 0.6729
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3606 - accuracy: 0.7249 - val_loss: 0.6386 - val_accuracy: 0.6729
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4867 - accuracy: 0.6915 - val_loss: 0.6379 - val_accuracy: 0.6729
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4303 - accuracy: 0.6812 - val_loss: 0.6413 - val_accuracy: 0.6589
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4693 - accuracy: 0.7044 - val_loss: 0.6593 - val_accuracy: 0.6589
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5749 - accuracy: 0.6941 - val_loss: 0.6485 - val_accuracy: 0.6636
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4361 - accuracy: 0.6812 - val_loss: 0.6760 - val_accuracy: 0.6682
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4296 - accuracy: 0.7147 - val_loss: 0.6537 - val_accuracy: 0.6682
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4288 - accuracy: 0.6812 - val_loss: 0.6413 - val_accuracy: 0.6589
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5403 - accuracy: 0.6967 - val_loss: 0.6925 - val_accuracy: 0.6589
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4033 - accuracy: 0.6992 - val_loss: 0.7285 - val_accuracy: 0.6682
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4812 - accuracy: 0.7044 - val_loss: 0.7164 - val_accuracy: 0.6682
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3891 - accuracy: 0.7172 - val_loss: 0.6857 - val_accuracy: 0.6682
Epoch 117/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4978 - accuracy: 0.6992 - val_loss: 0.6826 - val_accuracy: 0.7009
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4153 - accuracy: 0.7018 - val_loss: 0.6825 - val_accuracy: 0.6916
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4660 - accuracy: 0.6864 - val_loss: 0.7076 - val_accuracy: 0.6729
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4070 - accuracy: 0.6967 - val_loss: 0.7092 - val_accuracy: 0.6636
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4330 - accuracy: 0.6915 - val_loss: 0.7157 - val_accuracy: 0.6822
Epoch 122/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4581 - accuracy: 0.6967 - val_loss: 0.7070 - val_accuracy: 0.6822
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3821 - accuracy: 0.6967 - val_loss: 0.7135 - val_accuracy: 0.6869
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4465 - accuracy: 0.6632 - val_loss: 0.6649 - val_accuracy: 0.6729

```
accuracy: 0.6729
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4256 - accuracy: 0.7069 - val_loss: 0.7202 - val_
accuracy: 0.6729
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4425 - accuracy: 0.7198 - val_loss: 0.7267 - val_
accuracy: 0.6682
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3449 - accuracy: 0.6889 - val_loss: 0.7422 - val_
accuracy: 0.6963
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3975 - accuracy: 0.7044 - val_loss: 0.8024 - val_
accuracy: 0.6916
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5596 - accuracy: 0.6864 - val_loss: 0.7932 - val_
accuracy: 0.6916
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3590 - accuracy: 0.7198 - val_loss: 0.8065 - val_
accuracy: 0.7009
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4945 - accuracy: 0.6915 - val_loss: 0.8191 - val_
accuracy: 0.7009
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4353 - accuracy: 0.6941 - val_loss: 0.8482 - val_
accuracy: 0.7009
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3792 - accuracy: 0.7147 - val_loss: 0.7647 - val_
accuracy: 0.7009
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3564 - accuracy: 0.6992 - val_loss: 0.8346 - val_
accuracy: 0.6869
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4264 - accuracy: 0.6735 - val_loss: 0.8853 - val_
accuracy: 0.6822
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3918 - accuracy: 0.7044 - val_loss: 1.0379 - val_
accuracy: 0.6869
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4040 - accuracy: 0.7224 - val_loss: 0.9755 - val_
accuracy: 0.6916
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3616 - accuracy: 0.7198 - val_loss: 1.0002 - val_
accuracy: 0.6963
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4616 - accuracy: 0.7069 - val_loss: 1.0036 - val_
accuracy: 0.7009
Epoch 140/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4742 - accuracy: 0.6967 - val_loss: 1.0459 - val_
accuracy: 0.7150
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4553 - accuracy: 0.7224 - val_loss: 0.9901 - val_
accuracy: 0.7056
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3684 - accuracy: 0.7069 - val_loss: 0.9608 - val_
accuracy: 0.7009
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4738 - accuracy: 0.7095 - val_loss: 0.9369 - val_
accuracy: 0.7009
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3758 - accuracy: 0.7172 - val_loss: 0.9624 - val_
accuracy: 0.6916
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4158 - accuracy: 0.7378 - val_loss: 0.9687 - val_
accuracy: 0.6963
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4218 - accuracy: 0.7044 - val_loss: 0.8778 - val_
accuracy: 0.6963
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3917 - accuracy: 0.6941 - val_loss: 0.9092 - val_
accuracy: 0.6963
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4005 - accuracy: 0.7198 - val_loss: 0.9384 - val_
accuracy: 0.6916
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3792 - accuracy: 0.7018 - val_loss: 0.9885 - val_
accuracy: 0.7009
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4152 - accuracy: 0.7018 - val_loss: 0.9528 - val_
accuracy: 0.7009
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4348 - accuracy: 0.7121 - val_loss: 0.9495 - val_
accuracy: 0.7056
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3818 - accuracy: 0.6889 - val_loss: 0.9090 - val_
accuracy: 0.6776
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4371 - accuracy: 0.7172 - val_loss: 1.0304 - val_
accuracy: 0.6729
Epoch 154/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.4342 - accuracy: 0.7121 - val_loss: 1.0835 - val_accuracy: 0.6869
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4514 - accuracy: 0.6915 - val_loss: 1.0807 - val_accuracy: 0.6916
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4416 - accuracy: 0.7044 - val_loss: 1.1062 - val_accuracy: 0.6916
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3827 - accuracy: 0.7224 - val_loss: 1.0980 - val_accuracy: 0.7056
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4597 - accuracy: 0.7224 - val_loss: 1.0712 - val_accuracy: 0.6822
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4397 - accuracy: 0.7249 - val_loss: 1.1093 - val_accuracy: 0.6636
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3900 - accuracy: 0.7198 - val_loss: 1.0462 - val_accuracy: 0.6589
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3709 - accuracy: 0.7301 - val_loss: 1.0360 - val_accuracy: 0.6776
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3544 - accuracy: 0.7301 - val_loss: 0.9249 - val_accuracy: 0.6916
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4262 - accuracy: 0.7121 - val_loss: 0.9868 - val_accuracy: 0.6869
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3994 - accuracy: 0.7121 - val_loss: 0.9254 - val_accuracy: 0.6916
Epoch 165/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3580 - accuracy: 0.7044 - val_loss: 0.9236 - val_accuracy: 0.6916
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3345 - accuracy: 0.7301 - val_loss: 0.9607 - val_accuracy: 0.6916
Epoch 167/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3555 - accuracy: 0.7275 - val_loss: 1.0250 - val_accuracy: 0.6916
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3849 - accuracy: 0.7224 - val_loss: 1.0752 - val_accuracy: 0.7103
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4457 - accuracy: 0.7301 - val_loss: 1.1555 - val_accuracy: 0.6963
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3701 - accuracy: 0.7558 - val_loss: 1.2256 - val_accuracy: 0.6963
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3535 - accuracy: 0.7429 - val_loss: 1.1420 - val_accuracy: 0.6963
Epoch 172/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3535 - accuracy: 0.7275 - val_loss: 1.1393 - val_accuracy: 0.6963
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3816 - accuracy: 0.7352 - val_loss: 1.1135 - val_accuracy: 0.6729
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3295 - accuracy: 0.7249 - val_loss: 1.1207 - val_accuracy: 0.6776
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3474 - accuracy: 0.7147 - val_loss: 1.1408 - val_accuracy: 0.6776
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3567 - accuracy: 0.7429 - val_loss: 1.1171 - val_accuracy: 0.6822
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3707 - accuracy: 0.7275 - val_loss: 1.1257 - val_accuracy: 0.6916
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4544 - accuracy: 0.7172 - val_loss: 1.1267 - val_accuracy: 0.6963
Epoch 179/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4340 - accuracy: 0.7352 - val_loss: 1.1068 - val_accuracy: 0.6869
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4067 - accuracy: 0.7378 - val_loss: 1.1459 - val_accuracy: 0.6822
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4013 - accuracy: 0.7147 - val_loss: 1.0837 - val_accuracy: 0.6776
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4301 - accuracy: 0.7352 - val_loss: 1.1152 - val_accuracy: 0.6729
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3391 - accuracy: 0.7275 - val_loss: 1.0612 - val_accuracy: 0.6729
```

Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3113 - accuracy: 0.7121 - val_loss: 1.0620 - val_accuracy: 0.6729
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3183 - accuracy: 0.7121 - val_loss: 1.0599 - val_accuracy: 0.6776
Epoch 186/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3148 - accuracy: 0.6915 - val_loss: 1.0891 - val_accuracy: 0.6729
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3919 - accuracy: 0.7121 - val_loss: 1.0934 - val_accuracy: 0.6869
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3273 - accuracy: 0.7224 - val_loss: 1.0650 - val_accuracy: 0.6869
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3913 - accuracy: 0.7069 - val_loss: 1.1052 - val_accuracy: 0.6682
Epoch 190/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3384 - accuracy: 0.6710 - val_loss: 1.1671 - val_accuracy: 0.6776
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3155 - accuracy: 0.6967 - val_loss: 1.1129 - val_accuracy: 0.6636
Epoch 192/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2872 - accuracy: 0.6941 - val_loss: 1.1368 - val_accuracy: 0.6682
Epoch 193/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3869 - accuracy: 0.6658 - val_loss: 1.1058 - val_accuracy: 0.6682
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3960 - accuracy: 0.6941 - val_loss: 1.1539 - val_accuracy: 0.6729
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4614 - accuracy: 0.6967 - val_loss: 1.1860 - val_accuracy: 0.6729
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3533 - accuracy: 0.7069 - val_loss: 1.1945 - val_accuracy: 0.6776
Epoch 197/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3973 - accuracy: 0.6967 - val_loss: 1.2117 - val_accuracy: 0.6682
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3353 - accuracy: 0.7172 - val_loss: 1.1283 - val_accuracy: 0.6589
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3333 - accuracy: 0.6941 - val_loss: 1.0955 - val_accuracy: 0.6542
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3387 - accuracy: 0.6812 - val_loss: 1.0963 - val_accuracy: 0.6636
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3857 - accuracy: 0.6787 - val_loss: 1.0977 - val_accuracy: 0.6589
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3835 - accuracy: 0.6915 - val_loss: 1.0218 - val_accuracy: 0.6542
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3330 - accuracy: 0.7044 - val_loss: 1.0340 - val_accuracy: 0.6495
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3526 - accuracy: 0.6967 - val_loss: 1.0959 - val_accuracy: 0.6682
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3293 - accuracy: 0.7018 - val_loss: 0.9593 - val_accuracy: 0.6449
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3951 - accuracy: 0.6632 - val_loss: 1.0826 - val_accuracy: 0.6449
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2572 - accuracy: 0.6658 - val_loss: 1.1784 - val_accuracy: 0.6495
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3202 - accuracy: 0.6889 - val_loss: 1.1936 - val_accuracy: 0.6636
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3222 - accuracy: 0.6735 - val_loss: 1.1460 - val_accuracy: 0.6729
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3307 - accuracy: 0.6941 - val_loss: 1.1346 - val_accuracy: 0.6682
Epoch 211/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3869 - accuracy: 0.6941 - val_loss: 1.1366 - val_accuracy: 0.6729
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3071 - accuracy: 0.7147 - val_loss: 1.1105 - val_accuracy: 0.6589
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2834 - accuracy: 0.7018 - val_loss: 1.1078 - val_accuracy: 0.6589

```
accuracy: 0.6636
Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3100 - accuracy: 0.6992 - val_loss: 1.0856 - val_accuracy: 0.6589
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3147 - accuracy: 0.7147 - val_loss: 1.1057 - val_accuracy: 0.6542
Epoch 216/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4029 - accuracy: 0.6889 - val_loss: 1.1073 - val_accuracy: 0.6682
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2809 - accuracy: 0.7506 - val_loss: 0.9698 - val_accuracy: 0.6869
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2752 - accuracy: 0.7198 - val_loss: 0.9938 - val_accuracy: 0.6869
Epoch 219/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2886 - accuracy: 0.7378 - val_loss: 0.9390 - val_accuracy: 0.6682
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3063 - accuracy: 0.6787 - val_loss: 0.9622 - val_accuracy: 0.6869
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3515 - accuracy: 0.6992 - val_loss: 1.0652 - val_accuracy: 0.7009
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3414 - accuracy: 0.7249 - val_loss: 1.0284 - val_accuracy: 0.7009
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3711 - accuracy: 0.7249 - val_loss: 0.9801 - val_accuracy: 0.6869
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3307 - accuracy: 0.7095 - val_loss: 0.9823 - val_accuracy: 0.6822
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3562 - accuracy: 0.7121 - val_loss: 1.0473 - val_accuracy: 0.7056
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3066 - accuracy: 0.7224 - val_loss: 1.0639 - val_accuracy: 0.7056
Epoch 227/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3107 - accuracy: 0.7249 - val_loss: 1.0419 - val_accuracy: 0.6963
Epoch 228/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3298 - accuracy: 0.7172 - val_loss: 1.0678 - val_accuracy: 0.6916
Epoch 229/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3234 - accuracy: 0.6941 - val_loss: 0.9826 - val_accuracy: 0.6869
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2940 - accuracy: 0.7172 - val_loss: 0.9892 - val_accuracy: 0.6636
Epoch 231/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3734 - accuracy: 0.7301 - val_loss: 1.0226 - val_accuracy: 0.6682
Epoch 232/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3356 - accuracy: 0.6992 - val_loss: 1.0551 - val_accuracy: 0.6916
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3588 - accuracy: 0.7095 - val_loss: 1.0401 - val_accuracy: 0.6636
Epoch 234/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3911 - accuracy: 0.6915 - val_loss: 1.0982 - val_accuracy: 0.6776
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4962 - accuracy: 0.7018 - val_loss: 1.1128 - val_accuracy: 0.6776
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4468 - accuracy: 0.7044 - val_loss: 1.0964 - val_accuracy: 0.6776
Epoch 237/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2909 - accuracy: 0.7301 - val_loss: 1.1024 - val_accuracy: 0.6822
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3966 - accuracy: 0.7455 - val_loss: 1.1292 - val_accuracy: 0.6822
Epoch 239/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3466 - accuracy: 0.6838 - val_loss: 1.1251 - val_accuracy: 0.6916
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3534 - accuracy: 0.7301 - val_loss: 1.1402 - val_accuracy: 0.6776
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3872 - accuracy: 0.7249 - val_loss: 1.1240 - val_accuracy: 0.6822
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2763 - accuracy: 0.6812 - val_loss: 1.2111 - val_accuracy: 0.6916
Epoch 243/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.3585 - accuracy: 0.6889 - val_loss: 1.1198 - val_accuracy: 0.6682
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3025 - accuracy: 0.6838 - val_loss: 1.1200 - val_accuracy: 0.6589
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3343 - accuracy: 0.6684 - val_loss: 1.1051 - val_accuracy: 0.6776
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2913 - accuracy: 0.6812 - val_loss: 1.0876 - val_accuracy: 0.6776
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2764 - accuracy: 0.6889 - val_loss: 1.0634 - val_accuracy: 0.6682
Epoch 248/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2790 - accuracy: 0.7044 - val_loss: 1.1343 - val_accuracy: 0.6822
Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2760 - accuracy: 0.7198 - val_loss: 1.1403 - val_accuracy: 0.6822
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3183 - accuracy: 0.7224 - val_loss: 1.0622 - val_accuracy: 0.6729
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3154 - accuracy: 0.6992 - val_loss: 1.1140 - val_accuracy: 0.6729
Epoch 252/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3235 - accuracy: 0.6838 - val_loss: 1.0240 - val_accuracy: 0.6729
Epoch 253/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3182 - accuracy: 0.6838 - val_loss: 1.1259 - val_accuracy: 0.6729
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2852 - accuracy: 0.6967 - val_loss: 1.1509 - val_accuracy: 0.6682
Epoch 255/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3982 - accuracy: 0.7044 - val_loss: 1.1761 - val_accuracy: 0.6589
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3104 - accuracy: 0.7044 - val_loss: 1.1791 - val_accuracy: 0.6636
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3397 - accuracy: 0.6812 - val_loss: 1.0643 - val_accuracy: 0.6449
Epoch 258/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3921 - accuracy: 0.6838 - val_loss: 1.1507 - val_accuracy: 0.6355
Epoch 259/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3561 - accuracy: 0.7018 - val_loss: 1.2621 - val_accuracy: 0.6449
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2943 - accuracy: 0.6735 - val_loss: 1.2729 - val_accuracy: 0.6495
Epoch 261/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2800 - accuracy: 0.7121 - val_loss: 1.2392 - val_accuracy: 0.6495
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2731 - accuracy: 0.7069 - val_loss: 1.1220 - val_accuracy: 0.6495
Epoch 263/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3324 - accuracy: 0.7095 - val_loss: 1.1522 - val_accuracy: 0.6449
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3837 - accuracy: 0.7018 - val_loss: 1.1745 - val_accuracy: 0.6215
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2868 - accuracy: 0.7198 - val_loss: 1.3263 - val_accuracy: 0.6402
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2591 - accuracy: 0.7249 - val_loss: 1.3262 - val_accuracy: 0.6449
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2605 - accuracy: 0.6864 - val_loss: 1.2402 - val_accuracy: 0.5981
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2747 - accuracy: 0.6735 - val_loss: 1.2358 - val_accuracy: 0.6121
Epoch 269/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2654 - accuracy: 0.6710 - val_loss: 1.2538 - val_accuracy: 0.6355
Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2720 - accuracy: 0.6658 - val_loss: 1.2229 - val_accuracy: 0.6355
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2726 - accuracy: 0.7121 - val_loss: 1.2205 - val_accuracy: 0.6449
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3191 - accuracy: 0.6992 - val_loss: 1.1913 - val_accuracy: 0.6308
```

Epoch 273/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3913 - accuracy: 0.6967 - val_loss: 1.1440 - val_accuracy: 0.6402
 Epoch 274/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2471 - accuracy: 0.7018 - val_loss: 1.0948 - val_accuracy: 0.6449
 Epoch 275/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2666 - accuracy: 0.7044 - val_loss: 1.1850 - val_accuracy: 0.6636
 Epoch 276/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2850 - accuracy: 0.7044 - val_loss: 1.1353 - val_accuracy: 0.6402
 Epoch 277/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2560 - accuracy: 0.7044 - val_loss: 1.0946 - val_accuracy: 0.6449
 Epoch 278/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2850 - accuracy: 0.7301 - val_loss: 1.1213 - val_accuracy: 0.6495
 Epoch 279/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4734 - accuracy: 0.6787 - val_loss: 1.0245 - val_accuracy: 0.6308
 Epoch 280/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2958 - accuracy: 0.6812 - val_loss: 1.0660 - val_accuracy: 0.6355
 Epoch 281/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2510 - accuracy: 0.7326 - val_loss: 1.0464 - val_accuracy: 0.6308
 Epoch 282/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.1948 - accuracy: 0.7352 - val_loss: 1.1295 - val_accuracy: 0.6355
 Epoch 283/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2051 - accuracy: 0.6941 - val_loss: 1.1224 - val_accuracy: 0.6262
 Epoch 284/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3029 - accuracy: 0.6838 - val_loss: 1.0639 - val_accuracy: 0.6168
 Epoch 285/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2091 - accuracy: 0.7069 - val_loss: 1.0588 - val_accuracy: 0.6495
 Epoch 286/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2786 - accuracy: 0.7147 - val_loss: 1.0586 - val_accuracy: 0.6449
 Epoch 287/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2723 - accuracy: 0.7121 - val_loss: 1.0896 - val_accuracy: 0.6402
 Epoch 288/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2700 - accuracy: 0.6992 - val_loss: 1.0631 - val_accuracy: 0.6262
 Epoch 289/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2929 - accuracy: 0.7095 - val_loss: 1.0762 - val_accuracy: 0.6121
 Epoch 290/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.1844 - accuracy: 0.6797 Restoring model weights from the end of the best epoch: 140.
 4/4 [=====] - 0s 13ms/step - loss: 0.2368 - accuracy: 0.6992 - val_loss: 1.0672 - val_accuracy: 0.6028
 Epoch 290: early stopping
 2/2 [=====] - 0s 4ms/step - loss: 0.5298 - accuracy: 0.6512
 [CV] END Dense1=50, Dense2=50; total time= 15.3s
 Model: "sequential_66"

Layer (type)	Output Shape	Param #
<hr/>		
dense_264 (Dense)	(None, 50)	350
<hr/>		
batch_normalization_198 (BatchNormalization)	(None, 50)	200
activation_198 (Activation)	(None, 50)	0
dense_265 (Dense)	(None, 50)	2550
<hr/>		
batch_normalization_199 (BatchNormalization)	(None, 50)	200
activation_199 (Activation)	(None, 50)	0
dense_266 (Dense)	(None, 10)	510
<hr/>		
batch_normalization_200 (BatchNormalization)	(None, 10)	40
activation_200 (Activation)	(None, 10)	0
dense_267 (Dense)	(None, 2)	22
<hr/>		
Total params:	3,872	
Trainable params:	3,652	

Non-trainable params: 220

Epoch 1/1000
4/4 [=====] - 1s 55ms/step - loss: 5.2352 - accuracy: 0.5219 - val_loss: 4.6147 - val_accuracy: 0.5467
Epoch 2/1000
4/4 [=====] - 0s 15ms/step - loss: 4.3662 - accuracy: 0.5270 - val_loss: 4.3969 - val_accuracy: 0.6028
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9725 - accuracy: 0.5450 - val_loss: 4.4264 - val_accuracy: 0.6215
Epoch 4/1000
4/4 [=====] - 0s 12ms/step - loss: 3.9150 - accuracy: 0.5141 - val_loss: 4.2870 - val_accuracy: 0.5654
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6727 - accuracy: 0.4987 - val_loss: 3.8742 - val_accuracy: 0.5607
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4026 - accuracy: 0.5090 - val_loss: 3.5733 - val_accuracy: 0.5561
Epoch 7/1000
4/4 [=====] - 0s 19ms/step - loss: 3.2151 - accuracy: 0.5321 - val_loss: 3.2794 - val_accuracy: 0.5701
Epoch 8/1000
4/4 [=====] - 0s 15ms/step - loss: 3.1892 - accuracy: 0.4961 - val_loss: 2.9767 - val_accuracy: 0.5607
Epoch 9/1000
4/4 [=====] - 0s 12ms/step - loss: 3.1797 - accuracy: 0.5450 - val_loss: 2.7658 - val_accuracy: 0.5794
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2153 - accuracy: 0.5450 - val_loss: 2.6763 - val_accuracy: 0.5748
Epoch 11/1000
4/4 [=====] - 0s 12ms/step - loss: 3.1609 - accuracy: 0.5321 - val_loss: 2.6020 - val_accuracy: 0.5748
Epoch 12/1000
4/4 [=====] - 0s 12ms/step - loss: 3.0259 - accuracy: 0.5450 - val_loss: 2.4816 - val_accuracy: 0.5701
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0034 - accuracy: 0.5116 - val_loss: 2.3566 - val_accuracy: 0.4346
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9020 - accuracy: 0.5296 - val_loss: 2.2691 - val_accuracy: 0.4346
Epoch 15/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7855 - accuracy: 0.4859 - val_loss: 2.2500 - val_accuracy: 0.4346
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8660 - accuracy: 0.4910 - val_loss: 2.2077 - val_accuracy: 0.4393
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6448 - accuracy: 0.4910 - val_loss: 2.1716 - val_accuracy: 0.4486
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6069 - accuracy: 0.4730 - val_loss: 2.1240 - val_accuracy: 0.4533
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6014 - accuracy: 0.4833 - val_loss: 2.1004 - val_accuracy: 0.4533
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4616 - accuracy: 0.4884 - val_loss: 2.0842 - val_accuracy: 0.4486
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6258 - accuracy: 0.5039 - val_loss: 2.0374 - val_accuracy: 0.4486
Epoch 22/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3688 - accuracy: 0.4833 - val_loss: 2.0147 - val_accuracy: 0.6215
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2835 - accuracy: 0.5296 - val_loss: 1.9681 - val_accuracy: 0.6168
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2253 - accuracy: 0.5219 - val_loss: 1.9282 - val_accuracy: 0.6355
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1934 - accuracy: 0.5141 - val_loss: 1.8827 - val_accuracy: 0.6402
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1461 - accuracy: 0.5090 - val_loss: 1.8514 - val_accuracy: 0.6308
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0739 - accuracy: 0.5064 - val_loss: 1.8185 - val_accuracy: 0.6075
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0540 - accuracy: 0.5064 - val_loss: 1.7965 - val_accuracy: 0.5981
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1179 - accuracy: 0.5116 - val_loss: 1.7440 - val_accuracy: 0.5841

Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8020 - accuracy: 0.5193 - val_loss: 1.7580 - val_accuracy: 0.5561
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7902 - accuracy: 0.4961 - val_loss: 1.7363 - val_accuracy: 0.5654
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7328 - accuracy: 0.5141 - val_loss: 1.7137 - val_accuracy: 0.5514
Epoch 33/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5714 - accuracy: 0.4910 - val_loss: 1.6337 - val_accuracy: 0.5561
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4874 - accuracy: 0.5064 - val_loss: 1.6671 - val_accuracy: 0.5467
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4616 - accuracy: 0.5013 - val_loss: 1.6105 - val_accuracy: 0.5093
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5741 - accuracy: 0.4679 - val_loss: 1.6253 - val_accuracy: 0.5047
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2855 - accuracy: 0.4859 - val_loss: 1.6108 - val_accuracy: 0.5047
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2655 - accuracy: 0.5039 - val_loss: 1.5965 - val_accuracy: 0.5047
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1686 - accuracy: 0.4833 - val_loss: 1.5258 - val_accuracy: 0.5093
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2010 - accuracy: 0.4910 - val_loss: 1.3971 - val_accuracy: 0.4907
Epoch 41/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2089 - accuracy: 0.4961 - val_loss: 1.3519 - val_accuracy: 0.4860
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0302 - accuracy: 0.4679 - val_loss: 1.3273 - val_accuracy: 0.4766
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9458 - accuracy: 0.4859 - val_loss: 1.3441 - val_accuracy: 0.4533
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0126 - accuracy: 0.4961 - val_loss: 1.3434 - val_accuracy: 0.4673
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0828 - accuracy: 0.4859 - val_loss: 1.3292 - val_accuracy: 0.4486
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8614 - accuracy: 0.4679 - val_loss: 1.3527 - val_accuracy: 0.4626
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9444 - accuracy: 0.4602 - val_loss: 1.3623 - val_accuracy: 0.4720
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9051 - accuracy: 0.4756 - val_loss: 1.3534 - val_accuracy: 0.4579
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9306 - accuracy: 0.4756 - val_loss: 1.3307 - val_accuracy: 0.4813
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8226 - accuracy: 0.4627 - val_loss: 1.2992 - val_accuracy: 0.4860
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8167 - accuracy: 0.5013 - val_loss: 1.3131 - val_accuracy: 0.4673
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7506 - accuracy: 0.4679 - val_loss: 1.2698 - val_accuracy: 0.4626
Epoch 53/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8559 - accuracy: 0.4679 - val_loss: 1.2914 - val_accuracy: 0.4673
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8698 - accuracy: 0.4679 - val_loss: 1.2197 - val_accuracy: 0.4766
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7435 - accuracy: 0.4370 - val_loss: 1.2544 - val_accuracy: 0.4486
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8402 - accuracy: 0.4627 - val_loss: 1.2863 - val_accuracy: 0.4159
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8181 - accuracy: 0.4293 - val_loss: 1.2542 - val_accuracy: 0.4159
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6898 - accuracy: 0.4679 - val_loss: 1.0765 - val_accuracy: 0.4206
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7394 - accuracy: 0.4319 - val_loss: 1.0836 - val_accuracy: 0.4159

```
accuracy: 0.3972
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7003 - accuracy: 0.4422 - val_loss: 1.0803 - val_accuracy: 0.4019
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6977 - accuracy: 0.4190 - val_loss: 1.0810 - val_accuracy: 0.4019
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7669 - accuracy: 0.4396 - val_loss: 1.1068 - val_accuracy: 0.3879
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7314 - accuracy: 0.4447 - val_loss: 1.1181 - val_accuracy: 0.4159
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7355 - accuracy: 0.4422 - val_loss: 1.1725 - val_accuracy: 0.3832
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6701 - accuracy: 0.4370 - val_loss: 1.1633 - val_accuracy: 0.3879
Epoch 66/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6191 - accuracy: 0.3985 - val_loss: 1.1526 - val_accuracy: 0.3879
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6186 - accuracy: 0.4344 - val_loss: 1.1478 - val_accuracy: 0.3879
Epoch 68/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5583 - accuracy: 0.4422 - val_loss: 1.1399 - val_accuracy: 0.3645
Epoch 69/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6013 - accuracy: 0.4370 - val_loss: 1.0910 - val_accuracy: 0.3505
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6270 - accuracy: 0.4087 - val_loss: 1.0690 - val_accuracy: 0.3645
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6140 - accuracy: 0.4473 - val_loss: 1.0494 - val_accuracy: 0.3318
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5805 - accuracy: 0.4370 - val_loss: 1.0319 - val_accuracy: 0.3645
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5509 - accuracy: 0.4267 - val_loss: 0.9670 - val_accuracy: 0.3598
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4833 - accuracy: 0.4165 - val_loss: 0.9429 - val_accuracy: 0.3458
Epoch 75/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6055 - accuracy: 0.4267 - val_loss: 1.0178 - val_accuracy: 0.3411
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5169 - accuracy: 0.4010 - val_loss: 0.9924 - val_accuracy: 0.3364
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5480 - accuracy: 0.4344 - val_loss: 0.9298 - val_accuracy: 0.3505
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5788 - accuracy: 0.4190 - val_loss: 0.8967 - val_accuracy: 0.3411
Epoch 79/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4582 - accuracy: 0.4267 - val_loss: 0.7809 - val_accuracy: 0.3364
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4849 - accuracy: 0.4036 - val_loss: 0.7718 - val_accuracy: 0.3411
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4953 - accuracy: 0.4396 - val_loss: 0.7560 - val_accuracy: 0.3411
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4219 - accuracy: 0.4319 - val_loss: 0.7459 - val_accuracy: 0.3458
Epoch 83/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4842 - accuracy: 0.4344 - val_loss: 0.7394 - val_accuracy: 0.3458
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4189 - accuracy: 0.4267 - val_loss: 0.7416 - val_accuracy: 0.3505
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4337 - accuracy: 0.4113 - val_loss: 0.7677 - val_accuracy: 0.3505
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6012 - accuracy: 0.4190 - val_loss: 0.7872 - val_accuracy: 0.3692
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4770 - accuracy: 0.4267 - val_loss: 0.7729 - val_accuracy: 0.3645
Epoch 88/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4098 - accuracy: 0.4062 - val_loss: 0.7727 - val_accuracy: 0.3364
Epoch 89/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.4406 - accuracy: 0.3985 - val_loss: 0.7690 - val_accuracy: 0.3458
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4584 - accuracy: 0.3907 - val_loss: 0.7923 - val_accuracy: 0.3505
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4787 - accuracy: 0.3985 - val_loss: 0.8238 - val_accuracy: 0.3505
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4422 - accuracy: 0.4062 - val_loss: 0.8135 - val_accuracy: 0.3505
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3742 - accuracy: 0.3882 - val_loss: 0.7443 - val_accuracy: 0.3551
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3709 - accuracy: 0.4036 - val_loss: 0.7354 - val_accuracy: 0.3505
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3932 - accuracy: 0.3830 - val_loss: 0.7383 - val_accuracy: 0.3458
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3639 - accuracy: 0.3830 - val_loss: 0.7342 - val_accuracy: 0.3505
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4090 - accuracy: 0.4062 - val_loss: 0.7311 - val_accuracy: 0.3411
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3913 - accuracy: 0.3959 - val_loss: 0.7342 - val_accuracy: 0.3505
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4479 - accuracy: 0.4087 - val_loss: 0.6428 - val_accuracy: 0.3598
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3856 - accuracy: 0.3728 - val_loss: 0.7152 - val_accuracy: 0.3645
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4414 - accuracy: 0.3882 - val_loss: 0.6932 - val_accuracy: 0.3645
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4190 - accuracy: 0.3805 - val_loss: 0.6658 - val_accuracy: 0.3645
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3288 - accuracy: 0.3599 - val_loss: 0.7015 - val_accuracy: 0.3645
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3696 - accuracy: 0.4267 - val_loss: 0.7391 - val_accuracy: 0.3832
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4020 - accuracy: 0.3779 - val_loss: 0.7299 - val_accuracy: 0.3692
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3652 - accuracy: 0.3882 - val_loss: 0.6778 - val_accuracy: 0.3738
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3584 - accuracy: 0.3959 - val_loss: 0.7219 - val_accuracy: 0.3692
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3377 - accuracy: 0.3933 - val_loss: 0.7396 - val_accuracy: 0.3692
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3552 - accuracy: 0.3985 - val_loss: 0.7179 - val_accuracy: 0.3645
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3947 - accuracy: 0.3933 - val_loss: 0.7025 - val_accuracy: 0.3692
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4449 - accuracy: 0.3753 - val_loss: 0.6930 - val_accuracy: 0.4065
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3324 - accuracy: 0.3728 - val_loss: 0.6967 - val_accuracy: 0.4159
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3327 - accuracy: 0.3650 - val_loss: 0.6630 - val_accuracy: 0.4019
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4121 - accuracy: 0.3728 - val_loss: 0.6679 - val_accuracy: 0.4065
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3239 - accuracy: 0.3650 - val_loss: 0.6863 - val_accuracy: 0.4065
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3512 - accuracy: 0.3573 - val_loss: 0.7153 - val_accuracy: 0.4159
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3649 - accuracy: 0.3882 - val_loss: 0.6851 - val_accuracy: 0.4065
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3397 - accuracy: 0.3753 - val_loss: 0.6578 - val_accuracy: 0.4159
```

Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2788 - accuracy: 0.3599 - val_loss: 0.6888 - val_accuracy: 0.4252
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4012 - accuracy: 0.3985 - val_loss: 0.6850 - val_accuracy: 0.4065
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3333 - accuracy: 0.3728 - val_loss: 0.7112 - val_accuracy: 0.3879
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2839 - accuracy: 0.3470 - val_loss: 0.7686 - val_accuracy: 0.3879
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3402 - accuracy: 0.3522 - val_loss: 0.7942 - val_accuracy: 0.3879
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3818 - accuracy: 0.3702 - val_loss: 0.7860 - val_accuracy: 0.4159
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2961 - accuracy: 0.3470 - val_loss: 0.8096 - val_accuracy: 0.4065
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3449 - accuracy: 0.3702 - val_loss: 0.7920 - val_accuracy: 0.4065
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3293 - accuracy: 0.3625 - val_loss: 0.8185 - val_accuracy: 0.4159
Epoch 128/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3406 - accuracy: 0.3882 - val_loss: 0.8401 - val_accuracy: 0.4065
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3425 - accuracy: 0.3676 - val_loss: 0.8370 - val_accuracy: 0.4112
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3098 - accuracy: 0.4010 - val_loss: 0.8278 - val_accuracy: 0.4112
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2812 - accuracy: 0.3522 - val_loss: 0.8302 - val_accuracy: 0.4112
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3224 - accuracy: 0.3753 - val_loss: 0.8095 - val_accuracy: 0.4159
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2748 - accuracy: 0.3779 - val_loss: 0.8049 - val_accuracy: 0.4206
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3328 - accuracy: 0.3702 - val_loss: 0.8272 - val_accuracy: 0.4159
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2907 - accuracy: 0.3728 - val_loss: 0.8352 - val_accuracy: 0.4159
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2746 - accuracy: 0.3728 - val_loss: 0.8363 - val_accuracy: 0.4065
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3391 - accuracy: 0.3702 - val_loss: 0.9116 - val_accuracy: 0.3972
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2780 - accuracy: 0.3548 - val_loss: 0.8872 - val_accuracy: 0.3879
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2491 - accuracy: 0.3882 - val_loss: 0.8605 - val_accuracy: 0.3879
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2737 - accuracy: 0.3676 - val_loss: 0.8863 - val_accuracy: 0.3925
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3762 - accuracy: 0.4139 - val_loss: 0.9328 - val_accuracy: 0.4112
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3053 - accuracy: 0.3445 - val_loss: 0.9222 - val_accuracy: 0.4346
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3659 - accuracy: 0.3728 - val_loss: 0.9537 - val_accuracy: 0.3785
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3210 - accuracy: 0.3650 - val_loss: 0.9375 - val_accuracy: 0.4019
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4696 - accuracy: 0.3419 - val_loss: 0.9837 - val_accuracy: 0.4206
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2854 - accuracy: 0.3496 - val_loss: 0.9774 - val_accuracy: 0.4206
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2844 - accuracy: 0.3753 - val_loss: 1.0069 - val_accuracy: 0.4393
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2920 - accuracy: 0.3907 - val_loss: 0.9955 - val_accuracy: 0.4206

```
accuracy: 0.4159
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3911 - accuracy: 0.3907 - val_loss: 0.9905 - val_accuracy: 0.3925
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3802 - accuracy: 0.3625 - val_loss: 1.0053 - val_accuracy: 0.4206
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3686 - accuracy: 0.4062 - val_loss: 0.9340 - val_accuracy: 0.4252
Epoch 152/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2813 - accuracy: 0.3496 - val_loss: 0.9388 - val_accuracy: 0.4346
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3031 - accuracy: 0.3779 - val_loss: 0.9424 - val_accuracy: 0.4159
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3983 - accuracy: 0.3728 - val_loss: 0.9707 - val_accuracy: 0.4252
Epoch 155/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3297 - accuracy: 0.3985 - val_loss: 1.0015 - val_accuracy: 0.4065
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3246 - accuracy: 0.3573 - val_loss: 0.9969 - val_accuracy: 0.3925
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2848 - accuracy: 0.3419 - val_loss: 1.0354 - val_accuracy: 0.3692
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3602 - accuracy: 0.3522 - val_loss: 1.0373 - val_accuracy: 0.3832
Epoch 159/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3048 - accuracy: 0.3445 - val_loss: 1.0274 - val_accuracy: 0.3925
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2977 - accuracy: 0.3625 - val_loss: 1.0256 - val_accuracy: 0.3972
Epoch 161/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2540 - accuracy: 0.3625 - val_loss: 1.0245 - val_accuracy: 0.4019
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3075 - accuracy: 0.3753 - val_loss: 1.0239 - val_accuracy: 0.4065
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3006 - accuracy: 0.3933 - val_loss: 1.0320 - val_accuracy: 0.4206
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3156 - accuracy: 0.3779 - val_loss: 1.0432 - val_accuracy: 0.3925
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3091 - accuracy: 0.3882 - val_loss: 1.0260 - val_accuracy: 0.4112
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2932 - accuracy: 0.3753 - val_loss: 1.0289 - val_accuracy: 0.4065
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2829 - accuracy: 0.3650 - val_loss: 0.9786 - val_accuracy: 0.4252
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2794 - accuracy: 0.3882 - val_loss: 0.9302 - val_accuracy: 0.4346
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2514 - accuracy: 0.3779 - val_loss: 0.9855 - val_accuracy: 0.4346
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2846 - accuracy: 0.3779 - val_loss: 1.2016 - val_accuracy: 0.4206
Epoch 171/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3260 - accuracy: 0.3779 - val_loss: 1.1939 - val_accuracy: 0.4159
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3763 - accuracy: 0.4087 - val_loss: 1.1958 - val_accuracy: 0.4299
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2739 - accuracy: 0.4036 - val_loss: 1.2970 - val_accuracy: 0.4439
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3802 - accuracy: 0.3959 - val_loss: 1.4126 - val_accuracy: 0.4346
Epoch 175/1000
1/4 [====>.....] - ETA: 0s - loss: 0.2831 - accuracy: 0.3906Restoring model weights from the end of the best epoch: 25.
4/4 [=====] - 0s 13ms/step - loss: 0.2906 - accuracy: 0.4165 - val_loss: 1.2881 - val_accuracy: 0.4439
Epoch 175: early stopping
2/2 [=====] - 0s 3ms/step - loss: 1.5063 - accuracy: 0.6512
[CV] END .....Dense1=50, Dense2=50; total time= 9.3s
Model: "sequential_67"
```

Layer (type)	Output Shape	Param #
dense_268 (Dense)	(None, 50)	350
batch_normalization_201 (BatchNormalization)	(None, 50)	200
activation_201 (Activation)	(None, 50)	0
dense_269 (Dense)	(None, 50)	2550
batch_normalization_202 (BatchNormalization)	(None, 50)	200
activation_202 (Activation)	(None, 50)	0
dense_270 (Dense)	(None, 10)	510
batch_normalization_203 (BatchNormalization)	(None, 10)	40
activation_203 (Activation)	(None, 10)	0
dense_271 (Dense)	(None, 2)	22

Total params: 3,872

Trainable params: 3,652

Non-trainable params: 220

Epoch 1/1000

4/4 [=====] - 1s 54ms/step - loss: 4.2768 - accuracy: 0.6967 - val_loss: 4.0955 - val_accuracy: 0.6308

Epoch 2/1000

4/4 [=====] - 0s 13ms/step - loss: 3.2173 - accuracy: 0.7018 - val_loss: 3.0988 - val_accuracy: 0.6075

Epoch 3/1000

4/4 [=====] - 0s 13ms/step - loss: 2.8635 - accuracy: 0.6812 - val_loss: 3.3318 - val_accuracy: 0.5607

Epoch 4/1000

4/4 [=====] - 0s 12ms/step - loss: 2.8032 - accuracy: 0.6787 - val_loss: 2.8647 - val_accuracy: 0.5888

Epoch 5/1000

4/4 [=====] - 0s 13ms/step - loss: 2.5409 - accuracy: 0.6864 - val_loss: 2.7413 - val_accuracy: 0.6075

Epoch 6/1000

4/4 [=====] - 0s 13ms/step - loss: 2.3771 - accuracy: 0.6915 - val_loss: 2.5665 - val_accuracy: 0.6308

Epoch 7/1000

4/4 [=====] - 0s 13ms/step - loss: 2.0770 - accuracy: 0.7018 - val_loss: 2.3930 - val_accuracy: 0.6075

Epoch 8/1000

4/4 [=====] - 0s 12ms/step - loss: 1.8813 - accuracy: 0.6607 - val_loss: 2.3189 - val_accuracy: 0.6028

Epoch 9/1000

4/4 [=====] - 0s 13ms/step - loss: 1.6917 - accuracy: 0.6735 - val_loss: 2.2872 - val_accuracy: 0.5888

Epoch 10/1000

4/4 [=====] - 0s 13ms/step - loss: 1.4353 - accuracy: 0.6247 - val_loss: 2.2840 - val_accuracy: 0.5701

Epoch 11/1000

4/4 [=====] - 0s 13ms/step - loss: 1.3752 - accuracy: 0.6427 - val_loss: 2.2557 - val_accuracy: 0.5514

Epoch 12/1000

4/4 [=====] - 0s 13ms/step - loss: 1.3526 - accuracy: 0.6761 - val_loss: 2.0740 - val_accuracy: 0.5187

Epoch 13/1000

4/4 [=====] - 0s 13ms/step - loss: 1.1981 - accuracy: 0.6735 - val_loss: 2.0904 - val_accuracy: 0.4907

Epoch 14/1000

4/4 [=====] - 0s 13ms/step - loss: 1.0942 - accuracy: 0.6864 - val_loss: 1.9864 - val_accuracy: 0.4813

Epoch 15/1000

4/4 [=====] - 0s 12ms/step - loss: 1.0706 - accuracy: 0.6658 - val_loss: 1.9011 - val_accuracy: 0.4579

Epoch 16/1000

4/4 [=====] - 0s 12ms/step - loss: 0.9849 - accuracy: 0.6812 - val_loss: 1.8768 - val_accuracy: 0.4533

Epoch 17/1000

4/4 [=====] - 0s 12ms/step - loss: 0.8985 - accuracy: 0.6787 - val_loss: 1.8618 - val_accuracy: 0.4579

Epoch 18/1000

4/4 [=====] - 0s 12ms/step - loss: 0.9757 - accuracy: 0.6735 - val_loss: 1.8511 - val_accuracy: 0.4766

Epoch 19/1000

4/4 [=====] - 0s 12ms/step - loss: 0.9907 - accuracy: 0.6504 - val_loss: 1.7714 - val_accuracy: 0.4813

Epoch 20/1000

4/4 [=====] - 0s 11ms/step - loss: 0.9781 - accuracy: 0.6555 - val_loss: 1.7176 - val_accuracy: 0.4813

```
accuracy: 0.4860
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8644 - accuracy: 0.6710 - val_loss: 1.7043 - val_accuracy: 0.4766
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9894 - accuracy: 0.6555 - val_loss: 1.7152 - val_accuracy: 0.4813
Epoch 23/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8469 - accuracy: 0.6710 - val_loss: 1.6888 - val_accuracy: 0.4766
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9681 - accuracy: 0.6555 - val_loss: 1.6401 - val_accuracy: 0.4720
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9177 - accuracy: 0.6375 - val_loss: 1.6145 - val_accuracy: 0.4720
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8371 - accuracy: 0.6401 - val_loss: 1.5696 - val_accuracy: 0.4766
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9251 - accuracy: 0.6350 - val_loss: 1.5726 - val_accuracy: 0.4766
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8144 - accuracy: 0.6401 - val_loss: 1.4922 - val_accuracy: 0.4860
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8056 - accuracy: 0.6530 - val_loss: 1.4517 - val_accuracy: 0.4860
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7082 - accuracy: 0.6350 - val_loss: 1.3564 - val_accuracy: 0.4813
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8248 - accuracy: 0.6504 - val_loss: 1.3220 - val_accuracy: 0.4813
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7194 - accuracy: 0.6555 - val_loss: 1.3049 - val_accuracy: 0.4813
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6839 - accuracy: 0.6452 - val_loss: 1.2971 - val_accuracy: 0.4860
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5964 - accuracy: 0.6761 - val_loss: 1.2763 - val_accuracy: 0.4860
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6394 - accuracy: 0.6375 - val_loss: 1.2539 - val_accuracy: 0.4860
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7238 - accuracy: 0.6324 - val_loss: 1.2491 - val_accuracy: 0.4766
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6263 - accuracy: 0.6144 - val_loss: 1.2310 - val_accuracy: 0.4766
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5852 - accuracy: 0.6478 - val_loss: 1.2102 - val_accuracy: 0.4813
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5890 - accuracy: 0.6401 - val_loss: 1.2301 - val_accuracy: 0.4813
Epoch 40/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6352 - accuracy: 0.6350 - val_loss: 1.1885 - val_accuracy: 0.4813
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5448 - accuracy: 0.6247 - val_loss: 1.1665 - val_accuracy: 0.4813
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5075 - accuracy: 0.6272 - val_loss: 1.1526 - val_accuracy: 0.4860
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5338 - accuracy: 0.6427 - val_loss: 1.1351 - val_accuracy: 0.5047
Epoch 44/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5592 - accuracy: 0.6555 - val_loss: 1.1514 - val_accuracy: 0.5047
Epoch 45/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5497 - accuracy: 0.6298 - val_loss: 1.1259 - val_accuracy: 0.5187
Epoch 46/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4567 - accuracy: 0.6170 - val_loss: 1.1166 - val_accuracy: 0.5093
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5637 - accuracy: 0.6350 - val_loss: 1.1078 - val_accuracy: 0.5047
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5078 - accuracy: 0.6427 - val_loss: 1.0952 - val_accuracy: 0.5140
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4486 - accuracy: 0.6452 - val_loss: 1.0919 - val_accuracy: 0.5187
Epoch 50/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.5259 - accuracy: 0.6170 - val_loss: 1.0843 - val_accuracy: 0.5234
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5573 - accuracy: 0.6452 - val_loss: 1.0488 - val_accuracy: 0.5327
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5338 - accuracy: 0.6298 - val_loss: 1.0415 - val_accuracy: 0.5280
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5187 - accuracy: 0.6221 - val_loss: 1.0386 - val_accuracy: 0.5140
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4939 - accuracy: 0.6272 - val_loss: 1.0838 - val_accuracy: 0.5234
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5914 - accuracy: 0.6375 - val_loss: 1.0355 - val_accuracy: 0.5327
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4876 - accuracy: 0.6272 - val_loss: 1.0721 - val_accuracy: 0.5327
Epoch 57/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5013 - accuracy: 0.6298 - val_loss: 1.0594 - val_accuracy: 0.5327
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5190 - accuracy: 0.6221 - val_loss: 1.0501 - val_accuracy: 0.5374
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6028 - accuracy: 0.6350 - val_loss: 1.0953 - val_accuracy: 0.5327
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4201 - accuracy: 0.6350 - val_loss: 1.0802 - val_accuracy: 0.5280
Epoch 61/1000
4/4 [=====] - 0s 18ms/step - loss: 0.5082 - accuracy: 0.6375 - val_loss: 1.0953 - val_accuracy: 0.5280
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4044 - accuracy: 0.6221 - val_loss: 1.0867 - val_accuracy: 0.5327
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4999 - accuracy: 0.6195 - val_loss: 1.0667 - val_accuracy: 0.5327
Epoch 64/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4433 - accuracy: 0.6170 - val_loss: 1.0569 - val_accuracy: 0.5327
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4169 - accuracy: 0.6247 - val_loss: 1.0501 - val_accuracy: 0.5374
Epoch 66/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4508 - accuracy: 0.6247 - val_loss: 1.0430 - val_accuracy: 0.5421
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4483 - accuracy: 0.6427 - val_loss: 1.0129 - val_accuracy: 0.5374
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5004 - accuracy: 0.6272 - val_loss: 1.0051 - val_accuracy: 0.5467
Epoch 69/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4387 - accuracy: 0.6118 - val_loss: 0.9653 - val_accuracy: 0.5374
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5046 - accuracy: 0.6195 - val_loss: 0.9337 - val_accuracy: 0.5467
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4778 - accuracy: 0.6247 - val_loss: 0.9762 - val_accuracy: 0.5467
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4296 - accuracy: 0.6144 - val_loss: 0.9679 - val_accuracy: 0.5561
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4690 - accuracy: 0.6504 - val_loss: 0.9695 - val_accuracy: 0.5514
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4499 - accuracy: 0.6298 - val_loss: 0.9542 - val_accuracy: 0.5374
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4089 - accuracy: 0.6272 - val_loss: 0.9417 - val_accuracy: 0.5467
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4224 - accuracy: 0.6195 - val_loss: 0.9358 - val_accuracy: 0.5514
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4389 - accuracy: 0.6015 - val_loss: 0.9240 - val_accuracy: 0.5467
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5183 - accuracy: 0.6324 - val_loss: 0.8827 - val_accuracy: 0.5374
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4206 - accuracy: 0.6298 - val_loss: 0.8674 - val_accuracy: 0.5514
```

Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4220 - accuracy: 0.6221 - val_loss: 0.8544 - val_accuracy: 0.5421
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4999 - accuracy: 0.6170 - val_loss: 0.8379 - val_accuracy: 0.5467
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3764 - accuracy: 0.6272 - val_loss: 0.8600 - val_accuracy: 0.5467
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4226 - accuracy: 0.6144 - val_loss: 0.8591 - val_accuracy: 0.5561
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4782 - accuracy: 0.6324 - val_loss: 0.8646 - val_accuracy: 0.5561
Epoch 85/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3835 - accuracy: 0.6401 - val_loss: 0.8554 - val_accuracy: 0.5514
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3638 - accuracy: 0.6041 - val_loss: 0.8716 - val_accuracy: 0.5467
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4369 - accuracy: 0.6118 - val_loss: 0.8610 - val_accuracy: 0.5561
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4632 - accuracy: 0.6067 - val_loss: 0.8365 - val_accuracy: 0.5561
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3869 - accuracy: 0.6272 - val_loss: 0.7818 - val_accuracy: 0.5794
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4888 - accuracy: 0.6221 - val_loss: 0.7325 - val_accuracy: 0.5888
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4162 - accuracy: 0.6015 - val_loss: 0.7422 - val_accuracy: 0.5935
Epoch 92/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3693 - accuracy: 0.6324 - val_loss: 0.7712 - val_accuracy: 0.5935
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3924 - accuracy: 0.6170 - val_loss: 0.7708 - val_accuracy: 0.5935
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4328 - accuracy: 0.6272 - val_loss: 0.7712 - val_accuracy: 0.5935
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4393 - accuracy: 0.6401 - val_loss: 0.7652 - val_accuracy: 0.5888
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4382 - accuracy: 0.6350 - val_loss: 0.7690 - val_accuracy: 0.5935
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4227 - accuracy: 0.6452 - val_loss: 0.7599 - val_accuracy: 0.5935
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3815 - accuracy: 0.6350 - val_loss: 0.7613 - val_accuracy: 0.5981
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3772 - accuracy: 0.6375 - val_loss: 0.7603 - val_accuracy: 0.5981
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4030 - accuracy: 0.6375 - val_loss: 0.8050 - val_accuracy: 0.5888
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4026 - accuracy: 0.6350 - val_loss: 0.8056 - val_accuracy: 0.6075
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4401 - accuracy: 0.6530 - val_loss: 0.7986 - val_accuracy: 0.6075
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4569 - accuracy: 0.6607 - val_loss: 0.8141 - val_accuracy: 0.6121
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4017 - accuracy: 0.6298 - val_loss: 0.8116 - val_accuracy: 0.6075
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3587 - accuracy: 0.6247 - val_loss: 0.7957 - val_accuracy: 0.6215
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3957 - accuracy: 0.6195 - val_loss: 0.8270 - val_accuracy: 0.6308
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3568 - accuracy: 0.6607 - val_loss: 0.8384 - val_accuracy: 0.6308
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3497 - accuracy: 0.6272 - val_loss: 0.8149 - val_accuracy: 0.6262
Epoch 109/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4376 - accuracy: 0.6272 - val_loss: 0.8190 - val_accuracy: 0.6262

```
accuracy: 0.6262
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3409 - accuracy: 0.6221 - val_loss: 0.8677 - val_accuracy: 0.6262
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3752 - accuracy: 0.6401 - val_loss: 0.8399 - val_accuracy: 0.6355
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4018 - accuracy: 0.6504 - val_loss: 0.8585 - val_accuracy: 0.6402
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3813 - accuracy: 0.6555 - val_loss: 0.8575 - val_accuracy: 0.6449
Epoch 114/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3678 - accuracy: 0.6401 - val_loss: 0.9323 - val_accuracy: 0.6402
Epoch 115/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3482 - accuracy: 0.6324 - val_loss: 0.9332 - val_accuracy: 0.6262
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3452 - accuracy: 0.6195 - val_loss: 0.8663 - val_accuracy: 0.6308
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3095 - accuracy: 0.6272 - val_loss: 0.8718 - val_accuracy: 0.6402
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3490 - accuracy: 0.6067 - val_loss: 0.8937 - val_accuracy: 0.6449
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3808 - accuracy: 0.6427 - val_loss: 0.8874 - val_accuracy: 0.6449
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5214 - accuracy: 0.6375 - val_loss: 0.9091 - val_accuracy: 0.6355
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5027 - accuracy: 0.6350 - val_loss: 1.0534 - val_accuracy: 0.6121
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3112 - accuracy: 0.6350 - val_loss: 1.0663 - val_accuracy: 0.5981
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3956 - accuracy: 0.6427 - val_loss: 1.0384 - val_accuracy: 0.5981
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4486 - accuracy: 0.6452 - val_loss: 1.0336 - val_accuracy: 0.6028
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3751 - accuracy: 0.6607 - val_loss: 1.0127 - val_accuracy: 0.5981
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3208 - accuracy: 0.6555 - val_loss: 1.0632 - val_accuracy: 0.6075
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2838 - accuracy: 0.6350 - val_loss: 1.0578 - val_accuracy: 0.6075
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3574 - accuracy: 0.6401 - val_loss: 1.0389 - val_accuracy: 0.6028
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4016 - accuracy: 0.6735 - val_loss: 1.0562 - val_accuracy: 0.6028
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2948 - accuracy: 0.6504 - val_loss: 1.1022 - val_accuracy: 0.6028
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3928 - accuracy: 0.6710 - val_loss: 1.1570 - val_accuracy: 0.6028
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3258 - accuracy: 0.6658 - val_loss: 1.2122 - val_accuracy: 0.6028
Epoch 133/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2821 - accuracy: 0.6581 - val_loss: 1.1563 - val_accuracy: 0.6028
Epoch 134/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2770 - accuracy: 0.6581 - val_loss: 1.1320 - val_accuracy: 0.6028
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3515 - accuracy: 0.6555 - val_loss: 1.1798 - val_accuracy: 0.5935
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3652 - accuracy: 0.6350 - val_loss: 1.2381 - val_accuracy: 0.5888
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2833 - accuracy: 0.6530 - val_loss: 1.2544 - val_accuracy: 0.5701
Epoch 138/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3380 - accuracy: 0.6504 - val_loss: 1.1101 - val_accuracy: 0.6028
Epoch 139/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.4617 - accuracy: 0.6375 - val_loss: 1.0389 - val_accuracy: 0.6028
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3347 - accuracy: 0.6710 - val_loss: 1.0217 - val_accuracy: 0.6168
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3859 - accuracy: 0.6735 - val_loss: 1.0295 - val_accuracy: 0.5935
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2761 - accuracy: 0.6324 - val_loss: 1.0821 - val_accuracy: 0.5794
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3433 - accuracy: 0.6581 - val_loss: 1.0739 - val_accuracy: 0.5794
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2853 - accuracy: 0.6710 - val_loss: 1.1783 - val_accuracy: 0.5607
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3067 - accuracy: 0.6530 - val_loss: 1.1608 - val_accuracy: 0.5514
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3370 - accuracy: 0.6478 - val_loss: 1.1359 - val_accuracy: 0.5888
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3198 - accuracy: 0.6452 - val_loss: 1.2105 - val_accuracy: 0.5561
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3013 - accuracy: 0.6710 - val_loss: 1.2092 - val_accuracy: 0.5561
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2748 - accuracy: 0.6684 - val_loss: 1.2327 - val_accuracy: 0.5607
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2686 - accuracy: 0.6504 - val_loss: 1.4289 - val_accuracy: 0.5888
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3197 - accuracy: 0.6530 - val_loss: 1.4339 - val_accuracy: 0.6028
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3608 - accuracy: 0.6658 - val_loss: 1.5432 - val_accuracy: 0.5888
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3844 - accuracy: 0.6555 - val_loss: 1.4098 - val_accuracy: 0.5935
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3000 - accuracy: 0.6401 - val_loss: 1.5100 - val_accuracy: 0.5888
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3503 - accuracy: 0.6504 - val_loss: 1.4791 - val_accuracy: 0.5794
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2951 - accuracy: 0.6581 - val_loss: 1.4344 - val_accuracy: 0.5748
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3023 - accuracy: 0.6478 - val_loss: 1.3681 - val_accuracy: 0.5561
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2955 - accuracy: 0.6427 - val_loss: 1.5494 - val_accuracy: 0.5514
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3405 - accuracy: 0.6298 - val_loss: 1.5784 - val_accuracy: 0.5514
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2927 - accuracy: 0.6427 - val_loss: 1.4114 - val_accuracy: 0.5701
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2864 - accuracy: 0.6478 - val_loss: 1.4510 - val_accuracy: 0.5748
Epoch 162/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3121 - accuracy: 0.6658 - val_loss: 1.4220 - val_accuracy: 0.5561
Epoch 163/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3277 - accuracy: 0.6401 - val_loss: 1.4478 - val_accuracy: 0.5654
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2920 - accuracy: 0.6684 - val_loss: 1.4531 - val_accuracy: 0.5748
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2706 - accuracy: 0.6761 - val_loss: 1.3293 - val_accuracy: 0.5935
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2508 - accuracy: 0.6504 - val_loss: 1.3047 - val_accuracy: 0.5467
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2636 - accuracy: 0.6812 - val_loss: 1.3261 - val_accuracy: 0.5748
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3441 - accuracy: 0.6504 - val_loss: 1.4067 - val_accuracy: 0.5607
```

Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2808 - accuracy: 0.6478 - val_loss: 1.2957 - val_accuracy: 0.5421
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2645 - accuracy: 0.6684 - val_loss: 1.4319 - val_accuracy: 0.5374
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3263 - accuracy: 0.6530 - val_loss: 1.2751 - val_accuracy: 0.5327
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3091 - accuracy: 0.6581 - val_loss: 1.2095 - val_accuracy: 0.5561
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3216 - accuracy: 0.6401 - val_loss: 1.3275 - val_accuracy: 0.5514
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3334 - accuracy: 0.6787 - val_loss: 1.2981 - val_accuracy: 0.5561
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4292 - accuracy: 0.6684 - val_loss: 1.3066 - val_accuracy: 0.5467
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3448 - accuracy: 0.6684 - val_loss: 1.2984 - val_accuracy: 0.5701
Epoch 177/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2946 - accuracy: 0.6504 - val_loss: 1.2771 - val_accuracy: 0.5701
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2549 - accuracy: 0.6530 - val_loss: 1.2849 - val_accuracy: 0.5654
Epoch 179/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2826 - accuracy: 0.6375 - val_loss: 1.3128 - val_accuracy: 0.5421
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3489 - accuracy: 0.6401 - val_loss: 1.3858 - val_accuracy: 0.5374
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2615 - accuracy: 0.6221 - val_loss: 1.3903 - val_accuracy: 0.5327
Epoch 182/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3573 - accuracy: 0.6350 - val_loss: 1.4791 - val_accuracy: 0.5701
Epoch 183/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3161 - accuracy: 0.6504 - val_loss: 1.4814 - val_accuracy: 0.5748
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2361 - accuracy: 0.6761 - val_loss: 1.4828 - val_accuracy: 0.5607
Epoch 185/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2693 - accuracy: 0.6761 - val_loss: 1.5150 - val_accuracy: 0.5514
Epoch 186/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3069 - accuracy: 0.6401 - val_loss: 1.4880 - val_accuracy: 0.5467
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2756 - accuracy: 0.6658 - val_loss: 1.4668 - val_accuracy: 0.5421
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2484 - accuracy: 0.6452 - val_loss: 1.4948 - val_accuracy: 0.5421
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3862 - accuracy: 0.6504 - val_loss: 1.5663 - val_accuracy: 0.5514
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3097 - accuracy: 0.6889 - val_loss: 1.5149 - val_accuracy: 0.5374
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2584 - accuracy: 0.6889 - val_loss: 1.5714 - val_accuracy: 0.5514
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2364 - accuracy: 0.6967 - val_loss: 1.6248 - val_accuracy: 0.5467
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4821 - accuracy: 0.6684 - val_loss: 1.5552 - val_accuracy: 0.5467
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3567 - accuracy: 0.6889 - val_loss: 1.5838 - val_accuracy: 0.5561
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3542 - accuracy: 0.7044 - val_loss: 1.4834 - val_accuracy: 0.5654
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2935 - accuracy: 0.6864 - val_loss: 1.3548 - val_accuracy: 0.5607
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2546 - accuracy: 0.6967 - val_loss: 1.3802 - val_accuracy: 0.5561
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2770 - accuracy: 0.7018 - val_loss: 1.4000 - val_accuracy: 0.5607

```
accuracy: 0.5561
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2675 - accuracy: 0.6992 - val_loss: 1.4848 - val_
accuracy: 0.5701
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2673 - accuracy: 0.6555 - val_loss: 1.7334 - val_
accuracy: 0.5981
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2534 - accuracy: 0.6684 - val_loss: 1.6938 - val_
accuracy: 0.5794
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2962 - accuracy: 0.6452 - val_loss: 1.6092 - val_
accuracy: 0.5748
Epoch 203/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2911 - accuracy: 0.6812 - val_loss: 1.4460 - val_
accuracy: 0.5841
Epoch 204/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2575 - accuracy: 0.6581 - val_loss: 1.3991 - val_
accuracy: 0.6168
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2709 - accuracy: 0.6581 - val_loss: 1.3850 - val_
accuracy: 0.6168
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3067 - accuracy: 0.6530 - val_loss: 1.3842 - val_
accuracy: 0.6215
Epoch 207/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2414 - accuracy: 0.6735 - val_loss: 1.4096 - val_
accuracy: 0.6075
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2695 - accuracy: 0.6581 - val_loss: 1.4239 - val_
accuracy: 0.6168
Epoch 209/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3156 - accuracy: 0.6684 - val_loss: 1.5279 - val_
accuracy: 0.6168
Epoch 210/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2567 - accuracy: 0.6658 - val_loss: 1.4887 - val_
accuracy: 0.6121
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2067 - accuracy: 0.6838 - val_loss: 1.6459 - val_
accuracy: 0.6075
Epoch 212/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2768 - accuracy: 0.6812 - val_loss: 1.6162 - val_
accuracy: 0.5888
Epoch 213/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2812 - accuracy: 0.6581 - val_loss: 1.7582 - val_
accuracy: 0.5794
Epoch 214/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2207 - accuracy: 0.6530 - val_loss: 1.6020 - val_
accuracy: 0.5607
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3576 - accuracy: 0.7018 - val_loss: 1.7892 - val_
accuracy: 0.5888
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3254 - accuracy: 0.6915 - val_loss: 1.7817 - val_
accuracy: 0.5935
Epoch 217/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2344 - accuracy: 0.6915 - val_loss: 1.8589 - val_
accuracy: 0.5935
Epoch 218/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2660 - accuracy: 0.6632 - val_loss: 1.7800 - val_
accuracy: 0.6028
Epoch 219/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4069 - accuracy: 0.6735 - val_loss: 1.8141 - val_
accuracy: 0.5701
Epoch 220/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2656 - accuracy: 0.6864 - val_loss: 1.7721 - val_
accuracy: 0.5841
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3457 - accuracy: 0.7044 - val_loss: 1.6055 - val_
accuracy: 0.5701
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3576 - accuracy: 0.6761 - val_loss: 1.5193 - val_
accuracy: 0.5794
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3399 - accuracy: 0.6889 - val_loss: 1.5275 - val_
accuracy: 0.5888
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3033 - accuracy: 0.6992 - val_loss: 1.6472 - val_
accuracy: 0.5748
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3388 - accuracy: 0.7069 - val_loss: 1.7499 - val_
accuracy: 0.5935
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3391 - accuracy: 0.6838 - val_loss: 1.7142 - val_
accuracy: 0.5981
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2832 - accuracy: 0.6761 - val_loss: 1.6251 - val_
accuracy: 0.5888
Epoch 228/1000
```

4/4 [=====] - 0s 12ms/step - loss: 0.2920 - accuracy: 0.6761 - val_loss: 1.6054 - val_accuracy: 0.5607
Epoch 229/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2472 - accuracy: 0.6787 - val_loss: 1.5693 - val_accuracy: 0.5514
Epoch 230/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2498 - accuracy: 0.6632 - val_loss: 1.4178 - val_accuracy: 0.5654
Epoch 231/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2456 - accuracy: 0.6787 - val_loss: 1.5235 - val_accuracy: 0.5467
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3188 - accuracy: 0.6478 - val_loss: 1.5056 - val_accuracy: 0.5514
Epoch 233/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2853 - accuracy: 0.6530 - val_loss: 1.4053 - val_accuracy: 0.5561
Epoch 234/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2622 - accuracy: 0.6607 - val_loss: 1.3449 - val_accuracy: 0.5514
Epoch 235/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3078 - accuracy: 0.6607 - val_loss: 1.3453 - val_accuracy: 0.5654
Epoch 236/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2542 - accuracy: 0.6324 - val_loss: 1.3187 - val_accuracy: 0.5607
Epoch 237/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2229 - accuracy: 0.6889 - val_loss: 1.3509 - val_accuracy: 0.5748
Epoch 238/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2063 - accuracy: 0.6298 - val_loss: 1.4025 - val_accuracy: 0.5748
Epoch 239/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2347 - accuracy: 0.6889 - val_loss: 1.3659 - val_accuracy: 0.5981
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2305 - accuracy: 0.7044 - val_loss: 1.3436 - val_accuracy: 0.6215
Epoch 241/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2805 - accuracy: 0.6941 - val_loss: 1.3984 - val_accuracy: 0.6121
Epoch 242/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2613 - accuracy: 0.6812 - val_loss: 1.5040 - val_accuracy: 0.6308
Epoch 243/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2867 - accuracy: 0.7095 - val_loss: 1.5193 - val_accuracy: 0.6075
Epoch 244/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2211 - accuracy: 0.6684 - val_loss: 1.4172 - val_accuracy: 0.6028
Epoch 245/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3383 - accuracy: 0.6761 - val_loss: 1.4206 - val_accuracy: 0.5841
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2638 - accuracy: 0.6710 - val_loss: 1.3392 - val_accuracy: 0.6215
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3288 - accuracy: 0.6710 - val_loss: 1.3899 - val_accuracy: 0.5935
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2850 - accuracy: 0.6967 - val_loss: 1.3896 - val_accuracy: 0.5701
Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2458 - accuracy: 0.7018 - val_loss: 1.3393 - val_accuracy: 0.5841
Epoch 250/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2112 - accuracy: 0.6864 - val_loss: 1.3213 - val_accuracy: 0.5654
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3354 - accuracy: 0.6992 - val_loss: 1.3444 - val_accuracy: 0.5607
Epoch 252/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2310 - accuracy: 0.6992 - val_loss: 1.3214 - val_accuracy: 0.5794
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2339 - accuracy: 0.7147 - val_loss: 1.3449 - val_accuracy: 0.5794
Epoch 254/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2868 - accuracy: 0.6915 - val_loss: 1.3523 - val_accuracy: 0.5888
Epoch 255/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3219 - accuracy: 0.6812 - val_loss: 1.3392 - val_accuracy: 0.5794
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2665 - accuracy: 0.6864 - val_loss: 1.3545 - val_accuracy: 0.5794
Epoch 257/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3645 - accuracy: 0.6967 - val_loss: 1.3477 - val_accuracy: 0.5794

Epoch 258/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2362 - accuracy: 0.6889 - val_loss: 1.3392 - val_accuracy: 0.6075
 Epoch 259/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3407 - accuracy: 0.6684 - val_loss: 1.3346 - val_accuracy: 0.5981
 Epoch 260/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2806 - accuracy: 0.6889 - val_loss: 1.4177 - val_accuracy: 0.6121
 Epoch 261/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2588 - accuracy: 0.6889 - val_loss: 1.3750 - val_accuracy: 0.6168
 Epoch 262/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.1900 - accuracy: 0.6992 - val_loss: 1.3804 - val_accuracy: 0.6262
 Epoch 263/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.2443 - accuracy: 0.7031 Restoring model weights from the end of the best epoch: 113.
 4/4 [=====] - 0s 14ms/step - loss: 0.2641 - accuracy: 0.7069 - val_loss: 1.3686 - val_accuracy: 0.6121
 Epoch 263: early stopping
 2/2 [=====] - 0s 4ms/step - loss: 0.8306 - accuracy: 0.6047
 [CV] ENDDense1=50, Dense2=50; total time= 13.2s
 Model: "sequential_68"

Layer (type)	Output Shape	Param #
<hr/>		
dense_272 (Dense)	(None, 50)	350
batch_normalization_204 (BatchNormalization)	(None, 50)	200
activation_204 (Activation)	(None, 50)	0
dense_273 (Dense)	(None, 50)	2550
batch_normalization_205 (BatchNormalization)	(None, 50)	200
activation_205 (Activation)	(None, 50)	0
dense_274 (Dense)	(None, 10)	510
batch_normalization_206 (BatchNormalization)	(None, 10)	40
activation_206 (Activation)	(None, 10)	0
dense_275 (Dense)	(None, 2)	22
<hr/>		
Total params: 3,872		
Trainable params: 3,652		
Non-trainable params: 220		

Epoch 1/1000
 4/4 [=====] - 1s 56ms/step - loss: 4.5982 - accuracy: 0.4267 - val_loss: 5.4603 - val_accuracy: 0.5888
 Epoch 2/1000
 4/4 [=====] - 0s 14ms/step - loss: 4.1873 - accuracy: 0.4524 - val_loss: 5.8327 - val_accuracy: 0.5888
 Epoch 3/1000
 4/4 [=====] - 0s 13ms/step - loss: 4.2724 - accuracy: 0.4499 - val_loss: 6.0043 - val_accuracy: 0.5561
 Epoch 4/1000
 4/4 [=====] - 0s 14ms/step - loss: 4.1399 - accuracy: 0.4447 - val_loss: 5.5773 - val_accuracy: 0.5187
 Epoch 5/1000
 4/4 [=====] - 0s 14ms/step - loss: 4.2404 - accuracy: 0.4679 - val_loss: 5.4412 - val_accuracy: 0.4486
 Epoch 6/1000
 4/4 [=====] - 0s 14ms/step - loss: 4.2150 - accuracy: 0.4473 - val_loss: 5.3022 - val_accuracy: 0.4252
 Epoch 7/1000
 4/4 [=====] - 0s 14ms/step - loss: 4.1650 - accuracy: 0.4679 - val_loss: 5.1471 - val_accuracy: 0.4252
 Epoch 8/1000
 4/4 [=====] - 0s 14ms/step - loss: 4.1698 - accuracy: 0.4319 - val_loss: 5.1969 - val_accuracy: 0.4159
 Epoch 9/1000
 4/4 [=====] - 0s 13ms/step - loss: 3.9058 - accuracy: 0.4704 - val_loss: 5.1388 - val_accuracy: 0.4112
 Epoch 10/1000
 4/4 [=====] - 0s 14ms/step - loss: 3.8645 - accuracy: 0.4602 - val_loss: 5.0258 - val_accuracy: 0.4252
 Epoch 11/1000
 4/4 [=====] - 0s 13ms/step - loss: 3.6260 - accuracy: 0.4653 - val_loss: 4.9314 - val_accuracy: 0.4299
 Epoch 12/1000

```
4/4 [=====] - 0s 13ms/step - loss: 3.6621 - accuracy: 0.4653 - val_loss: 4.8674 - val_accuracy: 0.4299
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6058 - accuracy: 0.5013 - val_loss: 4.8492 - val_accuracy: 0.4346
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4183 - accuracy: 0.4884 - val_loss: 4.7950 - val_accuracy: 0.4393
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2913 - accuracy: 0.5141 - val_loss: 4.7229 - val_accuracy: 0.4439
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3009 - accuracy: 0.4987 - val_loss: 4.5982 - val_accuracy: 0.4486
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 3.1710 - accuracy: 0.5193 - val_loss: 4.5041 - val_accuracy: 0.4533
Epoch 18/1000
4/4 [=====] - 0s 15ms/step - loss: 3.1729 - accuracy: 0.5527 - val_loss: 4.4732 - val_accuracy: 0.4486
Epoch 19/1000
4/4 [=====] - 0s 17ms/step - loss: 3.1087 - accuracy: 0.5193 - val_loss: 4.3470 - val_accuracy: 0.4486
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8003 - accuracy: 0.5321 - val_loss: 2.8377 - val_accuracy: 0.4439
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5524 - accuracy: 0.5244 - val_loss: 2.5018 - val_accuracy: 0.4439
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3643 - accuracy: 0.5270 - val_loss: 2.4323 - val_accuracy: 0.4486
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4099 - accuracy: 0.5553 - val_loss: 2.4151 - val_accuracy: 0.4393
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2597 - accuracy: 0.5733 - val_loss: 2.3936 - val_accuracy: 0.4393
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2004 - accuracy: 0.5553 - val_loss: 2.3782 - val_accuracy: 0.4486
Epoch 26/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3321 - accuracy: 0.5707 - val_loss: 2.3710 - val_accuracy: 0.4579
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1780 - accuracy: 0.6118 - val_loss: 2.3839 - val_accuracy: 0.4533
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1127 - accuracy: 0.5578 - val_loss: 2.3963 - val_accuracy: 0.4393
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0547 - accuracy: 0.5887 - val_loss: 2.3786 - val_accuracy: 0.4393
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1148 - accuracy: 0.5835 - val_loss: 2.3356 - val_accuracy: 0.4393
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9782 - accuracy: 0.5501 - val_loss: 2.2815 - val_accuracy: 0.4486
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1232 - accuracy: 0.5733 - val_loss: 2.2994 - val_accuracy: 0.4439
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9560 - accuracy: 0.5938 - val_loss: 2.2801 - val_accuracy: 0.4486
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0999 - accuracy: 0.5733 - val_loss: 2.2393 - val_accuracy: 0.4533
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9683 - accuracy: 0.5887 - val_loss: 2.2190 - val_accuracy: 0.4533
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0307 - accuracy: 0.5758 - val_loss: 2.1285 - val_accuracy: 0.4579
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9489 - accuracy: 0.5913 - val_loss: 2.1103 - val_accuracy: 0.4626
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9416 - accuracy: 0.5784 - val_loss: 2.0879 - val_accuracy: 0.4673
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9027 - accuracy: 0.5887 - val_loss: 2.0709 - val_accuracy: 0.4626
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8256 - accuracy: 0.6067 - val_loss: 2.0502 - val_accuracy: 0.4673
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7116 - accuracy: 0.6350 - val_loss: 2.0238 - val_accuracy: 0.4673
```

Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8009 - accuracy: 0.5887 - val_loss: 1.9931 - val_accuracy: 0.4766
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7134 - accuracy: 0.6015 - val_loss: 1.9695 - val_accuracy: 0.4766
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7858 - accuracy: 0.6118 - val_loss: 1.9136 - val_accuracy: 0.4813
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6074 - accuracy: 0.5810 - val_loss: 1.8872 - val_accuracy: 0.4813
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6940 - accuracy: 0.5990 - val_loss: 1.8539 - val_accuracy: 0.5000
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5577 - accuracy: 0.6170 - val_loss: 1.8370 - val_accuracy: 0.5000
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5615 - accuracy: 0.6272 - val_loss: 1.8028 - val_accuracy: 0.5140
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4763 - accuracy: 0.6247 - val_loss: 1.8050 - val_accuracy: 0.5140
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4330 - accuracy: 0.6375 - val_loss: 1.7343 - val_accuracy: 0.5280
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5116 - accuracy: 0.6170 - val_loss: 1.7440 - val_accuracy: 0.5374
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4272 - accuracy: 0.6350 - val_loss: 1.6926 - val_accuracy: 0.5467
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4659 - accuracy: 0.6427 - val_loss: 1.6365 - val_accuracy: 0.5607
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3541 - accuracy: 0.6195 - val_loss: 1.6798 - val_accuracy: 0.5467
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2476 - accuracy: 0.6324 - val_loss: 1.5797 - val_accuracy: 0.5467
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2710 - accuracy: 0.6144 - val_loss: 1.5363 - val_accuracy: 0.5514
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1870 - accuracy: 0.6581 - val_loss: 1.4942 - val_accuracy: 0.5514
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1700 - accuracy: 0.6452 - val_loss: 1.4654 - val_accuracy: 0.5607
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2602 - accuracy: 0.6581 - val_loss: 1.4412 - val_accuracy: 0.5701
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1481 - accuracy: 0.6607 - val_loss: 1.3355 - val_accuracy: 0.5654
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0194 - accuracy: 0.6607 - val_loss: 1.3120 - val_accuracy: 0.5654
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0343 - accuracy: 0.6350 - val_loss: 1.2824 - val_accuracy: 0.5794
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9446 - accuracy: 0.6530 - val_loss: 1.2541 - val_accuracy: 0.5748
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0986 - accuracy: 0.6452 - val_loss: 1.2145 - val_accuracy: 0.5748
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9646 - accuracy: 0.6581 - val_loss: 1.2181 - val_accuracy: 0.5748
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8605 - accuracy: 0.6581 - val_loss: 1.2376 - val_accuracy: 0.5888
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8138 - accuracy: 0.6761 - val_loss: 1.2394 - val_accuracy: 0.5935
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8111 - accuracy: 0.6684 - val_loss: 1.2166 - val_accuracy: 0.5888
Epoch 69/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8316 - accuracy: 0.6992 - val_loss: 1.1879 - val_accuracy: 0.5981
Epoch 70/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7276 - accuracy: 0.7095 - val_loss: 1.1707 - val_accuracy: 0.6028
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7934 - accuracy: 0.7121 - val_loss: 1.1560 - val_accuracy: 0.6028

```
accuracy: 0.6028
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6837 - accuracy: 0.7301 - val_loss: 1.1368 - val_accuracy: 0.6075
Epoch 73/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6520 - accuracy: 0.7326 - val_loss: 1.0782 - val_accuracy: 0.6121
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6290 - accuracy: 0.7352 - val_loss: 1.0463 - val_accuracy: 0.6215
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6648 - accuracy: 0.7429 - val_loss: 1.0298 - val_accuracy: 0.6355
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6541 - accuracy: 0.7147 - val_loss: 1.0240 - val_accuracy: 0.6262
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5900 - accuracy: 0.7301 - val_loss: 1.0096 - val_accuracy: 0.6308
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5651 - accuracy: 0.7532 - val_loss: 1.0085 - val_accuracy: 0.6308
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5150 - accuracy: 0.7326 - val_loss: 0.9784 - val_accuracy: 0.6168
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5175 - accuracy: 0.7275 - val_loss: 0.9604 - val_accuracy: 0.6262
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5046 - accuracy: 0.7275 - val_loss: 1.0059 - val_accuracy: 0.6449
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5373 - accuracy: 0.7301 - val_loss: 0.9747 - val_accuracy: 0.6449
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5121 - accuracy: 0.7763 - val_loss: 0.9695 - val_accuracy: 0.6402
Epoch 84/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5432 - accuracy: 0.7558 - val_loss: 0.9611 - val_accuracy: 0.6355
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4956 - accuracy: 0.7584 - val_loss: 0.9411 - val_accuracy: 0.6449
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4550 - accuracy: 0.7789 - val_loss: 0.9950 - val_accuracy: 0.6262
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4494 - accuracy: 0.7686 - val_loss: 0.9763 - val_accuracy: 0.6308
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5073 - accuracy: 0.7661 - val_loss: 0.9114 - val_accuracy: 0.6402
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4996 - accuracy: 0.7763 - val_loss: 0.8978 - val_accuracy: 0.6495
Epoch 90/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5084 - accuracy: 0.7609 - val_loss: 0.8506 - val_accuracy: 0.6682
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4974 - accuracy: 0.7738 - val_loss: 0.8489 - val_accuracy: 0.6776
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5223 - accuracy: 0.7686 - val_loss: 0.8022 - val_accuracy: 0.6869
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4954 - accuracy: 0.7712 - val_loss: 0.7695 - val_accuracy: 0.6869
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4373 - accuracy: 0.7738 - val_loss: 0.7842 - val_accuracy: 0.6776
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4873 - accuracy: 0.7609 - val_loss: 0.7377 - val_accuracy: 0.7056
Epoch 96/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4592 - accuracy: 0.7815 - val_loss: 0.7517 - val_accuracy: 0.7103
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4469 - accuracy: 0.7661 - val_loss: 0.7253 - val_accuracy: 0.7430
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4590 - accuracy: 0.7789 - val_loss: 0.6827 - val_accuracy: 0.7430
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4765 - accuracy: 0.7738 - val_loss: 0.6771 - val_accuracy: 0.7430
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5308 - accuracy: 0.7943 - val_loss: 0.6666 - val_accuracy: 0.7336
Epoch 101/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 0.4257 - accuracy: 0.7841 - val_loss: 0.6660 - val_accuracy: 0.7477
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4774 - accuracy: 0.7918 - val_loss: 0.6487 - val_accuracy: 0.7336
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4859 - accuracy: 0.7686 - val_loss: 0.6818 - val_accuracy: 0.7430
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4335 - accuracy: 0.8046 - val_loss: 0.7412 - val_accuracy: 0.7477
Epoch 105/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4096 - accuracy: 0.8123 - val_loss: 0.7625 - val_accuracy: 0.7383
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4532 - accuracy: 0.7969 - val_loss: 0.7446 - val_accuracy: 0.7477
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4374 - accuracy: 0.7969 - val_loss: 0.7381 - val_accuracy: 0.7430
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4295 - accuracy: 0.7969 - val_loss: 0.7768 - val_accuracy: 0.7290
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3984 - accuracy: 0.8021 - val_loss: 0.7705 - val_accuracy: 0.7477
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4664 - accuracy: 0.7635 - val_loss: 0.7715 - val_accuracy: 0.7383
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4479 - accuracy: 0.7841 - val_loss: 0.7295 - val_accuracy: 0.7570
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4095 - accuracy: 0.7892 - val_loss: 0.7015 - val_accuracy: 0.7523
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4050 - accuracy: 0.7892 - val_loss: 0.6577 - val_accuracy: 0.7477
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4031 - accuracy: 0.7738 - val_loss: 0.6586 - val_accuracy: 0.7523
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4283 - accuracy: 0.7841 - val_loss: 0.6556 - val_accuracy: 0.7477
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4324 - accuracy: 0.8098 - val_loss: 0.6492 - val_accuracy: 0.7523
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3550 - accuracy: 0.7943 - val_loss: 0.7092 - val_accuracy: 0.7617
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4192 - accuracy: 0.7892 - val_loss: 0.7640 - val_accuracy: 0.7570
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4115 - accuracy: 0.8021 - val_loss: 0.8001 - val_accuracy: 0.7383
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4053 - accuracy: 0.7661 - val_loss: 0.8115 - val_accuracy: 0.7664
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3859 - accuracy: 0.8021 - val_loss: 0.8029 - val_accuracy: 0.7570
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4143 - accuracy: 0.7789 - val_loss: 0.8003 - val_accuracy: 0.7570
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4071 - accuracy: 0.7918 - val_loss: 0.7290 - val_accuracy: 0.7290
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4266 - accuracy: 0.8046 - val_loss: 0.7911 - val_accuracy: 0.7523
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4074 - accuracy: 0.8098 - val_loss: 0.7303 - val_accuracy: 0.7290
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3524 - accuracy: 0.8021 - val_loss: 0.8029 - val_accuracy: 0.7336
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3909 - accuracy: 0.8226 - val_loss: 0.8300 - val_accuracy: 0.7477
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3726 - accuracy: 0.7943 - val_loss: 0.8284 - val_accuracy: 0.7383
Epoch 129/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3774 - accuracy: 0.7969 - val_loss: 0.8591 - val_accuracy: 0.7430
Epoch 130/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4271 - accuracy: 0.8021 - val_loss: 0.8633 - val_accuracy: 0.7430
```

Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3473 - accuracy: 0.7995 - val_loss: 0.8643 - val_accuracy: 0.7290
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3475 - accuracy: 0.8175 - val_loss: 0.8943 - val_accuracy: 0.7290
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3692 - accuracy: 0.8072 - val_loss: 0.8048 - val_accuracy: 0.7430
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3566 - accuracy: 0.8098 - val_loss: 0.8510 - val_accuracy: 0.7477
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3366 - accuracy: 0.8175 - val_loss: 0.8116 - val_accuracy: 0.7290
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3394 - accuracy: 0.8175 - val_loss: 0.8130 - val_accuracy: 0.7290
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3938 - accuracy: 0.8046 - val_loss: 0.8052 - val_accuracy: 0.7243
Epoch 138/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3677 - accuracy: 0.7866 - val_loss: 0.7938 - val_accuracy: 0.7196
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4513 - accuracy: 0.7918 - val_loss: 0.7376 - val_accuracy: 0.7383
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4183 - accuracy: 0.8278 - val_loss: 0.7654 - val_accuracy: 0.7383
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3584 - accuracy: 0.7943 - val_loss: 0.7666 - val_accuracy: 0.7336
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3430 - accuracy: 0.7995 - val_loss: 0.7593 - val_accuracy: 0.7290
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3791 - accuracy: 0.8072 - val_loss: 0.8288 - val_accuracy: 0.7290
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3748 - accuracy: 0.7969 - val_loss: 0.8440 - val_accuracy: 0.7196
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3880 - accuracy: 0.8252 - val_loss: 0.8712 - val_accuracy: 0.7243
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3593 - accuracy: 0.7995 - val_loss: 0.8537 - val_accuracy: 0.7196
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4051 - accuracy: 0.8098 - val_loss: 0.8331 - val_accuracy: 0.7103
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3480 - accuracy: 0.7969 - val_loss: 0.8612 - val_accuracy: 0.7196
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4267 - accuracy: 0.7995 - val_loss: 0.8957 - val_accuracy: 0.7336
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3930 - accuracy: 0.7918 - val_loss: 0.9818 - val_accuracy: 0.7383
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3817 - accuracy: 0.8149 - val_loss: 0.9530 - val_accuracy: 0.7570
Epoch 152/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3578 - accuracy: 0.8021 - val_loss: 0.9134 - val_accuracy: 0.7523
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3344 - accuracy: 0.8252 - val_loss: 0.9605 - val_accuracy: 0.7617
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3905 - accuracy: 0.8252 - val_loss: 0.9198 - val_accuracy: 0.7430
Epoch 155/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3421 - accuracy: 0.8175 - val_loss: 0.9149 - val_accuracy: 0.7523
Epoch 156/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3743 - accuracy: 0.8021 - val_loss: 0.9250 - val_accuracy: 0.7523
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3511 - accuracy: 0.8098 - val_loss: 0.8963 - val_accuracy: 0.7570
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3800 - accuracy: 0.8252 - val_loss: 0.9344 - val_accuracy: 0.7430
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3237 - accuracy: 0.8252 - val_loss: 0.9458 - val_accuracy: 0.7430
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3443 - accuracy: 0.7995 - val_loss: 0.9229 - val_accuracy: 0.7430

```
accuracy: 0.7430
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4461 - accuracy: 0.7789 - val_loss: 1.0276 - val_
accuracy: 0.7570
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3421 - accuracy: 0.8021 - val_loss: 0.9772 - val_
accuracy: 0.7617
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3050 - accuracy: 0.8098 - val_loss: 0.9712 - val_
accuracy: 0.7570
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3974 - accuracy: 0.8149 - val_loss: 0.8615 - val_
accuracy: 0.7664
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3666 - accuracy: 0.8149 - val_loss: 0.8194 - val_
accuracy: 0.7664
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3490 - accuracy: 0.7815 - val_loss: 0.8214 - val_
accuracy: 0.7523
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2984 - accuracy: 0.8226 - val_loss: 0.8192 - val_
accuracy: 0.7570
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3283 - accuracy: 0.8098 - val_loss: 0.8491 - val_
accuracy: 0.7570
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3691 - accuracy: 0.8278 - val_loss: 0.8550 - val_
accuracy: 0.7477
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3602 - accuracy: 0.8201 - val_loss: 0.8502 - val_
accuracy: 0.7430
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2947 - accuracy: 0.8226 - val_loss: 0.8140 - val_
accuracy: 0.7336
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3121 - accuracy: 0.8149 - val_loss: 0.8157 - val_
accuracy: 0.7430
Epoch 173/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3688 - accuracy: 0.8201 - val_loss: 0.8471 - val_
accuracy: 0.7430
Epoch 174/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3366 - accuracy: 0.8098 - val_loss: 0.8859 - val_
accuracy: 0.7477
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4384 - accuracy: 0.8021 - val_loss: 0.9454 - val_
accuracy: 0.7617
Epoch 176/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3791 - accuracy: 0.8201 - val_loss: 0.8800 - val_
accuracy: 0.7617
Epoch 177/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3335 - accuracy: 0.8329 - val_loss: 0.9680 - val_
accuracy: 0.7617
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3732 - accuracy: 0.8458 - val_loss: 0.9158 - val_
accuracy: 0.7523
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2943 - accuracy: 0.8278 - val_loss: 0.9111 - val_
accuracy: 0.7523
Epoch 180/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3407 - accuracy: 0.8380 - val_loss: 0.8656 - val_
accuracy: 0.7383
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3504 - accuracy: 0.8252 - val_loss: 0.8561 - val_
accuracy: 0.7336
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3468 - accuracy: 0.8226 - val_loss: 0.8204 - val_
accuracy: 0.7290
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3245 - accuracy: 0.8329 - val_loss: 0.8411 - val_
accuracy: 0.7290
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3176 - accuracy: 0.8226 - val_loss: 0.8159 - val_
accuracy: 0.7150
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3029 - accuracy: 0.8458 - val_loss: 0.7820 - val_
accuracy: 0.7477
Epoch 186/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2996 - accuracy: 0.8509 - val_loss: 0.7766 - val_
accuracy: 0.7336
Epoch 187/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3216 - accuracy: 0.8252 - val_loss: 0.8615 - val_
accuracy: 0.7430
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4558 - accuracy: 0.7969 - val_loss: 0.8000 - val_
accuracy: 0.7523
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3054 - accuracy: 0.8432 - val_loss: 0.9703 - val_
accuracy: 0.7523
Epoch 190/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3274 - accuracy: 0.8355 - val_loss: 0.9082 - val_accuracy: 0.7617
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3484 - accuracy: 0.8329 - val_loss: 0.9475 - val_accuracy: 0.7570
Epoch 192/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3805 - accuracy: 0.8226 - val_loss: 0.8846 - val_accuracy: 0.7617
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3024 - accuracy: 0.8432 - val_loss: 0.9036 - val_accuracy: 0.7430
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3552 - accuracy: 0.8380 - val_loss: 0.9056 - val_accuracy: 0.7336
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3391 - accuracy: 0.8458 - val_loss: 0.9335 - val_accuracy: 0.7430
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3096 - accuracy: 0.8072 - val_loss: 0.9069 - val_accuracy: 0.7477
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3606 - accuracy: 0.8226 - val_loss: 1.0231 - val_accuracy: 0.7617
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3051 - accuracy: 0.8303 - val_loss: 1.0541 - val_accuracy: 0.7617
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3117 - accuracy: 0.8458 - val_loss: 1.1318 - val_accuracy: 0.7710
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4292 - accuracy: 0.8123 - val_loss: 1.1868 - val_accuracy: 0.7757
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3280 - accuracy: 0.8586 - val_loss: 1.0595 - val_accuracy: 0.7710
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2889 - accuracy: 0.8432 - val_loss: 1.0638 - val_accuracy: 0.7523
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3735 - accuracy: 0.8535 - val_loss: 0.9971 - val_accuracy: 0.7430
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3226 - accuracy: 0.8432 - val_loss: 0.9964 - val_accuracy: 0.7430
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3328 - accuracy: 0.8380 - val_loss: 1.1538 - val_accuracy: 0.7570
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3697 - accuracy: 0.8406 - val_loss: 1.0558 - val_accuracy: 0.7523
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4575 - accuracy: 0.8021 - val_loss: 1.1109 - val_accuracy: 0.7570
Epoch 208/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3108 - accuracy: 0.8458 - val_loss: 1.0304 - val_accuracy: 0.7804
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3235 - accuracy: 0.8560 - val_loss: 0.9832 - val_accuracy: 0.7477
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3181 - accuracy: 0.8458 - val_loss: 0.9472 - val_accuracy: 0.7570
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2719 - accuracy: 0.8458 - val_loss: 0.9441 - val_accuracy: 0.7617
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3137 - accuracy: 0.8329 - val_loss: 0.9793 - val_accuracy: 0.7570
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2989 - accuracy: 0.8509 - val_loss: 0.9431 - val_accuracy: 0.7477
Epoch 214/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2779 - accuracy: 0.8509 - val_loss: 0.9349 - val_accuracy: 0.7383
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3192 - accuracy: 0.8509 - val_loss: 0.9402 - val_accuracy: 0.7383
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3991 - accuracy: 0.8560 - val_loss: 0.9249 - val_accuracy: 0.7570
Epoch 217/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3142 - accuracy: 0.8766 - val_loss: 0.9235 - val_accuracy: 0.7570
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2890 - accuracy: 0.8740 - val_loss: 0.8940 - val_accuracy: 0.7570
Epoch 219/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2773 - accuracy: 0.8817 - val_loss: 0.9004 - val_accuracy: 0.7664
```

Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3126 - accuracy: 0.8586 - val_loss: 0.9137 - val_accuracy: 0.7710
Epoch 221/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2893 - accuracy: 0.8689 - val_loss: 0.9749 - val_accuracy: 0.7617
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4143 - accuracy: 0.8586 - val_loss: 0.9731 - val_accuracy: 0.7477
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2921 - accuracy: 0.8432 - val_loss: 0.9970 - val_accuracy: 0.7617
Epoch 224/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3288 - accuracy: 0.8638 - val_loss: 0.9682 - val_accuracy: 0.7570
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2934 - accuracy: 0.8740 - val_loss: 0.9933 - val_accuracy: 0.7570
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3588 - accuracy: 0.8535 - val_loss: 0.9788 - val_accuracy: 0.7523
Epoch 227/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3085 - accuracy: 0.8406 - val_loss: 1.0121 - val_accuracy: 0.7664
Epoch 228/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2934 - accuracy: 0.8329 - val_loss: 1.0497 - val_accuracy: 0.7664
Epoch 229/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4246 - accuracy: 0.8483 - val_loss: 0.9975 - val_accuracy: 0.7523
Epoch 230/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3102 - accuracy: 0.8638 - val_loss: 1.0554 - val_accuracy: 0.7523
Epoch 231/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3575 - accuracy: 0.8560 - val_loss: 1.0825 - val_accuracy: 0.7570
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3803 - accuracy: 0.8458 - val_loss: 1.0870 - val_accuracy: 0.7710
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3521 - accuracy: 0.8535 - val_loss: 1.1001 - val_accuracy: 0.7664
Epoch 234/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3303 - accuracy: 0.8175 - val_loss: 1.1355 - val_accuracy: 0.7477
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3184 - accuracy: 0.8638 - val_loss: 1.1927 - val_accuracy: 0.7710
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3075 - accuracy: 0.8560 - val_loss: 1.1585 - val_accuracy: 0.7757
Epoch 237/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2684 - accuracy: 0.8586 - val_loss: 1.0934 - val_accuracy: 0.7570
Epoch 238/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2473 - accuracy: 0.8638 - val_loss: 1.1216 - val_accuracy: 0.7570
Epoch 239/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3576 - accuracy: 0.8638 - val_loss: 1.1279 - val_accuracy: 0.7617
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2823 - accuracy: 0.8560 - val_loss: 1.1085 - val_accuracy: 0.7664
Epoch 241/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2567 - accuracy: 0.8509 - val_loss: 1.2099 - val_accuracy: 0.7664
Epoch 242/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3079 - accuracy: 0.8586 - val_loss: 1.1886 - val_accuracy: 0.7570
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2517 - accuracy: 0.8638 - val_loss: 1.1533 - val_accuracy: 0.7477
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2509 - accuracy: 0.8638 - val_loss: 1.1336 - val_accuracy: 0.7570
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3237 - accuracy: 0.8535 - val_loss: 1.1646 - val_accuracy: 0.7523
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2562 - accuracy: 0.8638 - val_loss: 1.1662 - val_accuracy: 0.7570
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3465 - accuracy: 0.8663 - val_loss: 1.2320 - val_accuracy: 0.7523
Epoch 248/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2856 - accuracy: 0.8715 - val_loss: 1.1771 - val_accuracy: 0.7570
Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2832 - accuracy: 0.8509 - val_loss: 1.1387 - val_accuracy: 0.7523

```
accuracy: 0.7523
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2432 - accuracy: 0.8638 - val_loss: 1.2693 - val_
accuracy: 0.7430
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3628 - accuracy: 0.8329 - val_loss: 1.2580 - val_
accuracy: 0.7523
Epoch 252/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3218 - accuracy: 0.8458 - val_loss: 1.2667 - val_
accuracy: 0.7430
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3234 - accuracy: 0.8509 - val_loss: 1.2417 - val_
accuracy: 0.7383
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2916 - accuracy: 0.8509 - val_loss: 1.2658 - val_
accuracy: 0.7477
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2815 - accuracy: 0.8535 - val_loss: 1.2872 - val_
accuracy: 0.7477
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3547 - accuracy: 0.8355 - val_loss: 1.2188 - val_
accuracy: 0.7477
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3235 - accuracy: 0.8355 - val_loss: 1.2868 - val_
accuracy: 0.7477
Epoch 258/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2533 - accuracy: 0.8355 - val_loss: 1.2081 - val_
accuracy: 0.7617
Epoch 259/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2902 - accuracy: 0.8303 - val_loss: 1.2635 - val_
accuracy: 0.7477
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3506 - accuracy: 0.8252 - val_loss: 1.2728 - val_
accuracy: 0.7383
Epoch 261/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2923 - accuracy: 0.8406 - val_loss: 1.2949 - val_
accuracy: 0.7430
Epoch 262/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2580 - accuracy: 0.8638 - val_loss: 1.3519 - val_
accuracy: 0.7570
Epoch 263/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3248 - accuracy: 0.8303 - val_loss: 1.3538 - val_
accuracy: 0.7430
Epoch 264/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2675 - accuracy: 0.8252 - val_loss: 1.4182 - val_
accuracy: 0.7290
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3631 - accuracy: 0.8098 - val_loss: 1.4393 - val_
accuracy: 0.7243
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4464 - accuracy: 0.8046 - val_loss: 1.3642 - val_
accuracy: 0.7477
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3731 - accuracy: 0.8303 - val_loss: 1.3983 - val_
accuracy: 0.7430
Epoch 268/1000
4/4 [=====] - 0s 18ms/step - loss: 0.3300 - accuracy: 0.8226 - val_loss: 1.3099 - val_
accuracy: 0.7477
Epoch 269/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2616 - accuracy: 0.8278 - val_loss: 1.3711 - val_
accuracy: 0.7383
Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3013 - accuracy: 0.8303 - val_loss: 1.4458 - val_
accuracy: 0.7383
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3336 - accuracy: 0.8303 - val_loss: 1.4243 - val_
accuracy: 0.7150
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3021 - accuracy: 0.8252 - val_loss: 1.3500 - val_
accuracy: 0.7383
Epoch 273/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3155 - accuracy: 0.8329 - val_loss: 1.3298 - val_
accuracy: 0.7150
Epoch 274/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2906 - accuracy: 0.8098 - val_loss: 1.3284 - val_
accuracy: 0.7196
Epoch 275/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2908 - accuracy: 0.8098 - val_loss: 1.2866 - val_
accuracy: 0.7336
Epoch 276/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3567 - accuracy: 0.8072 - val_loss: 1.2934 - val_
accuracy: 0.7336
Epoch 277/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3041 - accuracy: 0.8380 - val_loss: 1.3082 - val_
accuracy: 0.7336
Epoch 278/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3034 - accuracy: 0.8201 - val_loss: 1.2826 - val_
accuracy: 0.7430
Epoch 279/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.2762 - accuracy: 0.8123 - val_loss: 1.3383 - val_accuracy: 0.7383
Epoch 280/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2581 - accuracy: 0.8226 - val_loss: 1.3816 - val_accuracy: 0.7196
Epoch 281/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3059 - accuracy: 0.8201 - val_loss: 1.3369 - val_accuracy: 0.7290
Epoch 282/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2885 - accuracy: 0.8509 - val_loss: 1.3349 - val_accuracy: 0.7290
Epoch 283/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3547 - accuracy: 0.8098 - val_loss: 1.4159 - val_accuracy: 0.7430
Epoch 284/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3169 - accuracy: 0.8380 - val_loss: 1.4811 - val_accuracy: 0.7150
Epoch 285/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2841 - accuracy: 0.8432 - val_loss: 1.4381 - val_accuracy: 0.7150
Epoch 286/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3170 - accuracy: 0.8226 - val_loss: 1.4627 - val_accuracy: 0.7243
Epoch 287/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2739 - accuracy: 0.8380 - val_loss: 1.3723 - val_accuracy: 0.7243
Epoch 288/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2922 - accuracy: 0.8406 - val_loss: 1.4074 - val_accuracy: 0.7243
Epoch 289/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2395 - accuracy: 0.8355 - val_loss: 1.3742 - val_accuracy: 0.7290
Epoch 290/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2830 - accuracy: 0.8201 - val_loss: 1.3811 - val_accuracy: 0.7196
Epoch 291/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2559 - accuracy: 0.8329 - val_loss: 1.3842 - val_accuracy: 0.7196
Epoch 292/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2934 - accuracy: 0.8329 - val_loss: 1.3331 - val_accuracy: 0.7196
Epoch 293/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3289 - accuracy: 0.8252 - val_loss: 1.3306 - val_accuracy: 0.7196
Epoch 294/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2784 - accuracy: 0.8432 - val_loss: 1.3373 - val_accuracy: 0.7196
Epoch 295/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2277 - accuracy: 0.8432 - val_loss: 1.3223 - val_accuracy: 0.7243
Epoch 296/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2401 - accuracy: 0.8509 - val_loss: 1.3848 - val_accuracy: 0.7196
Epoch 297/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3900 - accuracy: 0.8123 - val_loss: 1.3835 - val_accuracy: 0.7196
Epoch 298/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2873 - accuracy: 0.8483 - val_loss: 1.4068 - val_accuracy: 0.7243
Epoch 299/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2965 - accuracy: 0.8329 - val_loss: 1.2821 - val_accuracy: 0.7430
Epoch 300/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2503 - accuracy: 0.8406 - val_loss: 1.3634 - val_accuracy: 0.7290
Epoch 301/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2421 - accuracy: 0.8483 - val_loss: 1.3288 - val_accuracy: 0.7243
Epoch 302/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2786 - accuracy: 0.8355 - val_loss: 1.3457 - val_accuracy: 0.7290
Epoch 303/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2893 - accuracy: 0.8329 - val_loss: 1.3620 - val_accuracy: 0.7336
Epoch 304/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3672 - accuracy: 0.8226 - val_loss: 1.2745 - val_accuracy: 0.7430
Epoch 305/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2715 - accuracy: 0.8329 - val_loss: 1.2825 - val_accuracy: 0.7336
Epoch 306/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3379 - accuracy: 0.8278 - val_loss: 1.1841 - val_accuracy: 0.7523
Epoch 307/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2650 - accuracy: 0.8355 - val_loss: 1.2695 - val_accuracy: 0.7383
Epoch 308/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2719 - accuracy: 0.8560 - val_loss: 1.3817 - val_accuracy: 0.7570
```

Epoch 309/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2388 - accuracy: 0.8458 - val_loss: 1.3757 - val_accuracy: 0.7383
Epoch 310/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2604 - accuracy: 0.8458 - val_loss: 1.3559 - val_accuracy: 0.7336
Epoch 311/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3034 - accuracy: 0.8406 - val_loss: 1.3449 - val_accuracy: 0.7243
Epoch 312/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3289 - accuracy: 0.8509 - val_loss: 1.3597 - val_accuracy: 0.7243
Epoch 313/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3397 - accuracy: 0.8252 - val_loss: 1.3722 - val_accuracy: 0.7196
Epoch 314/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3264 - accuracy: 0.8252 - val_loss: 1.3986 - val_accuracy: 0.7290
Epoch 315/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2422 - accuracy: 0.8560 - val_loss: 1.3894 - val_accuracy: 0.7383
Epoch 316/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2447 - accuracy: 0.8509 - val_loss: 1.3863 - val_accuracy: 0.7336
Epoch 317/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2319 - accuracy: 0.8432 - val_loss: 1.3536 - val_accuracy: 0.7383
Epoch 318/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2597 - accuracy: 0.8355 - val_loss: 1.3561 - val_accuracy: 0.7383
Epoch 319/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2344 - accuracy: 0.8355 - val_loss: 1.4154 - val_accuracy: 0.7430
Epoch 320/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2778 - accuracy: 0.8560 - val_loss: 1.3412 - val_accuracy: 0.7243
Epoch 321/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2867 - accuracy: 0.8046 - val_loss: 1.3922 - val_accuracy: 0.7336
Epoch 322/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2649 - accuracy: 0.8432 - val_loss: 1.3895 - val_accuracy: 0.7243
Epoch 323/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2568 - accuracy: 0.8303 - val_loss: 1.3280 - val_accuracy: 0.7383
Epoch 324/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2991 - accuracy: 0.8278 - val_loss: 1.3458 - val_accuracy: 0.7103
Epoch 325/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2496 - accuracy: 0.8278 - val_loss: 1.3766 - val_accuracy: 0.7150
Epoch 326/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2846 - accuracy: 0.8175 - val_loss: 1.3297 - val_accuracy: 0.7290
Epoch 327/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2996 - accuracy: 0.8329 - val_loss: 1.2534 - val_accuracy: 0.7477
Epoch 328/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2961 - accuracy: 0.8226 - val_loss: 1.3703 - val_accuracy: 0.7523
Epoch 329/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2507 - accuracy: 0.8355 - val_loss: 1.2837 - val_accuracy: 0.7570
Epoch 330/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2541 - accuracy: 0.8329 - val_loss: 1.3054 - val_accuracy: 0.7710
Epoch 331/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3477 - accuracy: 0.8252 - val_loss: 1.3698 - val_accuracy: 0.7570
Epoch 332/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2393 - accuracy: 0.8483 - val_loss: 1.3697 - val_accuracy: 0.7523
Epoch 333/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2654 - accuracy: 0.8380 - val_loss: 1.4323 - val_accuracy: 0.7430
Epoch 334/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3805 - accuracy: 0.8278 - val_loss: 1.4658 - val_accuracy: 0.7290
Epoch 335/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3463 - accuracy: 0.8432 - val_loss: 1.5048 - val_accuracy: 0.7336
Epoch 336/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3145 - accuracy: 0.8380 - val_loss: 1.4089 - val_accuracy: 0.7383
Epoch 337/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2641 - accuracy: 0.8509 - val_loss: 1.4727 - val_accuracy: 0.7430
Epoch 338/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2147 - accuracy: 0.8740 - val_loss: 1.4144 - val_accuracy: 0.7383

accuracy: 0.7477
Epoch 339/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2959 - accuracy: 0.8535 - val_loss: 1.3923 - val_accuracy: 0.7290
Epoch 340/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3125 - accuracy: 0.8586 - val_loss: 1.4640 - val_accuracy: 0.7430
Epoch 341/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2940 - accuracy: 0.8226 - val_loss: 1.3336 - val_accuracy: 0.7336
Epoch 342/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2435 - accuracy: 0.8612 - val_loss: 1.4106 - val_accuracy: 0.7383
Epoch 343/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2413 - accuracy: 0.8560 - val_loss: 1.3796 - val_accuracy: 0.7430
Epoch 344/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2564 - accuracy: 0.8406 - val_loss: 1.4617 - val_accuracy: 0.7336
Epoch 345/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3064 - accuracy: 0.8380 - val_loss: 1.4775 - val_accuracy: 0.7196
Epoch 346/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2577 - accuracy: 0.8612 - val_loss: 1.3733 - val_accuracy: 0.6963
Epoch 347/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2917 - accuracy: 0.8329 - val_loss: 1.3983 - val_accuracy: 0.7103
Epoch 348/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2785 - accuracy: 0.8406 - val_loss: 1.4226 - val_accuracy: 0.6916
Epoch 349/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2681 - accuracy: 0.8406 - val_loss: 1.3221 - val_accuracy: 0.7009
Epoch 350/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2688 - accuracy: 0.8560 - val_loss: 1.2720 - val_accuracy: 0.7056
Epoch 351/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2143 - accuracy: 0.8612 - val_loss: 1.2712 - val_accuracy: 0.7150
Epoch 352/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2669 - accuracy: 0.8355 - val_loss: 1.2787 - val_accuracy: 0.7150
Epoch 353/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2181 - accuracy: 0.8329 - val_loss: 1.2666 - val_accuracy: 0.7103
Epoch 354/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2235 - accuracy: 0.8740 - val_loss: 1.2890 - val_accuracy: 0.6963
Epoch 355/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2391 - accuracy: 0.8509 - val_loss: 1.2821 - val_accuracy: 0.7150
Epoch 356/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2088 - accuracy: 0.8612 - val_loss: 1.3324 - val_accuracy: 0.7056
Epoch 357/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3316 - accuracy: 0.8380 - val_loss: 1.4997 - val_accuracy: 0.7430
Epoch 358/1000
1/4 [=====] - ETA: 0s - loss: 0.2086 - accuracy: 0.8438 Restoring model weights from the end of the best epoch: 208.
4/4 [=====] - 0s 14ms/step - loss: 0.2228 - accuracy: 0.8663 - val_loss: 1.3855 - val_accuracy: 0.7290
Epoch 358: early stopping
2/2 [=====] - 0s 3ms/step - loss: 0.7865 - accuracy: 0.8372
[CV] ENDDense1=50, Dense2=50; total time= 18.2s
Model: "sequential_69"

Layer (type)	Output Shape	Param #
<hr/>		
dense_276 (Dense)	(None, 100)	700
batch_normalization_207 (BatchNormalization)	(None, 100)	400
activation_207 (Activation)	(None, 100)	0
dense_277 (Dense)	(None, 10)	1010
batch_normalization_208 (BatchNormalization)	(None, 10)	40
activation_208 (Activation)	(None, 10)	0
dense_278 (Dense)	(None, 10)	110
batch_normalization_209 (BatchNormalization)	(None, 10)	40

```
activation_209 (Activation) (None, 10)
```

```
0
```

```
dense_279 (Dense) (None, 2)
```

```
22
```

```
=====
```

```
Total params: 2,322
```

```
Trainable params: 2,082
```

```
Non-trainable params: 240
```

```
Epoch 1/1000
```

```
4/4 [=====] - 1s 55ms/step - loss: 3.7190 - accuracy: 0.6186 - val_loss: 2.8186 - val_accuracy: 0.6495
```

```
Epoch 2/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 2.7001 - accuracy: 0.5979 - val_loss: 2.4291 - val_accuracy: 0.6589
```

```
Epoch 3/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 2.3720 - accuracy: 0.5902 - val_loss: 2.3436 - val_accuracy: 0.6168
```

```
Epoch 4/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 2.0668 - accuracy: 0.5979 - val_loss: 2.3557 - val_accuracy: 0.5888
```

```
Epoch 5/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 1.9019 - accuracy: 0.5851 - val_loss: 2.2586 - val_accuracy: 0.5607
```

```
Epoch 6/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 1.6963 - accuracy: 0.5876 - val_loss: 2.1604 - val_accuracy: 0.5794
```

```
Epoch 7/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 1.7598 - accuracy: 0.5979 - val_loss: 2.0211 - val_accuracy: 0.5374
```

```
Epoch 8/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 1.6991 - accuracy: 0.5928 - val_loss: 1.9834 - val_accuracy: 0.4953
```

```
Epoch 9/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 1.6542 - accuracy: 0.6134 - val_loss: 1.9297 - val_accuracy: 0.4907
```

```
Epoch 10/1000
```

```
4/4 [=====] - 0s 15ms/step - loss: 1.4800 - accuracy: 0.6211 - val_loss: 1.9311 - val_accuracy: 0.5047
```

```
Epoch 11/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 1.4558 - accuracy: 0.6082 - val_loss: 1.8696 - val_accuracy: 0.5093
```

```
Epoch 12/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 1.3644 - accuracy: 0.5979 - val_loss: 1.8261 - val_accuracy: 0.4533
```

```
Epoch 13/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 1.3886 - accuracy: 0.6005 - val_loss: 1.7820 - val_accuracy: 0.4439
```

```
Epoch 14/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 1.4009 - accuracy: 0.6005 - val_loss: 1.7595 - val_accuracy: 0.4393
```

```
Epoch 15/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 1.2961 - accuracy: 0.5979 - val_loss: 1.7429 - val_accuracy: 0.4439
```

```
Epoch 16/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 1.3700 - accuracy: 0.6082 - val_loss: 1.7136 - val_accuracy: 0.4486
```

```
Epoch 17/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 1.2267 - accuracy: 0.5979 - val_loss: 1.6994 - val_accuracy: 0.4533
```

```
Epoch 18/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 1.3649 - accuracy: 0.6108 - val_loss: 1.6568 - val_accuracy: 0.4486
```

```
Epoch 19/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 1.2184 - accuracy: 0.6186 - val_loss: 1.6394 - val_accuracy: 0.4439
```

```
Epoch 20/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 1.1552 - accuracy: 0.6134 - val_loss: 1.5971 - val_accuracy: 0.4439
```

```
Epoch 21/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 1.1573 - accuracy: 0.6263 - val_loss: 1.5593 - val_accuracy: 0.4346
```

```
Epoch 22/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 1.0883 - accuracy: 0.6418 - val_loss: 1.5545 - val_accuracy: 0.4346
```

```
Epoch 23/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 1.0730 - accuracy: 0.6418 - val_loss: 1.5312 - val_accuracy: 0.4393
```

```
Epoch 24/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.9687 - accuracy: 0.6005 - val_loss: 1.5128 - val_accuracy: 0.4486
```

```
Epoch 25/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 1.0596 - accuracy: 0.6418 - val_loss: 1.5011 - val_accuracy: 0.4626
```

```
Epoch 26/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.9030 - accuracy: 0.6057 - val_loss: 1.4823 - val_accuracy: 0.4486
```

```
Epoch 27/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.9826 - accuracy: 0.6005 - val_loss: 1.4724 - val_accuracy: 0.4486
```

```
accuracy: 0.4206
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0305 - accuracy: 0.5619 - val_loss: 1.4562 - val_accuracy: 0.4159
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9826 - accuracy: 0.5747 - val_loss: 1.4427 - val_accuracy: 0.4673
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9404 - accuracy: 0.5799 - val_loss: 1.4279 - val_accuracy: 0.4626
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9242 - accuracy: 0.5361 - val_loss: 1.4189 - val_accuracy: 0.4673
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8525 - accuracy: 0.5412 - val_loss: 1.4015 - val_accuracy: 0.4720
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8739 - accuracy: 0.5335 - val_loss: 1.4154 - val_accuracy: 0.4766
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8842 - accuracy: 0.5026 - val_loss: 1.3786 - val_accuracy: 0.5000
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8176 - accuracy: 0.5361 - val_loss: 1.3724 - val_accuracy: 0.4579
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8214 - accuracy: 0.5284 - val_loss: 1.3655 - val_accuracy: 0.4486
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8554 - accuracy: 0.5464 - val_loss: 1.3077 - val_accuracy: 0.4486
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9043 - accuracy: 0.5309 - val_loss: 1.3400 - val_accuracy: 0.4720
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8366 - accuracy: 0.5515 - val_loss: 1.3211 - val_accuracy: 0.4813
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8085 - accuracy: 0.5180 - val_loss: 1.3029 - val_accuracy: 0.4766
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7957 - accuracy: 0.5077 - val_loss: 1.2631 - val_accuracy: 0.4533
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7332 - accuracy: 0.5052 - val_loss: 1.2229 - val_accuracy: 0.4720
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7985 - accuracy: 0.5000 - val_loss: 1.2146 - val_accuracy: 0.4813
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6741 - accuracy: 0.4871 - val_loss: 1.2387 - val_accuracy: 0.4252
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6269 - accuracy: 0.5361 - val_loss: 1.2035 - val_accuracy: 0.4159
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6561 - accuracy: 0.5258 - val_loss: 1.1976 - val_accuracy: 0.4159
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6789 - accuracy: 0.5361 - val_loss: 1.1864 - val_accuracy: 0.4159
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5775 - accuracy: 0.5129 - val_loss: 1.1691 - val_accuracy: 0.4112
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5658 - accuracy: 0.5155 - val_loss: 1.1740 - val_accuracy: 0.4159
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6473 - accuracy: 0.5902 - val_loss: 1.1765 - val_accuracy: 0.4252
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5596 - accuracy: 0.5464 - val_loss: 1.1644 - val_accuracy: 0.4206
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5440 - accuracy: 0.6443 - val_loss: 1.1560 - val_accuracy: 0.4206
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5780 - accuracy: 0.6469 - val_loss: 1.1481 - val_accuracy: 0.4159
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5441 - accuracy: 0.6186 - val_loss: 1.1345 - val_accuracy: 0.4206
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5584 - accuracy: 0.6443 - val_loss: 1.0928 - val_accuracy: 0.4346
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5402 - accuracy: 0.6443 - val_loss: 1.1091 - val_accuracy: 0.4299
Epoch 57/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.4992 - accuracy: 0.5979 - val_loss: 1.0553 - val_accuracy: 0.4299
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5196 - accuracy: 0.6108 - val_loss: 1.0343 - val_accuracy: 0.4346
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5403 - accuracy: 0.6186 - val_loss: 0.9910 - val_accuracy: 0.4393
Epoch 60/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5524 - accuracy: 0.5851 - val_loss: 0.9770 - val_accuracy: 0.4486
Epoch 61/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4806 - accuracy: 0.6005 - val_loss: 0.9800 - val_accuracy: 0.4486
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5101 - accuracy: 0.5979 - val_loss: 0.9673 - val_accuracy: 0.4439
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4672 - accuracy: 0.6237 - val_loss: 1.0068 - val_accuracy: 0.4486
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5368 - accuracy: 0.5979 - val_loss: 0.9892 - val_accuracy: 0.4486
Epoch 65/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5055 - accuracy: 0.6366 - val_loss: 0.9784 - val_accuracy: 0.4299
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4830 - accuracy: 0.6134 - val_loss: 0.9217 - val_accuracy: 0.4579
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4527 - accuracy: 0.6108 - val_loss: 0.9202 - val_accuracy: 0.4626
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4418 - accuracy: 0.6108 - val_loss: 0.9191 - val_accuracy: 0.4720
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4244 - accuracy: 0.6160 - val_loss: 0.9155 - val_accuracy: 0.4626
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4346 - accuracy: 0.6160 - val_loss: 0.9089 - val_accuracy: 0.4626
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4421 - accuracy: 0.5979 - val_loss: 0.9247 - val_accuracy: 0.4720
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4687 - accuracy: 0.5747 - val_loss: 0.8932 - val_accuracy: 0.4860
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4552 - accuracy: 0.5979 - val_loss: 0.8915 - val_accuracy: 0.4813
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3761 - accuracy: 0.5876 - val_loss: 0.8424 - val_accuracy: 0.4860
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3900 - accuracy: 0.5851 - val_loss: 0.8458 - val_accuracy: 0.4860
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4715 - accuracy: 0.5928 - val_loss: 0.8542 - val_accuracy: 0.5000
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4693 - accuracy: 0.5851 - val_loss: 0.8615 - val_accuracy: 0.5000
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4480 - accuracy: 0.5722 - val_loss: 0.8386 - val_accuracy: 0.5093
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4732 - accuracy: 0.6134 - val_loss: 0.8293 - val_accuracy: 0.5140
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4778 - accuracy: 0.5928 - val_loss: 0.8272 - val_accuracy: 0.5280
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3958 - accuracy: 0.5747 - val_loss: 0.7947 - val_accuracy: 0.5234
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4982 - accuracy: 0.5954 - val_loss: 0.7726 - val_accuracy: 0.5421
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4376 - accuracy: 0.6005 - val_loss: 0.7680 - val_accuracy: 0.5374
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3859 - accuracy: 0.6186 - val_loss: 0.7452 - val_accuracy: 0.5327
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3950 - accuracy: 0.5979 - val_loss: 0.7272 - val_accuracy: 0.5327
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4794 - accuracy: 0.6314 - val_loss: 0.7123 - val_accuracy: 0.5467
```

Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4089 - accuracy: 0.6289 - val_loss: 0.7670 - val_accuracy: 0.5421
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4527 - accuracy: 0.6057 - val_loss: 0.7334 - val_accuracy: 0.5421
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4294 - accuracy: 0.6237 - val_loss: 0.7445 - val_accuracy: 0.5327
Epoch 90/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4688 - accuracy: 0.5928 - val_loss: 0.7528 - val_accuracy: 0.5327
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3792 - accuracy: 0.6134 - val_loss: 0.6898 - val_accuracy: 0.5421
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3763 - accuracy: 0.6418 - val_loss: 0.6684 - val_accuracy: 0.5374
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5213 - accuracy: 0.6082 - val_loss: 0.6981 - val_accuracy: 0.5514
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4215 - accuracy: 0.6160 - val_loss: 0.6614 - val_accuracy: 0.4019
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4365 - accuracy: 0.4897 - val_loss: 0.6422 - val_accuracy: 0.4206
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4295 - accuracy: 0.5077 - val_loss: 0.6555 - val_accuracy: 0.5794
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3691 - accuracy: 0.6082 - val_loss: 0.6318 - val_accuracy: 0.5794
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4109 - accuracy: 0.6418 - val_loss: 0.6247 - val_accuracy: 0.5935
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3740 - accuracy: 0.6237 - val_loss: 0.6035 - val_accuracy: 0.5981
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3555 - accuracy: 0.6289 - val_loss: 0.5888 - val_accuracy: 0.6168
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3655 - accuracy: 0.6392 - val_loss: 0.5861 - val_accuracy: 0.6075
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4045 - accuracy: 0.6289 - val_loss: 0.6184 - val_accuracy: 0.6075
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3544 - accuracy: 0.6082 - val_loss: 0.5854 - val_accuracy: 0.6028
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3392 - accuracy: 0.6031 - val_loss: 0.5672 - val_accuracy: 0.6075
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4380 - accuracy: 0.5954 - val_loss: 0.5843 - val_accuracy: 0.5981
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3480 - accuracy: 0.5876 - val_loss: 0.5739 - val_accuracy: 0.5888
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3693 - accuracy: 0.5954 - val_loss: 0.5707 - val_accuracy: 0.6168
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3937 - accuracy: 0.6392 - val_loss: 0.5631 - val_accuracy: 0.5935
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3373 - accuracy: 0.6418 - val_loss: 0.5937 - val_accuracy: 0.5888
Epoch 110/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3484 - accuracy: 0.6469 - val_loss: 0.5517 - val_accuracy: 0.5748
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3799 - accuracy: 0.6340 - val_loss: 0.5518 - val_accuracy: 0.5841
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3659 - accuracy: 0.6289 - val_loss: 0.5394 - val_accuracy: 0.5794
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3847 - accuracy: 0.6134 - val_loss: 0.5332 - val_accuracy: 0.5748
Epoch 114/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3580 - accuracy: 0.6186 - val_loss: 0.5360 - val_accuracy: 0.5841
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3786 - accuracy: 0.6289 - val_loss: 0.5556 - val_accuracy: 0.5794
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4025 - accuracy: 0.5722 - val_loss: 0.5471 - val_accuracy: 0.5841

```
accuracy: 0.4813
Epoch 117/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3845 - accuracy: 0.4201 - val_loss: 0.5513 - val_accuracy: 0.4766
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4081 - accuracy: 0.4356 - val_loss: 0.5751 - val_accuracy: 0.4720
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3755 - accuracy: 0.4433 - val_loss: 0.5880 - val_accuracy: 0.5187
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3735 - accuracy: 0.5206 - val_loss: 0.6699 - val_accuracy: 0.5140
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3946 - accuracy: 0.5619 - val_loss: 0.6414 - val_accuracy: 0.5187
Epoch 122/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3877 - accuracy: 0.5206 - val_loss: 0.6354 - val_accuracy: 0.5000
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4309 - accuracy: 0.5515 - val_loss: 0.6324 - val_accuracy: 0.4907
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3371 - accuracy: 0.5464 - val_loss: 0.6300 - val_accuracy: 0.4766
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3935 - accuracy: 0.5387 - val_loss: 0.6316 - val_accuracy: 0.4907
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4216 - accuracy: 0.5464 - val_loss: 0.6237 - val_accuracy: 0.5000
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3486 - accuracy: 0.5309 - val_loss: 0.6514 - val_accuracy: 0.5000
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3739 - accuracy: 0.5206 - val_loss: 0.7109 - val_accuracy: 0.5093
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4159 - accuracy: 0.5541 - val_loss: 0.6823 - val_accuracy: 0.5047
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3310 - accuracy: 0.5619 - val_loss: 0.6790 - val_accuracy: 0.5047
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4229 - accuracy: 0.5335 - val_loss: 0.6835 - val_accuracy: 0.5093
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3453 - accuracy: 0.5309 - val_loss: 0.8459 - val_accuracy: 0.5187
Epoch 133/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3332 - accuracy: 0.5438 - val_loss: 0.8152 - val_accuracy: 0.5327
Epoch 134/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3358 - accuracy: 0.5541 - val_loss: 0.8382 - val_accuracy: 0.5093
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3631 - accuracy: 0.5438 - val_loss: 0.7730 - val_accuracy: 0.5140
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3335 - accuracy: 0.5129 - val_loss: 0.7799 - val_accuracy: 0.5327
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3593 - accuracy: 0.5335 - val_loss: 0.7718 - val_accuracy: 0.5327
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3910 - accuracy: 0.5232 - val_loss: 0.7715 - val_accuracy: 0.5093
Epoch 139/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3439 - accuracy: 0.5206 - val_loss: 0.7611 - val_accuracy: 0.5140
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3445 - accuracy: 0.5284 - val_loss: 0.7165 - val_accuracy: 0.6075
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3179 - accuracy: 0.6418 - val_loss: 0.7369 - val_accuracy: 0.6075
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3527 - accuracy: 0.6443 - val_loss: 0.8593 - val_accuracy: 0.5981
Epoch 143/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3636 - accuracy: 0.6701 - val_loss: 0.8655 - val_accuracy: 0.6121
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4903 - accuracy: 0.6314 - val_loss: 0.7372 - val_accuracy: 0.6121
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3447 - accuracy: 0.6057 - val_loss: 0.7409 - val_accuracy: 0.6168
Epoch 146/1000
```

```

4/4 [=====] - 0s 12ms/step - loss: 0.4263 - accuracy: 0.6082 - val_loss: 0.7392 - val_accuracy: 0.6075
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3579 - accuracy: 0.6392 - val_loss: 0.7327 - val_accuracy: 0.6215
Epoch 148/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3290 - accuracy: 0.6134 - val_loss: 0.8915 - val_accuracy: 0.5701
Epoch 149/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4283 - accuracy: 0.6392 - val_loss: 0.8020 - val_accuracy: 0.4673
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3348 - accuracy: 0.4923 - val_loss: 0.8111 - val_accuracy: 0.4813
Epoch 151/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4320 - accuracy: 0.4871 - val_loss: 0.7763 - val_accuracy: 0.5841
Epoch 152/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3937 - accuracy: 0.5938Restoring model weights from th
e end of the best epoch: 2.
4/4 [=====] - 0s 14ms/step - loss: 0.3558 - accuracy: 0.6237 - val_loss: 0.7702 - val_accuracy: 0.5701
Epoch 152: early stopping
2/2 [=====] - 0s 3ms/step - loss: 2.8751 - accuracy: 0.7045
[CV] END .....Dense1=100, Dense2=10; total time= 8.2s
Model: "sequential_70"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_280 (Dense)	(None, 100)	700
batch_normalization_210 (BatchNormalization)	(None, 100)	400
activation_210 (Activation)	(None, 100)	0
dense_281 (Dense)	(None, 10)	1010
batch_normalization_211 (BatchNormalization)	(None, 10)	40
activation_211 (Activation)	(None, 10)	0
dense_282 (Dense)	(None, 10)	110
batch_normalization_212 (BatchNormalization)	(None, 10)	40
activation_212 (Activation)	(None, 10)	0
dense_283 (Dense)	(None, 2)	22
<hr/>		
Total params:	2,322	
Trainable params:	2,082	
Non-trainable params:	240	

```

Epoch 1/1000
4/4 [=====] - 1s 55ms/step - loss: 5.5602 - accuracy: 0.5155 - val_loss: 2.4203 - val_accuracy: 0.3645
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 4.2852 - accuracy: 0.4923 - val_loss: 1.8399 - val_accuracy: 0.3505
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3679 - accuracy: 0.4897 - val_loss: 1.8674 - val_accuracy: 0.3505
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8699 - accuracy: 0.5361 - val_loss: 1.8256 - val_accuracy: 0.3645
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4240 - accuracy: 0.5309 - val_loss: 1.7930 - val_accuracy: 0.3692
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2170 - accuracy: 0.5593 - val_loss: 1.6349 - val_accuracy: 0.3832
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2126 - accuracy: 0.5722 - val_loss: 1.5659 - val_accuracy: 0.4393
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9152 - accuracy: 0.5232 - val_loss: 1.5880 - val_accuracy: 0.4206
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1151 - accuracy: 0.5438 - val_loss: 1.6078 - val_accuracy: 0.4393
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8240 - accuracy: 0.5335 - val_loss: 1.5986 - val_accuracy: 0.4159
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7998 - accuracy: 0.5438 - val_loss: 1.5900 - val_

```

```
accuracy: 0.4159
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7321 - accuracy: 0.5335 - val_loss: 1.6031 - val_accuracy: 0.4299
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6429 - accuracy: 0.5361 - val_loss: 1.5642 - val_accuracy: 0.4299
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6602 - accuracy: 0.5284 - val_loss: 1.6367 - val_accuracy: 0.3832
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7278 - accuracy: 0.5335 - val_loss: 1.6546 - val_accuracy: 0.4299
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5212 - accuracy: 0.5619 - val_loss: 1.6767 - val_accuracy: 0.4112
Epoch 17/1000
4/4 [=====] - 0s 15ms/step - loss: 1.6721 - accuracy: 0.5515 - val_loss: 1.6697 - val_accuracy: 0.4533
Epoch 18/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5374 - accuracy: 0.5387 - val_loss: 1.6528 - val_accuracy: 0.4626
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5650 - accuracy: 0.5387 - val_loss: 1.6427 - val_accuracy: 0.4720
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4936 - accuracy: 0.5361 - val_loss: 1.5919 - val_accuracy: 0.4860
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4031 - accuracy: 0.5438 - val_loss: 1.5935 - val_accuracy: 0.5047
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5916 - accuracy: 0.5619 - val_loss: 1.5819 - val_accuracy: 0.5327
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4739 - accuracy: 0.5619 - val_loss: 1.5613 - val_accuracy: 0.5280
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5061 - accuracy: 0.5619 - val_loss: 1.5513 - val_accuracy: 0.5374
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3534 - accuracy: 0.5593 - val_loss: 1.5236 - val_accuracy: 0.5421
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4087 - accuracy: 0.5438 - val_loss: 1.5042 - val_accuracy: 0.5187
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4755 - accuracy: 0.5258 - val_loss: 1.4831 - val_accuracy: 0.5374
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2650 - accuracy: 0.5232 - val_loss: 1.4534 - val_accuracy: 0.5327
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2749 - accuracy: 0.5387 - val_loss: 1.4594 - val_accuracy: 0.5280
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2918 - accuracy: 0.5722 - val_loss: 1.4509 - val_accuracy: 0.5327
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3175 - accuracy: 0.5438 - val_loss: 1.4398 - val_accuracy: 0.5327
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2518 - accuracy: 0.5593 - val_loss: 1.4185 - val_accuracy: 0.5140
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2681 - accuracy: 0.5644 - val_loss: 1.3865 - val_accuracy: 0.5000
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1465 - accuracy: 0.5593 - val_loss: 1.3832 - val_accuracy: 0.4953
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1850 - accuracy: 0.5979 - val_loss: 1.3644 - val_accuracy: 0.5000
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2418 - accuracy: 0.5902 - val_loss: 1.3557 - val_accuracy: 0.5187
Epoch 37/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2833 - accuracy: 0.5799 - val_loss: 1.3493 - val_accuracy: 0.5187
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2086 - accuracy: 0.5593 - val_loss: 1.3334 - val_accuracy: 0.5000
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0292 - accuracy: 0.6134 - val_loss: 1.3362 - val_accuracy: 0.5047
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2334 - accuracy: 0.5954 - val_loss: 1.3302 - val_accuracy: 0.5093
Epoch 41/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 1.1196 - accuracy: 0.5593 - val_loss: 1.3119 - val_accuracy: 0.5187
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0960 - accuracy: 0.5825 - val_loss: 1.3038 - val_accuracy: 0.5140
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0534 - accuracy: 0.5979 - val_loss: 1.2756 - val_accuracy: 0.4907
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9590 - accuracy: 0.5876 - val_loss: 1.2519 - val_accuracy: 0.5093
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0068 - accuracy: 0.5799 - val_loss: 1.2296 - val_accuracy: 0.5047
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0191 - accuracy: 0.5928 - val_loss: 1.1929 - val_accuracy: 0.4673
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0279 - accuracy: 0.5464 - val_loss: 1.1839 - val_accuracy: 0.4720
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9463 - accuracy: 0.5644 - val_loss: 1.1890 - val_accuracy: 0.4953
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9847 - accuracy: 0.5593 - val_loss: 1.1833 - val_accuracy: 0.4953
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8841 - accuracy: 0.5438 - val_loss: 1.1229 - val_accuracy: 0.4813
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9397 - accuracy: 0.5773 - val_loss: 1.1346 - val_accuracy: 0.4953
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7249 - accuracy: 0.5593 - val_loss: 1.1206 - val_accuracy: 0.4907
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8133 - accuracy: 0.5490 - val_loss: 1.1166 - val_accuracy: 0.4953
Epoch 54/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6077 - accuracy: 0.5335 - val_loss: 1.1140 - val_accuracy: 0.4953
Epoch 55/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8478 - accuracy: 0.5387 - val_loss: 1.0964 - val_accuracy: 0.5000
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5720 - accuracy: 0.5412 - val_loss: 1.0998 - val_accuracy: 0.4860
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7263 - accuracy: 0.5103 - val_loss: 1.0829 - val_accuracy: 0.4766
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6015 - accuracy: 0.5232 - val_loss: 1.0792 - val_accuracy: 0.4860
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6553 - accuracy: 0.5335 - val_loss: 1.0764 - val_accuracy: 0.4813
Epoch 60/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7203 - accuracy: 0.5361 - val_loss: 1.1019 - val_accuracy: 0.4813
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6734 - accuracy: 0.5464 - val_loss: 1.0453 - val_accuracy: 0.4720
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5584 - accuracy: 0.5206 - val_loss: 1.0435 - val_accuracy: 0.4813
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6552 - accuracy: 0.5515 - val_loss: 1.0722 - val_accuracy: 0.4813
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5840 - accuracy: 0.5129 - val_loss: 1.0787 - val_accuracy: 0.4813
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6156 - accuracy: 0.5232 - val_loss: 1.0651 - val_accuracy: 0.4860
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5608 - accuracy: 0.5541 - val_loss: 1.0326 - val_accuracy: 0.4813
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6597 - accuracy: 0.5593 - val_loss: 1.0406 - val_accuracy: 0.4626
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6756 - accuracy: 0.5747 - val_loss: 0.9989 - val_accuracy: 0.4579
Epoch 69/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6188 - accuracy: 0.5567 - val_loss: 1.0352 - val_accuracy: 0.4533
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6183 - accuracy: 0.5799 - val_loss: 1.0357 - val_accuracy: 0.4533
```

Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6310 - accuracy: 0.5541 - val_loss: 1.0172 - val_accuracy: 0.4579
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5742 - accuracy: 0.5619 - val_loss: 0.9911 - val_accuracy: 0.4626
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5318 - accuracy: 0.5567 - val_loss: 0.9823 - val_accuracy: 0.4673
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6039 - accuracy: 0.5515 - val_loss: 0.9714 - val_accuracy: 0.4673
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5547 - accuracy: 0.5206 - val_loss: 0.9500 - val_accuracy: 0.4813
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5131 - accuracy: 0.5490 - val_loss: 0.9717 - val_accuracy: 0.5000
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5776 - accuracy: 0.5541 - val_loss: 0.9554 - val_accuracy: 0.4907
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5267 - accuracy: 0.5464 - val_loss: 0.9294 - val_accuracy: 0.4813
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5173 - accuracy: 0.5490 - val_loss: 0.9086 - val_accuracy: 0.4953
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4485 - accuracy: 0.5747 - val_loss: 0.8966 - val_accuracy: 0.5234
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5276 - accuracy: 0.5438 - val_loss: 0.9154 - val_accuracy: 0.5187
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4893 - accuracy: 0.5438 - val_loss: 0.8923 - val_accuracy: 0.5187
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5581 - accuracy: 0.5335 - val_loss: 0.8860 - val_accuracy: 0.5187
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4413 - accuracy: 0.5438 - val_loss: 0.8733 - val_accuracy: 0.5187
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6753 - accuracy: 0.5619 - val_loss: 0.8354 - val_accuracy: 0.5187
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4149 - accuracy: 0.5490 - val_loss: 0.8029 - val_accuracy: 0.5140
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5203 - accuracy: 0.5696 - val_loss: 0.7588 - val_accuracy: 0.5093
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5028 - accuracy: 0.5696 - val_loss: 0.7850 - val_accuracy: 0.5280
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5404 - accuracy: 0.5773 - val_loss: 0.6914 - val_accuracy: 0.5280
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4913 - accuracy: 0.5876 - val_loss: 0.6812 - val_accuracy: 0.5187
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4575 - accuracy: 0.5644 - val_loss: 0.6769 - val_accuracy: 0.5234
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5306 - accuracy: 0.5541 - val_loss: 0.6697 - val_accuracy: 0.5327
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4604 - accuracy: 0.5696 - val_loss: 0.6705 - val_accuracy: 0.5467
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4645 - accuracy: 0.5644 - val_loss: 0.6970 - val_accuracy: 0.5514
Epoch 95/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4849 - accuracy: 0.5696 - val_loss: 0.7021 - val_accuracy: 0.5234
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4591 - accuracy: 0.5619 - val_loss: 0.7238 - val_accuracy: 0.5187
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4621 - accuracy: 0.5438 - val_loss: 0.7127 - val_accuracy: 0.5234
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4595 - accuracy: 0.5361 - val_loss: 0.6629 - val_accuracy: 0.5327
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4733 - accuracy: 0.5387 - val_loss: 0.6957 - val_accuracy: 0.5514
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5016 - accuracy: 0.5722 - val_loss: 0.6446 - val_accuracy: 0.5514

```
accuracy: 0.5327
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4218 - accuracy: 0.5541 - val_loss: 0.6544 - val_accuracy: 0.5701
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4966 - accuracy: 0.5464 - val_loss: 0.6385 - val_accuracy: 0.5654
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4072 - accuracy: 0.5387 - val_loss: 0.6301 - val_accuracy: 0.5607
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4127 - accuracy: 0.5284 - val_loss: 0.6229 - val_accuracy: 0.5654
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4227 - accuracy: 0.5284 - val_loss: 0.6096 - val_accuracy: 0.5888
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4746 - accuracy: 0.5206 - val_loss: 0.6032 - val_accuracy: 0.5841
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3905 - accuracy: 0.5438 - val_loss: 0.5944 - val_accuracy: 0.5794
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4724 - accuracy: 0.5335 - val_loss: 0.6219 - val_accuracy: 0.5654
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4305 - accuracy: 0.5541 - val_loss: 0.6240 - val_accuracy: 0.5514
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4541 - accuracy: 0.5129 - val_loss: 0.6494 - val_accuracy: 0.5280
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5065 - accuracy: 0.5232 - val_loss: 0.6432 - val_accuracy: 0.5421
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4590 - accuracy: 0.5206 - val_loss: 0.6338 - val_accuracy: 0.5467
Epoch 113/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5066 - accuracy: 0.5438 - val_loss: 0.6037 - val_accuracy: 0.5607
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3598 - accuracy: 0.5464 - val_loss: 0.5973 - val_accuracy: 0.5701
Epoch 115/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4342 - accuracy: 0.5644 - val_loss: 0.5909 - val_accuracy: 0.5701
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4712 - accuracy: 0.5619 - val_loss: 0.5934 - val_accuracy: 0.5701
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3962 - accuracy: 0.5412 - val_loss: 0.5515 - val_accuracy: 0.5701
Epoch 118/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4333 - accuracy: 0.5747 - val_loss: 0.5729 - val_accuracy: 0.5607
Epoch 119/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3994 - accuracy: 0.5515 - val_loss: 0.6358 - val_accuracy: 0.5701
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4186 - accuracy: 0.5335 - val_loss: 0.5977 - val_accuracy: 0.5841
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4350 - accuracy: 0.5876 - val_loss: 0.6079 - val_accuracy: 0.5467
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3954 - accuracy: 0.5722 - val_loss: 0.6319 - val_accuracy: 0.5374
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4683 - accuracy: 0.5490 - val_loss: 0.6702 - val_accuracy: 0.5140
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3414 - accuracy: 0.5335 - val_loss: 0.7044 - val_accuracy: 0.5280
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4380 - accuracy: 0.5747 - val_loss: 0.7272 - val_accuracy: 0.5654
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4521 - accuracy: 0.5490 - val_loss: 0.7456 - val_accuracy: 0.5234
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4393 - accuracy: 0.5515 - val_loss: 0.7258 - val_accuracy: 0.5374
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4926 - accuracy: 0.5773 - val_loss: 0.7803 - val_accuracy: 0.5280
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4104 - accuracy: 0.5619 - val_loss: 0.8359 - val_accuracy: 0.5187
Epoch 130/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.3584 - accuracy: 0.5696 - val_loss: 0.8199 - val_accuracy: 0.5374
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3591 - accuracy: 0.5644 - val_loss: 0.8124 - val_accuracy: 0.5514
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3557 - accuracy: 0.5825 - val_loss: 0.8076 - val_accuracy: 0.5654
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3337 - accuracy: 0.5670 - val_loss: 0.8252 - val_accuracy: 0.5607
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3688 - accuracy: 0.5696 - val_loss: 0.8479 - val_accuracy: 0.5467
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4227 - accuracy: 0.5670 - val_loss: 0.8673 - val_accuracy: 0.5748
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3639 - accuracy: 0.5438 - val_loss: 0.9635 - val_accuracy: 0.5794
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4200 - accuracy: 0.5515 - val_loss: 0.9715 - val_accuracy: 0.6028
Epoch 138/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3716 - accuracy: 0.5464 - val_loss: 0.9404 - val_accuracy: 0.5981
Epoch 139/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3141 - accuracy: 0.5644 - val_loss: 0.9356 - val_accuracy: 0.5607
Epoch 140/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3404 - accuracy: 0.5567 - val_loss: 0.9705 - val_accuracy: 0.5561
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3339 - accuracy: 0.5490 - val_loss: 0.9188 - val_accuracy: 0.5654
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3398 - accuracy: 0.5696 - val_loss: 0.9119 - val_accuracy: 0.5467
Epoch 143/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3270 - accuracy: 0.5644 - val_loss: 0.9154 - val_accuracy: 0.5421
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2856 - accuracy: 0.5773 - val_loss: 1.0056 - val_accuracy: 0.5374
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4388 - accuracy: 0.5876 - val_loss: 0.9322 - val_accuracy: 0.5374
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3167 - accuracy: 0.5876 - val_loss: 1.0099 - val_accuracy: 0.5327
Epoch 147/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3164 - accuracy: 0.5722 - val_loss: 0.9920 - val_accuracy: 0.5327
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3876 - accuracy: 0.5851 - val_loss: 1.0120 - val_accuracy: 0.5467
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3238 - accuracy: 0.5799 - val_loss: 1.0193 - val_accuracy: 0.5327
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3661 - accuracy: 0.5541 - val_loss: 0.9934 - val_accuracy: 0.5280
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3807 - accuracy: 0.5928 - val_loss: 1.0676 - val_accuracy: 0.5234
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3628 - accuracy: 0.5773 - val_loss: 1.0674 - val_accuracy: 0.5234
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4557 - accuracy: 0.5696 - val_loss: 1.0258 - val_accuracy: 0.5234
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2999 - accuracy: 0.5747 - val_loss: 0.9792 - val_accuracy: 0.5140
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3889 - accuracy: 0.5979 - val_loss: 0.9193 - val_accuracy: 0.5607
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3663 - accuracy: 0.5773 - val_loss: 0.9716 - val_accuracy: 0.5280
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3030 - accuracy: 0.5851 - val_loss: 0.9730 - val_accuracy: 0.5327
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3326 - accuracy: 0.5928 - val_loss: 0.9784 - val_accuracy: 0.5374
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2932 - accuracy: 0.5696 - val_loss: 0.9591 - val_accuracy: 0.5514
```

Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2938 - accuracy: 0.5567 - val_loss: 0.9011 - val_accuracy: 0.5514
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4135 - accuracy: 0.6057 - val_loss: 1.0134 - val_accuracy: 0.5561
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3367 - accuracy: 0.6005 - val_loss: 1.0604 - val_accuracy: 0.5514
Epoch 163/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3924 - accuracy: 0.5876 - val_loss: 1.0630 - val_accuracy: 0.5467
Epoch 164/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2806 - accuracy: 0.5876 - val_loss: 1.0857 - val_accuracy: 0.5841
Epoch 165/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3535 - accuracy: 0.6005 - val_loss: 1.0028 - val_accuracy: 0.5841
Epoch 166/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3020 - accuracy: 0.5876 - val_loss: 1.0783 - val_accuracy: 0.5888
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4233 - accuracy: 0.6031 - val_loss: 0.9210 - val_accuracy: 0.5794
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3143 - accuracy: 0.5979 - val_loss: 0.9783 - val_accuracy: 0.5748
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2915 - accuracy: 0.6108 - val_loss: 1.0134 - val_accuracy: 0.5748
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2804 - accuracy: 0.5928 - val_loss: 1.0109 - val_accuracy: 0.5794
Epoch 171/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2635 - accuracy: 0.6237 - val_loss: 1.0256 - val_accuracy: 0.5607
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2836 - accuracy: 0.6005 - val_loss: 1.0610 - val_accuracy: 0.5607
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2853 - accuracy: 0.5928 - val_loss: 1.0299 - val_accuracy: 0.5748
Epoch 174/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3684 - accuracy: 0.6160 - val_loss: 1.0055 - val_accuracy: 0.5701
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3866 - accuracy: 0.5696 - val_loss: 0.9789 - val_accuracy: 0.5748
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2904 - accuracy: 0.6160 - val_loss: 1.0247 - val_accuracy: 0.5794
Epoch 177/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2800 - accuracy: 0.6108 - val_loss: 1.0184 - val_accuracy: 0.5607
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2542 - accuracy: 0.5928 - val_loss: 1.0277 - val_accuracy: 0.5654
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3015 - accuracy: 0.5902 - val_loss: 0.9849 - val_accuracy: 0.5701
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4244 - accuracy: 0.5644 - val_loss: 1.0181 - val_accuracy: 0.5888
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3695 - accuracy: 0.5593 - val_loss: 0.9879 - val_accuracy: 0.5794
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3288 - accuracy: 0.5696 - val_loss: 0.9581 - val_accuracy: 0.5701
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3526 - accuracy: 0.5619 - val_loss: 0.9543 - val_accuracy: 0.5607
Epoch 184/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3823 - accuracy: 0.6005 - val_loss: 0.9844 - val_accuracy: 0.5748
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2906 - accuracy: 0.6031 - val_loss: 0.9854 - val_accuracy: 0.5701
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4156 - accuracy: 0.5619 - val_loss: 1.0250 - val_accuracy: 0.5467
Epoch 187/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3252 - accuracy: 0.5747 - val_loss: 0.9626 - val_accuracy: 0.5093
Epoch 188/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4115 - accuracy: 0.5464 - val_loss: 0.9290 - val_accuracy: 0.5374
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3749 - accuracy: 0.5902 - val_loss: 0.9244 - val_accuracy: 0.5093

```
accuracy: 0.5140
Epoch 190/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3146 - accuracy: 0.5799 - val_loss: 0.9379 - val_
accuracy: 0.5140
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3938 - accuracy: 0.5851 - val_loss: 1.0483 - val_
accuracy: 0.5187
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2957 - accuracy: 0.5644 - val_loss: 1.0244 - val_
accuracy: 0.5467
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2665 - accuracy: 0.5851 - val_loss: 1.0780 - val_
accuracy: 0.5421
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3342 - accuracy: 0.5902 - val_loss: 1.0831 - val_
accuracy: 0.5421
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3149 - accuracy: 0.5902 - val_loss: 1.0215 - val_
accuracy: 0.5421
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3095 - accuracy: 0.5747 - val_loss: 1.0494 - val_
accuracy: 0.5561
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3021 - accuracy: 0.5722 - val_loss: 1.0514 - val_
accuracy: 0.5374
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2572 - accuracy: 0.6031 - val_loss: 1.0067 - val_
accuracy: 0.5327
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3485 - accuracy: 0.5799 - val_loss: 1.0112 - val_
accuracy: 0.5654
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3260 - accuracy: 0.6031 - val_loss: 1.0291 - val_
accuracy: 0.5467
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2684 - accuracy: 0.5644 - val_loss: 1.0538 - val_
accuracy: 0.5421
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3246 - accuracy: 0.5567 - val_loss: 1.0232 - val_
accuracy: 0.5514
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2632 - accuracy: 0.5515 - val_loss: 1.1990 - val_
accuracy: 0.5234
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3117 - accuracy: 0.5747 - val_loss: 1.1853 - val_
accuracy: 0.5280
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3016 - accuracy: 0.5825 - val_loss: 1.2397 - val_
accuracy: 0.5327
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3315 - accuracy: 0.5876 - val_loss: 0.9808 - val_
accuracy: 0.5374
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2474 - accuracy: 0.5619 - val_loss: 0.9841 - val_
accuracy: 0.5280
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3125 - accuracy: 0.5490 - val_loss: 1.0367 - val_
accuracy: 0.5234
Epoch 209/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2489 - accuracy: 0.5644 - val_loss: 0.9812 - val_
accuracy: 0.5280
Epoch 210/1000
4/4 [=====] - 0s 17ms/step - loss: 0.2784 - accuracy: 0.5747 - val_loss: 1.1185 - val_
accuracy: 0.5280
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3836 - accuracy: 0.5928 - val_loss: 1.0359 - val_
accuracy: 0.5234
Epoch 212/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2864 - accuracy: 0.5799 - val_loss: 1.0662 - val_
accuracy: 0.5374
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3484 - accuracy: 0.5825 - val_loss: 1.0419 - val_
accuracy: 0.5234
Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2648 - accuracy: 0.5954 - val_loss: 1.1722 - val_
accuracy: 0.4907
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3172 - accuracy: 0.5799 - val_loss: 1.1846 - val_
accuracy: 0.5093
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3561 - accuracy: 0.5696 - val_loss: 1.1849 - val_
accuracy: 0.5140
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3601 - accuracy: 0.5644 - val_loss: 1.1976 - val_
accuracy: 0.5047
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2448 - accuracy: 0.5799 - val_loss: 1.1899 - val_
accuracy: 0.5000
Epoch 219/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.3546 - accuracy: 0.5773 - val_loss: 1.1469 - val_accuracy: 0.4860
Epoch 220/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2910 - accuracy: 0.5876 - val_loss: 1.2098 - val_accuracy: 0.4907
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2709 - accuracy: 0.5747 - val_loss: 1.1741 - val_accuracy: 0.4860
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3060 - accuracy: 0.5644 - val_loss: 1.1802 - val_accuracy: 0.4907
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2504 - accuracy: 0.5567 - val_loss: 1.1635 - val_accuracy: 0.4907
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3608 - accuracy: 0.5722 - val_loss: 1.2158 - val_accuracy: 0.5000
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3058 - accuracy: 0.5851 - val_loss: 1.2484 - val_accuracy: 0.4860
Epoch 226/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2472 - accuracy: 0.5928 - val_loss: 1.2341 - val_accuracy: 0.4860
Epoch 227/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2380 - accuracy: 0.5799 - val_loss: 1.2621 - val_accuracy: 0.4766
Epoch 228/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2202 - accuracy: 0.5851 - val_loss: 1.2396 - val_accuracy: 0.4720
Epoch 229/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2994 - accuracy: 0.5747 - val_loss: 1.2319 - val_accuracy: 0.4720
Epoch 230/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2286 - accuracy: 0.5876 - val_loss: 1.2354 - val_accuracy: 0.4813
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2686 - accuracy: 0.5799 - val_loss: 1.2550 - val_accuracy: 0.4766
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2808 - accuracy: 0.5773 - val_loss: 1.2002 - val_accuracy: 0.4766
Epoch 233/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2761 - accuracy: 0.5876 - val_loss: 1.1418 - val_accuracy: 0.4813
Epoch 234/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2665 - accuracy: 0.6108 - val_loss: 1.2130 - val_accuracy: 0.4766
Epoch 235/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2280 - accuracy: 0.5464 - val_loss: 1.1760 - val_accuracy: 0.4860
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3142 - accuracy: 0.5696 - val_loss: 1.1060 - val_accuracy: 0.4907
Epoch 237/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2369 - accuracy: 0.5876 - val_loss: 1.1896 - val_accuracy: 0.4813
Epoch 238/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2172 - accuracy: 0.5979 - val_loss: 1.1415 - val_accuracy: 0.4813
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2098 - accuracy: 0.5851 - val_loss: 1.2179 - val_accuracy: 0.4907
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2505 - accuracy: 0.5902 - val_loss: 1.3162 - val_accuracy: 0.4720
Epoch 241/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2388 - accuracy: 0.6005 - val_loss: 1.1859 - val_accuracy: 0.4486
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3018 - accuracy: 0.5799 - val_loss: 1.1601 - val_accuracy: 0.4673
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2967 - accuracy: 0.5851 - val_loss: 1.2549 - val_accuracy: 0.4766
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2972 - accuracy: 0.5979 - val_loss: 1.1714 - val_accuracy: 0.4673
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2308 - accuracy: 0.5928 - val_loss: 1.2081 - val_accuracy: 0.4860
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3242 - accuracy: 0.5773 - val_loss: 1.2417 - val_accuracy: 0.5000
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2217 - accuracy: 0.5979 - val_loss: 1.1439 - val_accuracy: 0.4953
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2755 - accuracy: 0.6134 - val_loss: 1.0918 - val_accuracy: 0.4720
```

Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4114 - accuracy: 0.5851 - val_loss: 1.1202 - val_accuracy: 0.4766
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2742 - accuracy: 0.6289 - val_loss: 1.1561 - val_accuracy: 0.4673
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2335 - accuracy: 0.5825 - val_loss: 1.1809 - val_accuracy: 0.4720
Epoch 252/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2327 - accuracy: 0.5876 - val_loss: 1.1123 - val_accuracy: 0.4813
Epoch 253/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3079 - accuracy: 0.5902 - val_loss: 1.1419 - val_accuracy: 0.4860
Epoch 254/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2252 - accuracy: 0.5928 - val_loss: 1.1736 - val_accuracy: 0.5000
Epoch 255/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1977 - accuracy: 0.6031 - val_loss: 1.3654 - val_accuracy: 0.5093
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3231 - accuracy: 0.6108 - val_loss: 1.4180 - val_accuracy: 0.5140
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2874 - accuracy: 0.6082 - val_loss: 1.1530 - val_accuracy: 0.5187
Epoch 258/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3988 - accuracy: 0.5954 - val_loss: 1.1937 - val_accuracy: 0.5047
Epoch 259/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2271 - accuracy: 0.6082 - val_loss: 1.3014 - val_accuracy: 0.4907
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1820 - accuracy: 0.6031 - val_loss: 1.2696 - val_accuracy: 0.4860
Epoch 261/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2883 - accuracy: 0.5954 - val_loss: 1.3314 - val_accuracy: 0.4766
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3078 - accuracy: 0.6057 - val_loss: 1.4126 - val_accuracy: 0.4860
Epoch 263/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2638 - accuracy: 0.6160 - val_loss: 1.4751 - val_accuracy: 0.4813
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3082 - accuracy: 0.6031 - val_loss: 1.3898 - val_accuracy: 0.4766
Epoch 265/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2318 - accuracy: 0.5825 - val_loss: 1.3352 - val_accuracy: 0.4673
Epoch 266/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2417 - accuracy: 0.5747 - val_loss: 1.2998 - val_accuracy: 0.4673
Epoch 267/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2810 - accuracy: 0.5747 - val_loss: 1.3286 - val_accuracy: 0.4626
Epoch 268/1000
4/4 [=====] - 0s 17ms/step - loss: 0.2734 - accuracy: 0.5825 - val_loss: 1.2791 - val_accuracy: 0.4673
Epoch 269/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2982 - accuracy: 0.5696 - val_loss: 1.2630 - val_accuracy: 0.4579
Epoch 270/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2274 - accuracy: 0.5722 - val_loss: 1.2309 - val_accuracy: 0.4673
Epoch 271/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3362 - accuracy: 0.5644 - val_loss: 1.2569 - val_accuracy: 0.4673
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3345 - accuracy: 0.5799 - val_loss: 1.2231 - val_accuracy: 0.4626
Epoch 273/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2157 - accuracy: 0.5799 - val_loss: 1.2151 - val_accuracy: 0.4626
Epoch 274/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1977 - accuracy: 0.5954 - val_loss: 1.2426 - val_accuracy: 0.4673
Epoch 275/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3109 - accuracy: 0.6031 - val_loss: 1.2742 - val_accuracy: 0.4860
Epoch 276/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2963 - accuracy: 0.5799 - val_loss: 1.2466 - val_accuracy: 0.4486
Epoch 277/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2212 - accuracy: 0.5799 - val_loss: 1.3842 - val_accuracy: 0.4579
Epoch 278/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2364 - accuracy: 0.5825 - val_loss: 1.3382 - val_accuracy: 0.4579

```

accuracy: 0.4626
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2325 - accuracy: 0.5851 - val_loss: 1.5632 - val_
accuracy: 0.4626
Epoch 280/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3238 - accuracy: 0.5722 - val_loss: 1.5569 - val_
accuracy: 0.4486
Epoch 281/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2257 - accuracy: 0.5799 - val_loss: 1.4668 - val_
accuracy: 0.4626
Epoch 282/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2153 - accuracy: 0.5773 - val_loss: 1.4604 - val_
accuracy: 0.4486
Epoch 283/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2281 - accuracy: 0.5954 - val_loss: 1.4301 - val_
accuracy: 0.4626
Epoch 284/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2255 - accuracy: 0.6005 - val_loss: 1.2528 - val_
accuracy: 0.4813
Epoch 285/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2108 - accuracy: 0.5747 - val_loss: 1.1208 - val_
accuracy: 0.4626
Epoch 286/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2596 - accuracy: 0.5747 - val_loss: 1.1247 - val_
accuracy: 0.4626
Epoch 287/1000
1/4 [====>.....] - ETA: 0s - loss: 0.2377 - accuracy: 0.5781Restoring model weights from th
e end of the best epoch: 137.
4/4 [=====] - 0s 13ms/step - loss: 0.2176 - accuracy: 0.5696 - val_loss: 1.1406 - val_
accuracy: 0.4626
Epoch 287: early stopping
2/2 [=====] - 0s 3ms/step - loss: 1.1687 - accuracy: 0.6136
[CV] END .....Dense1=100, Dense2=10; total time= 14.4s
Model: "sequential_71"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_284 (Dense)	(None, 100)	700
batch_normalization_213 (BatchNormalization)	(None, 100)	400
activation_213 (Activation)	(None, 100)	0
dense_285 (Dense)	(None, 10)	1010
batch_normalization_214 (BatchNormalization)	(None, 10)	40
activation_214 (Activation)	(None, 10)	0
dense_286 (Dense)	(None, 10)	110
batch_normalization_215 (BatchNormalization)	(None, 10)	40
activation_215 (Activation)	(None, 10)	0
dense_287 (Dense)	(None, 2)	22
<hr/>		

Total params: 2,322
Trainable params: 2,082
Non-trainable params: 240

```

Epoch 1/1000
4/4 [=====] - 1s 58ms/step - loss: 6.5224 - accuracy: 0.5707 - val_loss: 6.1509 - val_
accuracy: 0.4486
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 5.2666 - accuracy: 0.5913 - val_loss: 6.0937 - val_
accuracy: 0.4299
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 4.7834 - accuracy: 0.6015 - val_loss: 5.3520 - val_
accuracy: 0.4486
Epoch 4/1000
4/4 [=====] - 0s 15ms/step - loss: 4.4769 - accuracy: 0.6247 - val_loss: 4.6263 - val_
accuracy: 0.4766
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 4.2305 - accuracy: 0.5938 - val_loss: 4.2006 - val_
accuracy: 0.5140
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 4.4127 - accuracy: 0.5733 - val_loss: 3.5267 - val_
accuracy: 0.5935
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 4.0261 - accuracy: 0.6015 - val_loss: 3.1364 - val_
accuracy: 0.6262
Epoch 8/1000
4/4 [=====] - 0s 15ms/step - loss: 3.8666 - accuracy: 0.6067 - val_loss: 2.9571 - val_
accuracy: 0.6542

```

Epoch 9/1000
4/4 [=====] - 0s 15ms/step - loss: 3.7892 - accuracy: 0.5964 - val_loss: 2.7897 - val_accuracy: 0.6402
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5806 - accuracy: 0.6067 - val_loss: 2.6930 - val_accuracy: 0.6495
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5328 - accuracy: 0.6067 - val_loss: 2.6217 - val_accuracy: 0.6495
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4379 - accuracy: 0.6247 - val_loss: 2.5628 - val_accuracy: 0.6495
Epoch 13/1000
4/4 [=====] - 0s 12ms/step - loss: 3.2205 - accuracy: 0.6247 - val_loss: 2.5302 - val_accuracy: 0.6262
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1394 - accuracy: 0.6272 - val_loss: 2.4650 - val_accuracy: 0.6215
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1903 - accuracy: 0.6324 - val_loss: 2.3384 - val_accuracy: 0.6262
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1375 - accuracy: 0.6427 - val_loss: 2.2966 - val_accuracy: 0.6215
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0096 - accuracy: 0.6221 - val_loss: 2.2337 - val_accuracy: 0.6215
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9976 - accuracy: 0.5990 - val_loss: 2.1956 - val_accuracy: 0.6121
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8020 - accuracy: 0.6118 - val_loss: 2.1659 - val_accuracy: 0.6121
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7752 - accuracy: 0.6247 - val_loss: 2.1445 - val_accuracy: 0.6168
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7906 - accuracy: 0.6170 - val_loss: 2.1172 - val_accuracy: 0.6168
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5461 - accuracy: 0.6195 - val_loss: 2.0030 - val_accuracy: 0.6215
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5846 - accuracy: 0.6272 - val_loss: 1.9256 - val_accuracy: 0.6308
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6352 - accuracy: 0.5938 - val_loss: 1.9286 - val_accuracy: 0.6262
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5731 - accuracy: 0.5990 - val_loss: 1.9154 - val_accuracy: 0.6262
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5079 - accuracy: 0.6221 - val_loss: 1.9007 - val_accuracy: 0.6262
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4783 - accuracy: 0.6375 - val_loss: 1.8783 - val_accuracy: 0.6308
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3203 - accuracy: 0.6478 - val_loss: 1.8603 - val_accuracy: 0.6308
Epoch 29/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3888 - accuracy: 0.6324 - val_loss: 1.8163 - val_accuracy: 0.6215
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3699 - accuracy: 0.6452 - val_loss: 1.8005 - val_accuracy: 0.6168
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1948 - accuracy: 0.6530 - val_loss: 1.7876 - val_accuracy: 0.6168
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1694 - accuracy: 0.6530 - val_loss: 1.7922 - val_accuracy: 0.6308
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2066 - accuracy: 0.6504 - val_loss: 1.8014 - val_accuracy: 0.6308
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1253 - accuracy: 0.6607 - val_loss: 1.7596 - val_accuracy: 0.6355
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0813 - accuracy: 0.6452 - val_loss: 1.7175 - val_accuracy: 0.6449
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1090 - accuracy: 0.6530 - val_loss: 1.7014 - val_accuracy: 0.6355
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0308 - accuracy: 0.6581 - val_loss: 1.6907 - val_accuracy: 0.6215
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9784 - accuracy: 0.6504 - val_loss: 1.6633 - val_accuracy: 0.6215

```
accuracy: 0.6168
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9499 - accuracy: 0.6684 - val_loss: 1.6514 - val_accuracy: 0.6215
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0004 - accuracy: 0.6427 - val_loss: 1.6296 - val_accuracy: 0.6168
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9242 - accuracy: 0.6478 - val_loss: 1.6680 - val_accuracy: 0.6168
Epoch 42/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8772 - accuracy: 0.6607 - val_loss: 1.6198 - val_accuracy: 0.6168
Epoch 43/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7852 - accuracy: 0.6812 - val_loss: 1.6366 - val_accuracy: 0.6168
Epoch 44/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8500 - accuracy: 0.6658 - val_loss: 1.6446 - val_accuracy: 0.6215
Epoch 45/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7964 - accuracy: 0.6581 - val_loss: 1.6293 - val_accuracy: 0.6262
Epoch 46/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7354 - accuracy: 0.6607 - val_loss: 1.6152 - val_accuracy: 0.6262
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7208 - accuracy: 0.6838 - val_loss: 1.6030 - val_accuracy: 0.6262
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6171 - accuracy: 0.6735 - val_loss: 1.5587 - val_accuracy: 0.6121
Epoch 49/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6199 - accuracy: 0.6812 - val_loss: 1.5482 - val_accuracy: 0.6121
Epoch 50/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6457 - accuracy: 0.6710 - val_loss: 1.5327 - val_accuracy: 0.6121
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5617 - accuracy: 0.6864 - val_loss: 1.5202 - val_accuracy: 0.6075
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5897 - accuracy: 0.6632 - val_loss: 1.5107 - val_accuracy: 0.6121
Epoch 53/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5820 - accuracy: 0.6812 - val_loss: 1.4996 - val_accuracy: 0.6168
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5883 - accuracy: 0.6812 - val_loss: 1.4868 - val_accuracy: 0.6121
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4663 - accuracy: 0.6761 - val_loss: 1.4804 - val_accuracy: 0.6121
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4797 - accuracy: 0.6967 - val_loss: 1.4761 - val_accuracy: 0.6121
Epoch 57/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4645 - accuracy: 0.6761 - val_loss: 1.4677 - val_accuracy: 0.6168
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4397 - accuracy: 0.6889 - val_loss: 1.4571 - val_accuracy: 0.6121
Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3723 - accuracy: 0.6761 - val_loss: 1.4458 - val_accuracy: 0.6121
Epoch 60/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3027 - accuracy: 0.6838 - val_loss: 1.4368 - val_accuracy: 0.6168
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3785 - accuracy: 0.6838 - val_loss: 1.4306 - val_accuracy: 0.6121
Epoch 62/1000
4/4 [=====] - 0s 15ms/step - loss: 1.3148 - accuracy: 0.6735 - val_loss: 1.4217 - val_accuracy: 0.6121
Epoch 63/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2742 - accuracy: 0.6504 - val_loss: 1.4105 - val_accuracy: 0.6121
Epoch 64/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3554 - accuracy: 0.6787 - val_loss: 1.4066 - val_accuracy: 0.6075
Epoch 65/1000
4/4 [=====] - 0s 15ms/step - loss: 1.4211 - accuracy: 0.6504 - val_loss: 1.4038 - val_accuracy: 0.6075
Epoch 66/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2482 - accuracy: 0.6632 - val_loss: 1.4024 - val_accuracy: 0.6121
Epoch 67/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2824 - accuracy: 0.6632 - val_loss: 1.3998 - val_accuracy: 0.6168
Epoch 68/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 1.3142 - accuracy: 0.6221 - val_loss: 1.4017 - val_accuracy: 0.6215
Epoch 69/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2182 - accuracy: 0.6324 - val_loss: 1.3939 - val_accuracy: 0.6168
Epoch 70/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2501 - accuracy: 0.6067 - val_loss: 1.3882 - val_accuracy: 0.6215
Epoch 71/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2401 - accuracy: 0.5758 - val_loss: 1.4354 - val_accuracy: 0.6262
Epoch 72/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2605 - accuracy: 0.5835 - val_loss: 1.4312 - val_accuracy: 0.6215
Epoch 73/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1190 - accuracy: 0.5656 - val_loss: 1.4415 - val_accuracy: 0.6215
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1434 - accuracy: 0.5784 - val_loss: 1.4047 - val_accuracy: 0.6168
Epoch 75/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0257 - accuracy: 0.5938 - val_loss: 1.3674 - val_accuracy: 0.6168
Epoch 76/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0988 - accuracy: 0.5861 - val_loss: 1.3595 - val_accuracy: 0.6075
Epoch 77/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0439 - accuracy: 0.5964 - val_loss: 1.3537 - val_accuracy: 0.6075
Epoch 78/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9855 - accuracy: 0.5758 - val_loss: 1.3187 - val_accuracy: 0.6121
Epoch 79/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0249 - accuracy: 0.5604 - val_loss: 1.3363 - val_accuracy: 0.6075
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0094 - accuracy: 0.5835 - val_loss: 1.2661 - val_accuracy: 0.5981
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9276 - accuracy: 0.5913 - val_loss: 1.2626 - val_accuracy: 0.6028
Epoch 82/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0164 - accuracy: 0.5784 - val_loss: 1.2548 - val_accuracy: 0.5935
Epoch 83/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9873 - accuracy: 0.5476 - val_loss: 1.2462 - val_accuracy: 0.5935
Epoch 84/1000
4/4 [=====] - 0s 17ms/step - loss: 1.0121 - accuracy: 0.5861 - val_loss: 1.2389 - val_accuracy: 0.5841
Epoch 85/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9332 - accuracy: 0.5681 - val_loss: 1.2253 - val_accuracy: 0.5421
Epoch 86/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9294 - accuracy: 0.5527 - val_loss: 1.2640 - val_accuracy: 0.5374
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8442 - accuracy: 0.5630 - val_loss: 1.2186 - val_accuracy: 0.5187
Epoch 88/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8287 - accuracy: 0.5630 - val_loss: 1.2630 - val_accuracy: 0.5140
Epoch 89/1000
4/4 [=====] - 0s 16ms/step - loss: 0.8149 - accuracy: 0.5758 - val_loss: 1.1884 - val_accuracy: 0.4579
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8469 - accuracy: 0.5296 - val_loss: 1.1280 - val_accuracy: 0.4720
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8895 - accuracy: 0.5578 - val_loss: 1.1119 - val_accuracy: 0.4579
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9252 - accuracy: 0.5398 - val_loss: 1.1181 - val_accuracy: 0.4673
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8442 - accuracy: 0.5116 - val_loss: 1.1075 - val_accuracy: 0.4626
Epoch 94/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8973 - accuracy: 0.5039 - val_loss: 1.0831 - val_accuracy: 0.4720
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7888 - accuracy: 0.5141 - val_loss: 1.1068 - val_accuracy: 0.4626
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8401 - accuracy: 0.5296 - val_loss: 1.0196 - val_accuracy: 0.4720
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8209 - accuracy: 0.5167 - val_loss: 0.9995 - val_accuracy: 0.4720
```

Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7874 - accuracy: 0.5090 - val_loss: 0.9797 - val_accuracy: 0.5093
Epoch 99/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7933 - accuracy: 0.5347 - val_loss: 0.9386 - val_accuracy: 0.5140
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7639 - accuracy: 0.5553 - val_loss: 0.9773 - val_accuracy: 0.5093
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7375 - accuracy: 0.5296 - val_loss: 0.9672 - val_accuracy: 0.5140
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7238 - accuracy: 0.5424 - val_loss: 0.9220 - val_accuracy: 0.5467
Epoch 103/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7530 - accuracy: 0.5707 - val_loss: 0.9228 - val_accuracy: 0.5467
Epoch 104/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8326 - accuracy: 0.5707 - val_loss: 0.9517 - val_accuracy: 0.5421
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7334 - accuracy: 0.5219 - val_loss: 0.9200 - val_accuracy: 0.5748
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7849 - accuracy: 0.5501 - val_loss: 0.9165 - val_accuracy: 0.5654
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7463 - accuracy: 0.5604 - val_loss: 0.9086 - val_accuracy: 0.5748
Epoch 108/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7130 - accuracy: 0.5784 - val_loss: 0.9034 - val_accuracy: 0.5794
Epoch 109/1000
4/4 [=====] - 0s 16ms/step - loss: 0.7526 - accuracy: 0.6170 - val_loss: 0.9172 - val_accuracy: 0.5841
Epoch 110/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7792 - accuracy: 0.6067 - val_loss: 0.8764 - val_accuracy: 0.5981
Epoch 111/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7506 - accuracy: 0.5938 - val_loss: 0.8702 - val_accuracy: 0.6028
Epoch 112/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6644 - accuracy: 0.5887 - val_loss: 0.8419 - val_accuracy: 0.5935
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7228 - accuracy: 0.5887 - val_loss: 0.8582 - val_accuracy: 0.5888
Epoch 114/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8122 - accuracy: 0.5810 - val_loss: 0.8968 - val_accuracy: 0.6449
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7577 - accuracy: 0.5887 - val_loss: 0.8657 - val_accuracy: 0.6402
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6962 - accuracy: 0.5913 - val_loss: 0.8251 - val_accuracy: 0.6075
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7432 - accuracy: 0.5887 - val_loss: 0.8028 - val_accuracy: 0.6168
Epoch 118/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7058 - accuracy: 0.5887 - val_loss: 0.8199 - val_accuracy: 0.5888
Epoch 119/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6804 - accuracy: 0.5861 - val_loss: 0.8210 - val_accuracy: 0.5888
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6426 - accuracy: 0.5938 - val_loss: 0.7756 - val_accuracy: 0.5794
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6665 - accuracy: 0.5784 - val_loss: 0.7468 - val_accuracy: 0.5794
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6581 - accuracy: 0.6041 - val_loss: 0.7573 - val_accuracy: 0.6215
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7241 - accuracy: 0.6041 - val_loss: 0.7519 - val_accuracy: 0.6075
Epoch 124/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5973 - accuracy: 0.5733 - val_loss: 0.7740 - val_accuracy: 0.6308
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5807 - accuracy: 0.5707 - val_loss: 0.7748 - val_accuracy: 0.6262
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6436 - accuracy: 0.5476 - val_loss: 0.8324 - val_accuracy: 0.6402
Epoch 127/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6074 - accuracy: 0.5578 - val_loss: 0.8555 - val_accuracy: 0.6262

```
accuracy: 0.6495
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6231 - accuracy: 0.5501 - val_loss: 1.0094 - val_accuracy: 0.6402
Epoch 129/1000
4/4 [=====] - 0s 16ms/step - loss: 0.6671 - accuracy: 0.5964 - val_loss: 0.9700 - val_accuracy: 0.6542
Epoch 130/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5538 - accuracy: 0.5476 - val_loss: 0.8571 - val_accuracy: 0.6682
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5657 - accuracy: 0.5656 - val_loss: 0.8470 - val_accuracy: 0.6589
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5256 - accuracy: 0.6015 - val_loss: 0.9095 - val_accuracy: 0.6636
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6120 - accuracy: 0.6041 - val_loss: 1.1277 - val_accuracy: 0.6495
Epoch 134/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7000 - accuracy: 0.6684 - val_loss: 1.1018 - val_accuracy: 0.6402
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6049 - accuracy: 0.6375 - val_loss: 1.0436 - val_accuracy: 0.6495
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5978 - accuracy: 0.6632 - val_loss: 0.9588 - val_accuracy: 0.6542
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5428 - accuracy: 0.6735 - val_loss: 0.9563 - val_accuracy: 0.6542
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5812 - accuracy: 0.6632 - val_loss: 0.9540 - val_accuracy: 0.6262
Epoch 139/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5523 - accuracy: 0.6272 - val_loss: 0.8978 - val_accuracy: 0.6262
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5512 - accuracy: 0.6401 - val_loss: 0.9320 - val_accuracy: 0.6215
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5959 - accuracy: 0.6221 - val_loss: 0.9185 - val_accuracy: 0.6215
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5493 - accuracy: 0.6093 - val_loss: 0.8892 - val_accuracy: 0.6262
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5989 - accuracy: 0.5990 - val_loss: 0.9244 - val_accuracy: 0.5748
Epoch 144/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4926 - accuracy: 0.6067 - val_loss: 1.0426 - val_accuracy: 0.6028
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6367 - accuracy: 0.5810 - val_loss: 0.9141 - val_accuracy: 0.5794
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5948 - accuracy: 0.5424 - val_loss: 0.9294 - val_accuracy: 0.5421
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5090 - accuracy: 0.5553 - val_loss: 0.9468 - val_accuracy: 0.5327
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5160 - accuracy: 0.5784 - val_loss: 0.9337 - val_accuracy: 0.5514
Epoch 149/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5538 - accuracy: 0.5733 - val_loss: 0.9118 - val_accuracy: 0.5421
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5021 - accuracy: 0.5398 - val_loss: 0.9037 - val_accuracy: 0.5607
Epoch 151/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5464 - accuracy: 0.5270 - val_loss: 0.9054 - val_accuracy: 0.5514
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5118 - accuracy: 0.5398 - val_loss: 0.9058 - val_accuracy: 0.5467
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5366 - accuracy: 0.5527 - val_loss: 0.9084 - val_accuracy: 0.5374
Epoch 154/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4692 - accuracy: 0.6015 - val_loss: 0.9068 - val_accuracy: 0.5280
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5985 - accuracy: 0.6015 - val_loss: 0.8474 - val_accuracy: 0.5327
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5642 - accuracy: 0.5630 - val_loss: 0.8373 - val_accuracy: 0.5187
Epoch 157/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.5743 - accuracy: 0.5707 - val_loss: 0.8801 - val_accuracy: 0.5327
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5395 - accuracy: 0.5553 - val_loss: 0.9058 - val_accuracy: 0.5514
Epoch 159/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5366 - accuracy: 0.5244 - val_loss: 0.9784 - val_accuracy: 0.5935
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5717 - accuracy: 0.5707 - val_loss: 1.0694 - val_accuracy: 0.6449
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4979 - accuracy: 0.5784 - val_loss: 1.0473 - val_accuracy: 0.6682
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5294 - accuracy: 0.6093 - val_loss: 1.1092 - val_accuracy: 0.6495
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4970 - accuracy: 0.6170 - val_loss: 1.3639 - val_accuracy: 0.6776
Epoch 164/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4576 - accuracy: 0.6298 - val_loss: 1.1528 - val_accuracy: 0.6542
Epoch 165/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4816 - accuracy: 0.6555 - val_loss: 1.1791 - val_accuracy: 0.6729
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5007 - accuracy: 0.6632 - val_loss: 0.9074 - val_accuracy: 0.6495
Epoch 167/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4587 - accuracy: 0.6093 - val_loss: 0.8711 - val_accuracy: 0.6636
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4314 - accuracy: 0.6324 - val_loss: 0.8441 - val_accuracy: 0.6636
Epoch 169/1000
4/4 [=====] - 0s 17ms/step - loss: 0.5186 - accuracy: 0.6015 - val_loss: 0.9255 - val_accuracy: 0.6355
Epoch 170/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4884 - accuracy: 0.6247 - val_loss: 0.8989 - val_accuracy: 0.6262
Epoch 171/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4671 - accuracy: 0.6247 - val_loss: 0.9208 - val_accuracy: 0.6215
Epoch 172/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4721 - accuracy: 0.6272 - val_loss: 1.2221 - val_accuracy: 0.6262
Epoch 173/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6405 - accuracy: 0.5938 - val_loss: 1.1968 - val_accuracy: 0.6121
Epoch 174/1000
4/4 [=====] - 0s 16ms/step - loss: 0.6336 - accuracy: 0.6170 - val_loss: 1.1311 - val_accuracy: 0.6075
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5420 - accuracy: 0.5990 - val_loss: 0.9956 - val_accuracy: 0.6121
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4782 - accuracy: 0.6170 - val_loss: 0.9319 - val_accuracy: 0.5841
Epoch 177/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4695 - accuracy: 0.6324 - val_loss: 0.8926 - val_accuracy: 0.5935
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5070 - accuracy: 0.6041 - val_loss: 0.8759 - val_accuracy: 0.5701
Epoch 179/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4327 - accuracy: 0.5990 - val_loss: 0.8542 - val_accuracy: 0.5748
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4555 - accuracy: 0.5681 - val_loss: 0.8091 - val_accuracy: 0.5748
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4492 - accuracy: 0.5938 - val_loss: 0.8341 - val_accuracy: 0.5701
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4775 - accuracy: 0.5733 - val_loss: 0.8030 - val_accuracy: 0.5935
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4505 - accuracy: 0.5501 - val_loss: 0.8009 - val_accuracy: 0.5701
Epoch 184/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5019 - accuracy: 0.5913 - val_loss: 0.8106 - val_accuracy: 0.5794
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5198 - accuracy: 0.5861 - val_loss: 0.8311 - val_accuracy: 0.5654
Epoch 186/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4090 - accuracy: 0.5681 - val_loss: 0.8152 - val_accuracy: 0.5794
```

Epoch 187/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4618 - accuracy: 0.6118 - val_loss: 0.8362 - val_accuracy: 0.5701
Epoch 188/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4175 - accuracy: 0.5758 - val_loss: 0.8683 - val_accuracy: 0.5794
Epoch 189/1000
4/4 [=====] - 0s 18ms/step - loss: 0.4196 - accuracy: 0.5835 - val_loss: 0.8326 - val_accuracy: 0.5935
Epoch 190/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4322 - accuracy: 0.5913 - val_loss: 0.9178 - val_accuracy: 0.5514
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4895 - accuracy: 0.5707 - val_loss: 0.8981 - val_accuracy: 0.5374
Epoch 192/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5153 - accuracy: 0.5758 - val_loss: 0.7792 - val_accuracy: 0.5280
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4666 - accuracy: 0.5861 - val_loss: 0.7624 - val_accuracy: 0.5280
Epoch 194/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3876 - accuracy: 0.5681 - val_loss: 0.7901 - val_accuracy: 0.5467
Epoch 195/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4667 - accuracy: 0.5861 - val_loss: 0.8253 - val_accuracy: 0.5187
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4099 - accuracy: 0.5913 - val_loss: 0.7475 - val_accuracy: 0.5187
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4089 - accuracy: 0.6118 - val_loss: 0.8547 - val_accuracy: 0.5327
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4313 - accuracy: 0.6298 - val_loss: 0.8858 - val_accuracy: 0.5888
Epoch 199/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4361 - accuracy: 0.6272 - val_loss: 0.8661 - val_accuracy: 0.5981
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4190 - accuracy: 0.6221 - val_loss: 0.8702 - val_accuracy: 0.5607
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4768 - accuracy: 0.6067 - val_loss: 0.8351 - val_accuracy: 0.5654
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4299 - accuracy: 0.5887 - val_loss: 0.8775 - val_accuracy: 0.5748
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4347 - accuracy: 0.5784 - val_loss: 0.8802 - val_accuracy: 0.5514
Epoch 204/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4039 - accuracy: 0.5861 - val_loss: 0.8481 - val_accuracy: 0.5607
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3863 - accuracy: 0.5835 - val_loss: 0.8740 - val_accuracy: 0.5701
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4751 - accuracy: 0.5733 - val_loss: 0.8670 - val_accuracy: 0.5981
Epoch 207/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3881 - accuracy: 0.6247 - val_loss: 0.8632 - val_accuracy: 0.6121
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4108 - accuracy: 0.6247 - val_loss: 0.8884 - val_accuracy: 0.5981
Epoch 209/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3844 - accuracy: 0.6041 - val_loss: 0.8847 - val_accuracy: 0.6028
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3521 - accuracy: 0.5913 - val_loss: 0.8807 - val_accuracy: 0.5981
Epoch 211/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5038 - accuracy: 0.5527 - val_loss: 0.8750 - val_accuracy: 0.5421
Epoch 212/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4131 - accuracy: 0.5733 - val_loss: 0.8118 - val_accuracy: 0.5421
Epoch 213/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3773 - accuracy: 0.5604 - val_loss: 0.6273 - val_accuracy: 0.5047
Epoch 214/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4659 - accuracy: 0.6067 - val_loss: 0.6172 - val_accuracy: 0.5047
Epoch 215/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3571 - accuracy: 0.5964 - val_loss: 0.6148 - val_accuracy: 0.5140
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4289 - accuracy: 0.5810 - val_loss: 0.6125 - val_accuracy: 0.5140

```
accuracy: 0.5140
Epoch 217/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4154 - accuracy: 0.5913 - val_loss: 0.6128 - val_accuracy: 0.5280
Epoch 218/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3551 - accuracy: 0.5938 - val_loss: 0.6128 - val_accuracy: 0.5234
Epoch 219/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3349 - accuracy: 0.6221 - val_loss: 0.6331 - val_accuracy: 0.5140
Epoch 220/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3605 - accuracy: 0.6298 - val_loss: 0.6726 - val_accuracy: 0.5467
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3946 - accuracy: 0.5964 - val_loss: 0.6725 - val_accuracy: 0.5607
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3545 - accuracy: 0.6015 - val_loss: 0.6694 - val_accuracy: 0.5654
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3607 - accuracy: 0.6015 - val_loss: 0.7023 - val_accuracy: 0.5467
Epoch 224/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3624 - accuracy: 0.6221 - val_loss: 0.6950 - val_accuracy: 0.5794
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4704 - accuracy: 0.6067 - val_loss: 0.7281 - val_accuracy: 0.6121
Epoch 226/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3581 - accuracy: 0.6375 - val_loss: 0.7261 - val_accuracy: 0.6168
Epoch 227/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3973 - accuracy: 0.6555 - val_loss: 0.7201 - val_accuracy: 0.5888
Epoch 228/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3665 - accuracy: 0.6041 - val_loss: 0.6866 - val_accuracy: 0.5748
Epoch 229/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3596 - accuracy: 0.6221 - val_loss: 0.7183 - val_accuracy: 0.5701
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3665 - accuracy: 0.6118 - val_loss: 0.7338 - val_accuracy: 0.5841
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3936 - accuracy: 0.6350 - val_loss: 0.7303 - val_accuracy: 0.5888
Epoch 232/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4048 - accuracy: 0.6324 - val_loss: 0.7388 - val_accuracy: 0.5841
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3688 - accuracy: 0.6170 - val_loss: 0.7757 - val_accuracy: 0.6168
Epoch 234/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3715 - accuracy: 0.6298 - val_loss: 0.7278 - val_accuracy: 0.6075
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4181 - accuracy: 0.6298 - val_loss: 0.6842 - val_accuracy: 0.5748
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3715 - accuracy: 0.5835 - val_loss: 0.6814 - val_accuracy: 0.5607
Epoch 237/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3541 - accuracy: 0.5784 - val_loss: 0.6743 - val_accuracy: 0.5841
Epoch 238/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3900 - accuracy: 0.6144 - val_loss: 0.7826 - val_accuracy: 0.6075
Epoch 239/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3937 - accuracy: 0.6093 - val_loss: 0.8108 - val_accuracy: 0.6028
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4759 - accuracy: 0.6452 - val_loss: 0.7970 - val_accuracy: 0.5093
Epoch 241/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4508 - accuracy: 0.6195 - val_loss: 0.8270 - val_accuracy: 0.5467
Epoch 242/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4295 - accuracy: 0.5990 - val_loss: 0.7918 - val_accuracy: 0.5467
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4181 - accuracy: 0.6272 - val_loss: 0.8084 - val_accuracy: 0.5421
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3933 - accuracy: 0.5964 - val_loss: 0.8378 - val_accuracy: 0.5514
Epoch 245/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3564 - accuracy: 0.6170 - val_loss: 0.7596 - val_accuracy: 0.5654
Epoch 246/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.3727 - accuracy: 0.5784 - val_loss: 0.7891 - val_accuracy: 0.5748
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4283 - accuracy: 0.6118 - val_loss: 0.7511 - val_accuracy: 0.5888
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4304 - accuracy: 0.5887 - val_loss: 0.9287 - val_accuracy: 0.6168
Epoch 249/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3924 - accuracy: 0.5964 - val_loss: 0.9622 - val_accuracy: 0.6168
Epoch 250/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4326 - accuracy: 0.5938 - val_loss: 1.1703 - val_accuracy: 0.6308
Epoch 251/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3855 - accuracy: 0.5861 - val_loss: 0.9279 - val_accuracy: 0.6308
Epoch 252/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3597 - accuracy: 0.5733 - val_loss: 0.8641 - val_accuracy: 0.6215
Epoch 253/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3737 - accuracy: 0.5913 - val_loss: 0.8709 - val_accuracy: 0.6028
Epoch 254/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4556 - accuracy: 0.5424 - val_loss: 0.9427 - val_accuracy: 0.5701
Epoch 255/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3617 - accuracy: 0.5527 - val_loss: 0.9216 - val_accuracy: 0.5794
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4139 - accuracy: 0.5527 - val_loss: 0.9848 - val_accuracy: 0.5935
Epoch 257/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3335 - accuracy: 0.5681 - val_loss: 0.9458 - val_accuracy: 0.5935
Epoch 258/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3727 - accuracy: 0.5321 - val_loss: 0.9989 - val_accuracy: 0.5981
Epoch 259/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3804 - accuracy: 0.5450 - val_loss: 1.0603 - val_accuracy: 0.5888
Epoch 260/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3834 - accuracy: 0.5681 - val_loss: 1.0552 - val_accuracy: 0.5981
Epoch 261/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3854 - accuracy: 0.5681 - val_loss: 0.9554 - val_accuracy: 0.6075
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3651 - accuracy: 0.5527 - val_loss: 1.0550 - val_accuracy: 0.6121
Epoch 263/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4499 - accuracy: 0.5913 - val_loss: 1.1154 - val_accuracy: 0.6215
Epoch 264/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4801 - accuracy: 0.5835 - val_loss: 0.9060 - val_accuracy: 0.5935
Epoch 265/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4051 - accuracy: 0.5887 - val_loss: 0.9550 - val_accuracy: 0.5981
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3795 - accuracy: 0.5810 - val_loss: 0.9591 - val_accuracy: 0.5981
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4021 - accuracy: 0.6041 - val_loss: 0.9372 - val_accuracy: 0.6121
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3632 - accuracy: 0.5578 - val_loss: 1.0008 - val_accuracy: 0.5841
Epoch 269/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3623 - accuracy: 0.5784 - val_loss: 0.8973 - val_accuracy: 0.5888
Epoch 270/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4115 - accuracy: 0.5758 - val_loss: 0.9029 - val_accuracy: 0.5607
Epoch 271/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4071 - accuracy: 0.5835 - val_loss: 0.9512 - val_accuracy: 0.5561
Epoch 272/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3138 - accuracy: 0.5938 - val_loss: 0.9972 - val_accuracy: 0.5748
Epoch 273/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3935 - accuracy: 0.5681 - val_loss: 1.0766 - val_accuracy: 0.6028
Epoch 274/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3524 - accuracy: 0.5784 - val_loss: 1.0483 - val_accuracy: 0.5888
Epoch 275/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3881 - accuracy: 0.6195 - val_loss: 0.9793 - val_accuracy: 0.6028
```

Epoch 276/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3129 - accuracy: 0.5835 - val_loss: 0.9725 - val_accuracy: 0.6028
Epoch 277/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3802 - accuracy: 0.5913 - val_loss: 0.9791 - val_accuracy: 0.6262
Epoch 278/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3186 - accuracy: 0.6041 - val_loss: 0.9697 - val_accuracy: 0.5981
Epoch 279/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3258 - accuracy: 0.5964 - val_loss: 0.9739 - val_accuracy: 0.6075
Epoch 280/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3404 - accuracy: 0.6067 - val_loss: 1.0183 - val_accuracy: 0.6075
Epoch 281/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4228 - accuracy: 0.6375 - val_loss: 1.0781 - val_accuracy: 0.6402
Epoch 282/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4430 - accuracy: 0.6067 - val_loss: 1.1303 - val_accuracy: 0.6449
Epoch 283/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4346 - accuracy: 0.6195 - val_loss: 1.0749 - val_accuracy: 0.6542
Epoch 284/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4922 - accuracy: 0.6170 - val_loss: 0.9902 - val_accuracy: 0.6355
Epoch 285/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4680 - accuracy: 0.5835 - val_loss: 1.0128 - val_accuracy: 0.6542
Epoch 286/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4090 - accuracy: 0.6093 - val_loss: 1.0732 - val_accuracy: 0.6495
Epoch 287/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3754 - accuracy: 0.6324 - val_loss: 1.0239 - val_accuracy: 0.6449
Epoch 288/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3701 - accuracy: 0.6375 - val_loss: 1.0183 - val_accuracy: 0.6449
Epoch 289/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4233 - accuracy: 0.5990 - val_loss: 1.0352 - val_accuracy: 0.6308
Epoch 290/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3489 - accuracy: 0.6221 - val_loss: 1.0053 - val_accuracy: 0.6355
Epoch 291/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3646 - accuracy: 0.6298 - val_loss: 0.8471 - val_accuracy: 0.6355
Epoch 292/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3894 - accuracy: 0.6144 - val_loss: 1.0487 - val_accuracy: 0.6308
Epoch 293/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3861 - accuracy: 0.6247 - val_loss: 1.0093 - val_accuracy: 0.6262
Epoch 294/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3581 - accuracy: 0.6247 - val_loss: 0.9501 - val_accuracy: 0.6308
Epoch 295/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3584 - accuracy: 0.6221 - val_loss: 0.8769 - val_accuracy: 0.6121
Epoch 296/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3451 - accuracy: 0.6067 - val_loss: 0.9568 - val_accuracy: 0.5841
Epoch 297/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3070 - accuracy: 0.5758 - val_loss: 0.9370 - val_accuracy: 0.6262
Epoch 298/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3823 - accuracy: 0.5707 - val_loss: 0.9152 - val_accuracy: 0.5935
Epoch 299/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3346 - accuracy: 0.5733 - val_loss: 0.9480 - val_accuracy: 0.5841
Epoch 300/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3549 - accuracy: 0.5913 - val_loss: 1.0626 - val_accuracy: 0.6121
Epoch 301/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3224 - accuracy: 0.6015 - val_loss: 0.9497 - val_accuracy: 0.5888
Epoch 302/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4362 - accuracy: 0.5758 - val_loss: 0.8783 - val_accuracy: 0.5935
Epoch 303/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3404 - accuracy: 0.5604 - val_loss: 0.8552 - val_accuracy: 0.5841
Epoch 304/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3735 - accuracy: 0.5938 - val_loss: 1.1454 - val_accuracy: 0.5935
Epoch 305/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3409 - accuracy: 0.6015 - val_loss: 1.0196 - val_accuracy: 0.5935

```

accuracy: 0.5841
Epoch 306/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4284 - accuracy: 0.6118 - val_loss: 0.9459 - val_accuracy: 0.5981
Epoch 307/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3385 - accuracy: 0.6247 - val_loss: 0.9661 - val_accuracy: 0.6121
Epoch 308/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4237 - accuracy: 0.6247 - val_loss: 0.9486 - val_accuracy: 0.5981
Epoch 309/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3785 - accuracy: 0.5938 - val_loss: 0.9943 - val_accuracy: 0.5981
Epoch 310/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3681 - accuracy: 0.6195 - val_loss: 0.9474 - val_accuracy: 0.5841
Epoch 311/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3351 - accuracy: 0.6195 - val_loss: 0.8875 - val_accuracy: 0.5561
Epoch 312/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3173 - accuracy: 0.5990 - val_loss: 0.8560 - val_accuracy: 0.5654
Epoch 313/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3295 - accuracy: 0.4922Restoring model weights from the end of the best epoch: 163.
4/4 [=====] - 0s 14ms/step - loss: 0.3016 - accuracy: 0.5861 - val_loss: 0.8577 - val_accuracy: 0.6215
Epoch 313: early stopping
2/2 [=====] - 0s 3ms/step - loss: 0.9606 - accuracy: 0.6744
[CV] END .....Dense1=100, Dense2=10; total time= 17.1s
Model: "sequential_72"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_288 (Dense)	(None, 100)	700
batch_normalization_216 (BatchNormalization)	(None, 100)	400
activation_216 (Activation)	(None, 100)	0
dense_289 (Dense)	(None, 10)	1010
batch_normalization_217 (BatchNormalization)	(None, 10)	40
activation_217 (Activation)	(None, 10)	0
dense_290 (Dense)	(None, 10)	110
batch_normalization_218 (BatchNormalization)	(None, 10)	40
activation_218 (Activation)	(None, 10)	0
dense_291 (Dense)	(None, 2)	22
<hr/>		
Total params: 2,322		
Trainable params: 2,082		
Non-trainable params: 240		

```

Epoch 1/1000
4/4 [=====] - 1s 54ms/step - loss: 5.1227 - accuracy: 0.6067 - val_loss: 6.6899 - val_accuracy: 0.5935
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 4.2200 - accuracy: 0.5527 - val_loss: 5.3880 - val_accuracy: 0.6682
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 4.2622 - accuracy: 0.5656 - val_loss: 4.7456 - val_accuracy: 0.6916
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 4.1523 - accuracy: 0.5835 - val_loss: 3.8400 - val_accuracy: 0.6869
Epoch 5/1000
4/4 [=====] - 0s 12ms/step - loss: 4.0853 - accuracy: 0.5835 - val_loss: 3.2936 - val_accuracy: 0.6028
Epoch 6/1000
4/4 [=====] - 0s 12ms/step - loss: 3.9431 - accuracy: 0.5810 - val_loss: 2.8840 - val_accuracy: 0.5514
Epoch 7/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8546 - accuracy: 0.5707 - val_loss: 2.5656 - val_accuracy: 0.4860
Epoch 8/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7419 - accuracy: 0.5861 - val_loss: 2.4650 - val_accuracy: 0.4720
Epoch 9/1000
4/4 [=====] - 0s 12ms/step - loss: 3.6622 - accuracy: 0.5707 - val_loss: 2.2940 - val_accuracy: 0.4626

```

Epoch 10/1000
4/4 [=====] - 0s 12ms/step - loss: 3.4501 - accuracy: 0.5938 - val_loss: 2.1994 - val_accuracy: 0.4673
Epoch 11/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5097 - accuracy: 0.5861 - val_loss: 2.1469 - val_accuracy: 0.4439
Epoch 12/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3306 - accuracy: 0.5990 - val_loss: 2.0999 - val_accuracy: 0.4159
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3815 - accuracy: 0.6041 - val_loss: 2.0358 - val_accuracy: 0.4766
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1466 - accuracy: 0.5938 - val_loss: 1.9931 - val_accuracy: 0.5093
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1079 - accuracy: 0.6067 - val_loss: 1.9532 - val_accuracy: 0.5234
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 3.0180 - accuracy: 0.6067 - val_loss: 1.9230 - val_accuracy: 0.5047
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7269 - accuracy: 0.5964 - val_loss: 1.8914 - val_accuracy: 0.4907
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5596 - accuracy: 0.6221 - val_loss: 1.8565 - val_accuracy: 0.3785
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4488 - accuracy: 0.6247 - val_loss: 1.8349 - val_accuracy: 0.4299
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2573 - accuracy: 0.6452 - val_loss: 1.7690 - val_accuracy: 0.5794
Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3350 - accuracy: 0.6221 - val_loss: 1.7496 - val_accuracy: 0.5888
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1186 - accuracy: 0.6375 - val_loss: 1.7532 - val_accuracy: 0.5234
Epoch 23/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9789 - accuracy: 0.6607 - val_loss: 1.7380 - val_accuracy: 0.5280
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0223 - accuracy: 0.6452 - val_loss: 1.7199 - val_accuracy: 0.5467
Epoch 25/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0222 - accuracy: 0.6401 - val_loss: 1.6953 - val_accuracy: 0.5561
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8726 - accuracy: 0.6530 - val_loss: 1.6719 - val_accuracy: 0.5888
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8853 - accuracy: 0.6607 - val_loss: 1.6544 - val_accuracy: 0.5888
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9016 - accuracy: 0.6555 - val_loss: 1.6321 - val_accuracy: 0.5888
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8116 - accuracy: 0.6632 - val_loss: 1.6091 - val_accuracy: 0.5748
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8363 - accuracy: 0.6504 - val_loss: 1.5830 - val_accuracy: 0.5701
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7293 - accuracy: 0.6632 - val_loss: 1.5708 - val_accuracy: 0.5794
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7291 - accuracy: 0.6632 - val_loss: 1.5271 - val_accuracy: 0.5794
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7399 - accuracy: 0.6864 - val_loss: 1.5095 - val_accuracy: 0.5794
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6959 - accuracy: 0.6915 - val_loss: 1.4939 - val_accuracy: 0.5794
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6937 - accuracy: 0.6787 - val_loss: 1.4715 - val_accuracy: 0.5935
Epoch 36/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6408 - accuracy: 0.6941 - val_loss: 1.4557 - val_accuracy: 0.5981
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6391 - accuracy: 0.6967 - val_loss: 1.4579 - val_accuracy: 0.6121
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6302 - accuracy: 0.7275 - val_loss: 1.4397 - val_accuracy: 0.6075
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5319 - accuracy: 0.7121 - val_loss: 1.4177 - val_accuracy: 0.6075

```
accuracy: 0.5981
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5353 - accuracy: 0.7224 - val_loss: 1.4025 - val_
accuracy: 0.6028
Epoch 41/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5356 - accuracy: 0.7224 - val_loss: 1.3869 - val_
accuracy: 0.5841
Epoch 42/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5480 - accuracy: 0.7326 - val_loss: 1.3579 - val_
accuracy: 0.5794
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4523 - accuracy: 0.7481 - val_loss: 1.3097 - val_
accuracy: 0.6262
Epoch 44/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4059 - accuracy: 0.7455 - val_loss: 1.3027 - val_
accuracy: 0.6262
Epoch 45/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5035 - accuracy: 0.7429 - val_loss: 1.2874 - val_
accuracy: 0.6355
Epoch 46/1000
4/4 [=====] - 0s 15ms/step - loss: 1.3668 - accuracy: 0.7378 - val_loss: 1.2778 - val_
accuracy: 0.6308
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3936 - accuracy: 0.7352 - val_loss: 1.2662 - val_
accuracy: 0.6262
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3770 - accuracy: 0.7404 - val_loss: 1.2847 - val_
accuracy: 0.6308
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4886 - accuracy: 0.7481 - val_loss: 1.2711 - val_
accuracy: 0.6215
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3170 - accuracy: 0.7429 - val_loss: 1.2565 - val_
accuracy: 0.6262
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3340 - accuracy: 0.7352 - val_loss: 1.2211 - val_
accuracy: 0.6589
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2875 - accuracy: 0.7429 - val_loss: 1.2136 - val_
accuracy: 0.6682
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3199 - accuracy: 0.7584 - val_loss: 1.2117 - val_
accuracy: 0.6589
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2962 - accuracy: 0.7352 - val_loss: 1.2336 - val_
accuracy: 0.6589
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3137 - accuracy: 0.7378 - val_loss: 1.2224 - val_
accuracy: 0.6822
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2783 - accuracy: 0.7481 - val_loss: 1.2135 - val_
accuracy: 0.6916
Epoch 57/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2416 - accuracy: 0.7506 - val_loss: 1.1938 - val_
accuracy: 0.6963
Epoch 58/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2152 - accuracy: 0.7378 - val_loss: 1.1882 - val_
accuracy: 0.7009
Epoch 59/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2510 - accuracy: 0.7352 - val_loss: 1.1869 - val_
accuracy: 0.6916
Epoch 60/1000
4/4 [=====] - 0s 19ms/step - loss: 1.2591 - accuracy: 0.7506 - val_loss: 1.1531 - val_
accuracy: 0.6869
Epoch 61/1000
4/4 [=====] - 0s 16ms/step - loss: 1.2715 - accuracy: 0.7532 - val_loss: 1.1449 - val_
accuracy: 0.6869
Epoch 62/1000
4/4 [=====] - 0s 16ms/step - loss: 1.1779 - accuracy: 0.7712 - val_loss: 1.1390 - val_
accuracy: 0.6822
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1435 - accuracy: 0.7738 - val_loss: 1.1302 - val_
accuracy: 0.6682
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1473 - accuracy: 0.7789 - val_loss: 1.1200 - val_
accuracy: 0.6682
Epoch 65/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1116 - accuracy: 0.7661 - val_loss: 1.0962 - val_
accuracy: 0.6776
Epoch 66/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0932 - accuracy: 0.7712 - val_loss: 1.1023 - val_
accuracy: 0.6916
Epoch 67/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0768 - accuracy: 0.7584 - val_loss: 1.0964 - val_
accuracy: 0.6916
Epoch 68/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0864 - accuracy: 0.7455 - val_loss: 1.0906 - val_
accuracy: 0.6869
Epoch 69/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 1.0845 - accuracy: 0.7789 - val_loss: 1.0820 - val_accuracy: 0.6822
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2027 - accuracy: 0.7635 - val_loss: 1.0756 - val_accuracy: 0.6916
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0838 - accuracy: 0.7661 - val_loss: 1.0675 - val_accuracy: 0.6963
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0539 - accuracy: 0.7558 - val_loss: 1.0463 - val_accuracy: 0.6869
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0249 - accuracy: 0.7712 - val_loss: 1.0462 - val_accuracy: 0.7009
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0389 - accuracy: 0.7584 - val_loss: 1.0628 - val_accuracy: 0.6963
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0408 - accuracy: 0.7763 - val_loss: 1.0613 - val_accuracy: 0.6963
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0401 - accuracy: 0.7763 - val_loss: 1.0608 - val_accuracy: 0.7009
Epoch 77/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0333 - accuracy: 0.7635 - val_loss: 1.0237 - val_accuracy: 0.6963
Epoch 78/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9814 - accuracy: 0.7841 - val_loss: 1.0218 - val_accuracy: 0.7150
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0144 - accuracy: 0.7661 - val_loss: 1.0236 - val_accuracy: 0.7150
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9677 - accuracy: 0.7635 - val_loss: 1.0217 - val_accuracy: 0.7056
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0358 - accuracy: 0.7712 - val_loss: 1.0166 - val_accuracy: 0.7056
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0365 - accuracy: 0.7635 - val_loss: 1.0072 - val_accuracy: 0.7103
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0401 - accuracy: 0.7378 - val_loss: 1.0014 - val_accuracy: 0.7150
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9453 - accuracy: 0.7738 - val_loss: 1.0049 - val_accuracy: 0.6916
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0186 - accuracy: 0.7584 - val_loss: 1.0467 - val_accuracy: 0.6636
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9192 - accuracy: 0.7738 - val_loss: 1.0447 - val_accuracy: 0.6869
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9534 - accuracy: 0.7558 - val_loss: 1.0319 - val_accuracy: 0.7056
Epoch 88/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9215 - accuracy: 0.7558 - val_loss: 0.9476 - val_accuracy: 0.7570
Epoch 89/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9110 - accuracy: 0.7532 - val_loss: 0.9412 - val_accuracy: 0.7617
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9321 - accuracy: 0.7686 - val_loss: 0.8704 - val_accuracy: 0.7430
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9243 - accuracy: 0.7738 - val_loss: 0.8563 - val_accuracy: 0.7477
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9579 - accuracy: 0.7738 - val_loss: 0.8810 - val_accuracy: 0.7430
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9637 - accuracy: 0.7532 - val_loss: 0.8835 - val_accuracy: 0.7430
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9277 - accuracy: 0.7763 - val_loss: 0.8789 - val_accuracy: 0.7383
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8361 - accuracy: 0.7815 - val_loss: 0.8794 - val_accuracy: 0.7430
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9250 - accuracy: 0.7635 - val_loss: 0.8770 - val_accuracy: 0.7336
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8561 - accuracy: 0.7763 - val_loss: 0.9036 - val_accuracy: 0.7290
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8993 - accuracy: 0.7892 - val_loss: 0.9180 - val_accuracy: 0.7243
```

Epoch 99/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8721 - accuracy: 0.7943 - val_loss: 0.9214 - val_accuracy: 0.7243
Epoch 100/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8300 - accuracy: 0.7738 - val_loss: 0.9179 - val_accuracy: 0.7336
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9321 - accuracy: 0.7789 - val_loss: 0.9192 - val_accuracy: 0.7336
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8680 - accuracy: 0.7815 - val_loss: 0.9507 - val_accuracy: 0.7336
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8863 - accuracy: 0.7661 - val_loss: 0.9668 - val_accuracy: 0.7290
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8834 - accuracy: 0.7763 - val_loss: 0.9641 - val_accuracy: 0.7290
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8980 - accuracy: 0.7841 - val_loss: 0.9448 - val_accuracy: 0.7196
Epoch 106/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8428 - accuracy: 0.7738 - val_loss: 0.9344 - val_accuracy: 0.7196
Epoch 107/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9364 - accuracy: 0.7841 - val_loss: 0.9660 - val_accuracy: 0.7196
Epoch 108/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9077 - accuracy: 0.7789 - val_loss: 0.9692 - val_accuracy: 0.7243
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8574 - accuracy: 0.7866 - val_loss: 0.9835 - val_accuracy: 0.6916
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8689 - accuracy: 0.7892 - val_loss: 0.9803 - val_accuracy: 0.6916
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8863 - accuracy: 0.7738 - val_loss: 0.9471 - val_accuracy: 0.6963
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8271 - accuracy: 0.7918 - val_loss: 0.9306 - val_accuracy: 0.7196
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7631 - accuracy: 0.7815 - val_loss: 0.8899 - val_accuracy: 0.7290
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7598 - accuracy: 0.7969 - val_loss: 0.8828 - val_accuracy: 0.7430
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8486 - accuracy: 0.7635 - val_loss: 0.8796 - val_accuracy: 0.7336
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7780 - accuracy: 0.7943 - val_loss: 0.8548 - val_accuracy: 0.7383
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7922 - accuracy: 0.7892 - val_loss: 0.8479 - val_accuracy: 0.7196
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7617 - accuracy: 0.7918 - val_loss: 0.8580 - val_accuracy: 0.7243
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8083 - accuracy: 0.8072 - val_loss: 0.8834 - val_accuracy: 0.7290
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7766 - accuracy: 0.8046 - val_loss: 0.8442 - val_accuracy: 0.7243
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6395 - accuracy: 0.8149 - val_loss: 0.9158 - val_accuracy: 0.7243
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6521 - accuracy: 0.8201 - val_loss: 0.9112 - val_accuracy: 0.7243
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6928 - accuracy: 0.8201 - val_loss: 0.9027 - val_accuracy: 0.7290
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6405 - accuracy: 0.8098 - val_loss: 0.8656 - val_accuracy: 0.7430
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6904 - accuracy: 0.8046 - val_loss: 0.8618 - val_accuracy: 0.7430
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5940 - accuracy: 0.8098 - val_loss: 0.8309 - val_accuracy: 0.7523
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6225 - accuracy: 0.8098 - val_loss: 0.8527 - val_accuracy: 0.7710
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5906 - accuracy: 0.8380 - val_loss: 0.8269 - val_accuracy: 0.8269

```
accuracy: 0.7617
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5829 - accuracy: 0.8303 - val_loss: 0.8251 - val_
accuracy: 0.7664
Epoch 130/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5710 - accuracy: 0.8123 - val_loss: 0.8694 - val_
accuracy: 0.7570
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5523 - accuracy: 0.8226 - val_loss: 0.8046 - val_
accuracy: 0.7664
Epoch 132/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5750 - accuracy: 0.8098 - val_loss: 0.8253 - val_
accuracy: 0.7757
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5628 - accuracy: 0.8355 - val_loss: 0.7419 - val_
accuracy: 0.7617
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5310 - accuracy: 0.8046 - val_loss: 0.7921 - val_
accuracy: 0.7664
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5774 - accuracy: 0.8149 - val_loss: 0.8110 - val_
accuracy: 0.7570
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5191 - accuracy: 0.8252 - val_loss: 0.7886 - val_
accuracy: 0.7570
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5786 - accuracy: 0.7995 - val_loss: 0.7801 - val_
accuracy: 0.7664
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4985 - accuracy: 0.8021 - val_loss: 0.8170 - val_
accuracy: 0.7617
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4571 - accuracy: 0.7866 - val_loss: 0.8105 - val_
accuracy: 0.7757
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5521 - accuracy: 0.7969 - val_loss: 0.8010 - val_
accuracy: 0.7850
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4741 - accuracy: 0.8098 - val_loss: 0.8051 - val_
accuracy: 0.7850
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5671 - accuracy: 0.8226 - val_loss: 0.8160 - val_
accuracy: 0.7757
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4174 - accuracy: 0.8201 - val_loss: 0.8157 - val_
accuracy: 0.7804
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4949 - accuracy: 0.8072 - val_loss: 0.8097 - val_
accuracy: 0.7664
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4454 - accuracy: 0.8226 - val_loss: 0.8100 - val_
accuracy: 0.7710
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5023 - accuracy: 0.8303 - val_loss: 0.8110 - val_
accuracy: 0.7710
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5656 - accuracy: 0.8201 - val_loss: 0.8132 - val_
accuracy: 0.7710
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4700 - accuracy: 0.8483 - val_loss: 0.8097 - val_
accuracy: 0.7710
Epoch 149/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4549 - accuracy: 0.8329 - val_loss: 0.8736 - val_
accuracy: 0.7523
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4556 - accuracy: 0.8355 - val_loss: 0.8174 - val_
accuracy: 0.7617
Epoch 151/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5218 - accuracy: 0.8098 - val_loss: 0.8308 - val_
accuracy: 0.7710
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4175 - accuracy: 0.8252 - val_loss: 0.8073 - val_
accuracy: 0.7804
Epoch 153/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4073 - accuracy: 0.8329 - val_loss: 0.7935 - val_
accuracy: 0.7897
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4045 - accuracy: 0.8535 - val_loss: 0.7914 - val_
accuracy: 0.7897
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5202 - accuracy: 0.8458 - val_loss: 0.7745 - val_
accuracy: 0.7617
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4679 - accuracy: 0.8329 - val_loss: 0.7727 - val_
accuracy: 0.7570
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5153 - accuracy: 0.8278 - val_loss: 0.7688 - val_
accuracy: 0.7477
Epoch 158/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.4869 - accuracy: 0.8432 - val_loss: 0.7685 - val_accuracy: 0.7523
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4045 - accuracy: 0.8303 - val_loss: 0.7712 - val_accuracy: 0.7523
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4272 - accuracy: 0.8509 - val_loss: 0.7692 - val_accuracy: 0.7617
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4474 - accuracy: 0.8329 - val_loss: 0.7670 - val_accuracy: 0.7617
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3767 - accuracy: 0.8406 - val_loss: 0.7946 - val_accuracy: 0.7570
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4634 - accuracy: 0.8535 - val_loss: 0.7940 - val_accuracy: 0.7664
Epoch 164/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5299 - accuracy: 0.8355 - val_loss: 0.7895 - val_accuracy: 0.7757
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4229 - accuracy: 0.8483 - val_loss: 0.7846 - val_accuracy: 0.7664
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4213 - accuracy: 0.8406 - val_loss: 0.7882 - val_accuracy: 0.7757
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4112 - accuracy: 0.8509 - val_loss: 0.8017 - val_accuracy: 0.7523
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4018 - accuracy: 0.8432 - val_loss: 0.8620 - val_accuracy: 0.7617
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4471 - accuracy: 0.8458 - val_loss: 0.8871 - val_accuracy: 0.7617
Epoch 170/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4133 - accuracy: 0.8458 - val_loss: 0.9398 - val_accuracy: 0.7710
Epoch 171/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4010 - accuracy: 0.8355 - val_loss: 0.8586 - val_accuracy: 0.7664
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4033 - accuracy: 0.8458 - val_loss: 0.9358 - val_accuracy: 0.7757
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4202 - accuracy: 0.8303 - val_loss: 0.8861 - val_accuracy: 0.7757
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3947 - accuracy: 0.8458 - val_loss: 0.9010 - val_accuracy: 0.7757
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4770 - accuracy: 0.8509 - val_loss: 0.9222 - val_accuracy: 0.7710
Epoch 176/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4122 - accuracy: 0.8509 - val_loss: 0.8636 - val_accuracy: 0.7523
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4911 - accuracy: 0.8483 - val_loss: 0.8613 - val_accuracy: 0.7477
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4627 - accuracy: 0.8432 - val_loss: 0.7950 - val_accuracy: 0.7383
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4355 - accuracy: 0.8252 - val_loss: 0.8437 - val_accuracy: 0.7430
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4485 - accuracy: 0.8355 - val_loss: 0.8398 - val_accuracy: 0.7383
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3995 - accuracy: 0.8355 - val_loss: 0.8392 - val_accuracy: 0.7477
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4518 - accuracy: 0.8560 - val_loss: 0.8513 - val_accuracy: 0.7477
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4068 - accuracy: 0.8458 - val_loss: 0.8511 - val_accuracy: 0.7523
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4188 - accuracy: 0.8432 - val_loss: 0.8557 - val_accuracy: 0.7570
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3946 - accuracy: 0.8509 - val_loss: 0.8536 - val_accuracy: 0.7570
Epoch 186/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4847 - accuracy: 0.8483 - val_loss: 0.9543 - val_accuracy: 0.7757
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4804 - accuracy: 0.8226 - val_loss: 1.1753 - val_accuracy: 0.7850
```

Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3955 - accuracy: 0.8432 - val_loss: 1.0201 - val_accuracy: 0.7757
Epoch 189/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4605 - accuracy: 0.8098 - val_loss: 1.0076 - val_accuracy: 0.7757
Epoch 190/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4084 - accuracy: 0.8432 - val_loss: 1.0118 - val_accuracy: 0.7617
Epoch 191/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3844 - accuracy: 0.8072 - val_loss: 0.9960 - val_accuracy: 0.7850
Epoch 192/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4397 - accuracy: 0.7841 - val_loss: 0.9992 - val_accuracy: 0.7850
Epoch 193/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4000 - accuracy: 0.7969 - val_loss: 1.0057 - val_accuracy: 0.7757
Epoch 194/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3634 - accuracy: 0.8252 - val_loss: 1.0689 - val_accuracy: 0.7757
Epoch 195/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4025 - accuracy: 0.7815 - val_loss: 1.0678 - val_accuracy: 0.7850
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3863 - accuracy: 0.7609 - val_loss: 1.0677 - val_accuracy: 0.7850
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3722 - accuracy: 0.7789 - val_loss: 1.1063 - val_accuracy: 0.7850
Epoch 198/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4451 - accuracy: 0.7609 - val_loss: 1.1300 - val_accuracy: 0.7804
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4021 - accuracy: 0.7686 - val_loss: 1.1942 - val_accuracy: 0.7850
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4110 - accuracy: 0.7763 - val_loss: 1.0591 - val_accuracy: 0.7757
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3376 - accuracy: 0.7481 - val_loss: 1.0376 - val_accuracy: 0.7757
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3658 - accuracy: 0.7275 - val_loss: 1.0696 - val_accuracy: 0.7009
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4099 - accuracy: 0.6427 - val_loss: 0.9592 - val_accuracy: 0.6355
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3821 - accuracy: 0.6427 - val_loss: 1.1315 - val_accuracy: 0.6121
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3883 - accuracy: 0.5527 - val_loss: 1.1330 - val_accuracy: 0.6449
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4262 - accuracy: 0.5964 - val_loss: 1.0631 - val_accuracy: 0.5841
Epoch 207/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3910 - accuracy: 0.5604 - val_loss: 1.1530 - val_accuracy: 0.6402
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4309 - accuracy: 0.5758 - val_loss: 1.1521 - val_accuracy: 0.6075
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4237 - accuracy: 0.5758 - val_loss: 1.0477 - val_accuracy: 0.5935
Epoch 210/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3935 - accuracy: 0.5656 - val_loss: 1.0407 - val_accuracy: 0.6822
Epoch 211/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3376 - accuracy: 0.6375 - val_loss: 1.0340 - val_accuracy: 0.6636
Epoch 212/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3713 - accuracy: 0.6247 - val_loss: 1.0165 - val_accuracy: 0.7710
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3759 - accuracy: 0.7147 - val_loss: 1.1200 - val_accuracy: 0.7477
Epoch 214/1000
4/4 [=====] - 0s 26ms/step - loss: 0.3599 - accuracy: 0.6838 - val_loss: 1.0954 - val_accuracy: 0.7617
Epoch 215/1000
4/4 [=====] - 0s 37ms/step - loss: 0.3943 - accuracy: 0.7095 - val_loss: 0.9245 - val_accuracy: 0.7710
Epoch 216/1000
4/4 [=====] - 0s 18ms/step - loss: 0.4430 - accuracy: 0.8175 - val_loss: 0.9167 - val_accuracy: 0.7617
Epoch 217/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3896 - accuracy: 0.8406 - val_loss: 0.9373 - val_accuracy: 0.7617

```
accuracy: 0.7617
Epoch 218/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3964 - accuracy: 0.8278 - val_loss: 0.9705 - val_accuracy: 0.7523
Epoch 219/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3571 - accuracy: 0.8355 - val_loss: 0.9723 - val_accuracy: 0.7477
Epoch 220/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3812 - accuracy: 0.8560 - val_loss: 1.0096 - val_accuracy: 0.7570
Epoch 221/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4201 - accuracy: 0.8380 - val_loss: 0.9930 - val_accuracy: 0.7477
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3818 - accuracy: 0.8303 - val_loss: 1.0783 - val_accuracy: 0.7477
Epoch 223/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3486 - accuracy: 0.8380 - val_loss: 1.0507 - val_accuracy: 0.7430
Epoch 224/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3684 - accuracy: 0.8560 - val_loss: 0.9253 - val_accuracy: 0.7477
Epoch 225/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3594 - accuracy: 0.8638 - val_loss: 0.9840 - val_accuracy: 0.7664
Epoch 226/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4401 - accuracy: 0.8406 - val_loss: 1.0423 - val_accuracy: 0.7617
Epoch 227/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3346 - accuracy: 0.8509 - val_loss: 1.0910 - val_accuracy: 0.7850
Epoch 228/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3977 - accuracy: 0.8380 - val_loss: 1.0359 - val_accuracy: 0.7664
Epoch 229/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4140 - accuracy: 0.8201 - val_loss: 1.0756 - val_accuracy: 0.7617
Epoch 230/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4187 - accuracy: 0.8509 - val_loss: 1.0546 - val_accuracy: 0.7617
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3235 - accuracy: 0.8458 - val_loss: 1.0545 - val_accuracy: 0.7664
Epoch 232/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3219 - accuracy: 0.8380 - val_loss: 0.9778 - val_accuracy: 0.7570
Epoch 233/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3804 - accuracy: 0.8329 - val_loss: 0.9429 - val_accuracy: 0.7617
Epoch 234/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3187 - accuracy: 0.8380 - val_loss: 0.9578 - val_accuracy: 0.7710
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4293 - accuracy: 0.8149 - val_loss: 0.9296 - val_accuracy: 0.7664
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4300 - accuracy: 0.8329 - val_loss: 0.9202 - val_accuracy: 0.7617
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3331 - accuracy: 0.8535 - val_loss: 1.0011 - val_accuracy: 0.7617
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3624 - accuracy: 0.8252 - val_loss: 0.9686 - val_accuracy: 0.7570
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4007 - accuracy: 0.8329 - val_loss: 0.9279 - val_accuracy: 0.7523
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3477 - accuracy: 0.8123 - val_loss: 1.0015 - val_accuracy: 0.7617
Epoch 241/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3956 - accuracy: 0.8329 - val_loss: 0.9663 - val_accuracy: 0.7523
Epoch 242/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3597 - accuracy: 0.8226 - val_loss: 0.9183 - val_accuracy: 0.7710
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3112 - accuracy: 0.8303 - val_loss: 0.9489 - val_accuracy: 0.7664
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3406 - accuracy: 0.8458 - val_loss: 0.9496 - val_accuracy: 0.7617
Epoch 245/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4011 - accuracy: 0.8380 - val_loss: 0.9494 - val_accuracy: 0.7570
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4580 - accuracy: 0.8098 - val_loss: 0.9719 - val_accuracy: 0.7664
Epoch 247/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3634 - accuracy: 0.8432 - val_loss: 0.9717 - val_accuracy: 0.7617
Epoch 248/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3079 - accuracy: 0.8432 - val_loss: 0.9988 - val_accuracy: 0.7570
Epoch 249/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3388 - accuracy: 0.8458 - val_loss: 0.9719 - val_accuracy: 0.7523
Epoch 250/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3175 - accuracy: 0.8123 - val_loss: 0.9976 - val_accuracy: 0.7570
Epoch 251/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3298 - accuracy: 0.8355 - val_loss: 0.9577 - val_accuracy: 0.7617
Epoch 252/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3407 - accuracy: 0.8226 - val_loss: 1.0385 - val_accuracy: 0.7664
Epoch 253/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3129 - accuracy: 0.8123 - val_loss: 1.0559 - val_accuracy: 0.7336
Epoch 254/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3351 - accuracy: 0.7661 - val_loss: 1.2851 - val_accuracy: 0.7243
Epoch 255/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3788 - accuracy: 0.7301 - val_loss: 1.1731 - val_accuracy: 0.6682
Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4119 - accuracy: 0.6427 - val_loss: 1.1212 - val_accuracy: 0.4486
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2826 - accuracy: 0.5219 - val_loss: 1.1083 - val_accuracy: 0.5093
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3363 - accuracy: 0.5398 - val_loss: 1.1499 - val_accuracy: 0.4486
Epoch 259/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3644 - accuracy: 0.5219 - val_loss: 1.1771 - val_accuracy: 0.4346
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3819 - accuracy: 0.5116 - val_loss: 1.1610 - val_accuracy: 0.4346
Epoch 261/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3779 - accuracy: 0.5064 - val_loss: 1.1842 - val_accuracy: 0.4393
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3138 - accuracy: 0.5013 - val_loss: 1.2178 - val_accuracy: 0.4626
Epoch 263/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3322 - accuracy: 0.5090 - val_loss: 1.2200 - val_accuracy: 0.4579
Epoch 264/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3939 - accuracy: 0.5141 - val_loss: 1.1564 - val_accuracy: 0.4486
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2858 - accuracy: 0.5167 - val_loss: 1.1423 - val_accuracy: 0.4439
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3832 - accuracy: 0.5141 - val_loss: 1.1154 - val_accuracy: 0.4393
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3597 - accuracy: 0.5090 - val_loss: 1.0851 - val_accuracy: 0.4486
Epoch 268/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2636 - accuracy: 0.5064 - val_loss: 1.0833 - val_accuracy: 0.4486
Epoch 269/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4039 - accuracy: 0.5064 - val_loss: 1.0026 - val_accuracy: 0.4626
Epoch 270/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3816 - accuracy: 0.5141 - val_loss: 0.9912 - val_accuracy: 0.4673
Epoch 271/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3559 - accuracy: 0.5090 - val_loss: 0.9243 - val_accuracy: 0.4579
Epoch 272/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3254 - accuracy: 0.5141 - val_loss: 0.9965 - val_accuracy: 0.4533
Epoch 273/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2935 - accuracy: 0.5167 - val_loss: 0.9964 - val_accuracy: 0.4533
Epoch 274/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3694 - accuracy: 0.5219 - val_loss: 1.0306 - val_accuracy: 0.4533
Epoch 275/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2860 - accuracy: 0.5296 - val_loss: 1.0528 - val_accuracy: 0.4439
Epoch 276/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3389 - accuracy: 0.5090 - val_loss: 1.0576 - val_accuracy: 0.4439
```

Epoch 277/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3403 - accuracy: 0.4987 - val_loss: 0.9865 - val_accuracy: 0.4486
 Epoch 278/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3094 - accuracy: 0.5039 - val_loss: 0.9246 - val_accuracy: 0.4579
 Epoch 279/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3237 - accuracy: 0.5064 - val_loss: 0.8926 - val_accuracy: 0.4579
 Epoch 280/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2901 - accuracy: 0.4936 - val_loss: 0.8954 - val_accuracy: 0.4673
 Epoch 281/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3807 - accuracy: 0.5398 - val_loss: 0.8927 - val_accuracy: 0.4486
 Epoch 282/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3819 - accuracy: 0.5398 - val_loss: 0.8859 - val_accuracy: 0.5701
 Epoch 283/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3464 - accuracy: 0.6272 - val_loss: 0.8849 - val_accuracy: 0.5701
 Epoch 284/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2937 - accuracy: 0.7018 - val_loss: 0.8925 - val_accuracy: 0.4626
 Epoch 285/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3247 - accuracy: 0.5656 - val_loss: 0.8916 - val_accuracy: 0.5047
 Epoch 286/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2667 - accuracy: 0.5681 - val_loss: 0.8903 - val_accuracy: 0.5794
 Epoch 287/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3452 - accuracy: 0.7069 - val_loss: 0.8927 - val_accuracy: 0.5935
 Epoch 288/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3657 - accuracy: 0.6967 - val_loss: 0.8919 - val_accuracy: 0.5514
 Epoch 289/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3225 - accuracy: 0.6093 - val_loss: 0.8884 - val_accuracy: 0.5514
 Epoch 290/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3114 - accuracy: 0.6350 - val_loss: 0.8911 - val_accuracy: 0.5841
 Epoch 291/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.2870 - accuracy: 0.6812 - val_loss: 0.8879 - val_accuracy: 0.5374
 Epoch 292/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.3606 - accuracy: 0.6452 - val_loss: 0.8857 - val_accuracy: 0.6495
 Epoch 293/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3311 - accuracy: 0.7301 - val_loss: 0.8973 - val_accuracy: 0.7617
 Epoch 294/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4096 - accuracy: 0.8046 - val_loss: 0.8893 - val_accuracy: 0.7383
 Epoch 295/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3514 - accuracy: 0.7969 - val_loss: 0.9173 - val_accuracy: 0.7336
 Epoch 296/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3124 - accuracy: 0.8123 - val_loss: 0.8809 - val_accuracy: 0.7150
 Epoch 297/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3645 - accuracy: 0.7763 - val_loss: 0.9110 - val_accuracy: 0.6916
 Epoch 298/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2768 - accuracy: 0.7506 - val_loss: 0.9145 - val_accuracy: 0.7150
 Epoch 299/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3185 - accuracy: 0.7635 - val_loss: 0.9338 - val_accuracy: 0.6869
 Epoch 300/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2866 - accuracy: 0.7378 - val_loss: 0.9678 - val_accuracy: 0.5561
 Epoch 301/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3653 - accuracy: 0.6093 - val_loss: 0.9851 - val_accuracy: 0.5607
 Epoch 302/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3154 - accuracy: 0.6093 - val_loss: 0.9885 - val_accuracy: 0.5794
 Epoch 303/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.2928 - accuracy: 0.6484Restoring model weights from the end of the best epoch: 153.
 4/4 [=====] - 0s 14ms/step - loss: 0.3013 - accuracy: 0.6401 - val_loss: 0.9477 - val_accuracy: 0.5561
 Epoch 303: early stopping
 2/2 [=====] - 0s 4ms/step - loss: 0.3277 - accuracy: 0.8140
 [CV] ENDDense1=100, Dense2=10; total time= 15.9s
 Model: "sequential_73"

Layer (type)	Output Shape	Param #
--------------	--------------	---------

```
=====
dense_292 (Dense)          (None, 100)           700
batch_normalization_219 (Ba (None, 100)
tchNormalization)          400
activation_219 (Activation) (None, 100)           0
dense_293 (Dense)          (None, 10)            1010
batch_normalization_220 (Ba (None, 10)
tchNormalization)          40
activation_220 (Activation) (None, 10)           0
dense_294 (Dense)          (None, 10)            110
batch_normalization_221 (Ba (None, 10)
tchNormalization)          40
activation_221 (Activation) (None, 10)           0
dense_295 (Dense)          (None, 2)             22
=====

Total params: 2,322
Trainable params: 2,082
Non-trainable params: 240

Epoch 1/1000
4/4 [=====] - 1s 55ms/step - loss: 6.8103 - accuracy: 0.5219 - val_loss: 4.5061 - val_accuracy: 0.5421
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 5.3952 - accuracy: 0.5707 - val_loss: 4.0817 - val_accuracy: 0.5421
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 4.8536 - accuracy: 0.5887 - val_loss: 2.7816 - val_accuracy: 0.5467
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 4.6791 - accuracy: 0.6195 - val_loss: 2.3746 - val_accuracy: 0.5421
Epoch 5/1000
4/4 [=====] - 0s 12ms/step - loss: 4.6834 - accuracy: 0.6067 - val_loss: 2.2308 - val_accuracy: 0.5467
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 4.4722 - accuracy: 0.6247 - val_loss: 2.1595 - val_accuracy: 0.5421
Epoch 7/1000
4/4 [=====] - 0s 12ms/step - loss: 4.2806 - accuracy: 0.6401 - val_loss: 2.1785 - val_accuracy: 0.5374
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 4.2627 - accuracy: 0.6375 - val_loss: 2.1829 - val_accuracy: 0.5701
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 4.0049 - accuracy: 0.6478 - val_loss: 2.1394 - val_accuracy: 0.6308
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 4.1171 - accuracy: 0.6350 - val_loss: 2.0759 - val_accuracy: 0.6449
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9382 - accuracy: 0.6632 - val_loss: 2.0489 - val_accuracy: 0.6542
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8109 - accuracy: 0.6093 - val_loss: 2.0148 - val_accuracy: 0.5140
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6174 - accuracy: 0.5887 - val_loss: 1.9435 - val_accuracy: 0.5000
Epoch 14/1000
4/4 [=====] - 0s 12ms/step - loss: 3.6346 - accuracy: 0.5938 - val_loss: 1.8766 - val_accuracy: 0.5000
Epoch 15/1000
4/4 [=====] - 0s 11ms/step - loss: 3.6171 - accuracy: 0.6118 - val_loss: 1.8338 - val_accuracy: 0.5093
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5414 - accuracy: 0.5938 - val_loss: 1.7595 - val_accuracy: 0.5047
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5827 - accuracy: 0.5810 - val_loss: 1.7261 - val_accuracy: 0.5000
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 3.4379 - accuracy: 0.5964 - val_loss: 1.6874 - val_accuracy: 0.5047
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3413 - accuracy: 0.5861 - val_loss: 1.6608 - val_accuracy: 0.5000
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3540 - accuracy: 0.5964 - val_loss: 1.6272 - val_accuracy: 0.4953
```

Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3510 - accuracy: 0.6041 - val_loss: 1.6705 - val_accuracy: 0.4860
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0741 - accuracy: 0.5887 - val_loss: 1.6514 - val_accuracy: 0.4766
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9511 - accuracy: 0.5810 - val_loss: 1.6435 - val_accuracy: 0.4813
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6505 - accuracy: 0.5990 - val_loss: 1.6399 - val_accuracy: 0.4860
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8343 - accuracy: 0.5990 - val_loss: 1.6313 - val_accuracy: 0.4907
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7460 - accuracy: 0.5964 - val_loss: 1.6221 - val_accuracy: 0.4907
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4306 - accuracy: 0.5938 - val_loss: 1.6048 - val_accuracy: 0.4907
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2970 - accuracy: 0.5938 - val_loss: 1.5949 - val_accuracy: 0.4907
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2363 - accuracy: 0.5938 - val_loss: 1.5862 - val_accuracy: 0.4907
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1817 - accuracy: 0.6195 - val_loss: 1.5765 - val_accuracy: 0.4907
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1613 - accuracy: 0.5990 - val_loss: 1.5622 - val_accuracy: 0.4907
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1037 - accuracy: 0.6041 - val_loss: 1.5531 - val_accuracy: 0.4813
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9603 - accuracy: 0.5810 - val_loss: 1.5307 - val_accuracy: 0.4766
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1316 - accuracy: 0.5990 - val_loss: 1.5176 - val_accuracy: 0.4766
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9582 - accuracy: 0.6015 - val_loss: 1.4978 - val_accuracy: 0.4953
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9157 - accuracy: 0.5810 - val_loss: 1.4854 - val_accuracy: 0.5047
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9375 - accuracy: 0.6015 - val_loss: 1.4760 - val_accuracy: 0.5000
Epoch 38/1000
4/4 [=====] - 0s 16ms/step - loss: 1.7575 - accuracy: 0.6195 - val_loss: 1.4583 - val_accuracy: 0.5140
Epoch 39/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9107 - accuracy: 0.6170 - val_loss: 1.4412 - val_accuracy: 0.5093
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8059 - accuracy: 0.6093 - val_loss: 1.4218 - val_accuracy: 0.5234
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6572 - accuracy: 0.5990 - val_loss: 1.4026 - val_accuracy: 0.5234
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5555 - accuracy: 0.6427 - val_loss: 1.3692 - val_accuracy: 0.5327
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5999 - accuracy: 0.6324 - val_loss: 1.3622 - val_accuracy: 0.5374
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6040 - accuracy: 0.6195 - val_loss: 1.3530 - val_accuracy: 0.5421
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6289 - accuracy: 0.6221 - val_loss: 1.3399 - val_accuracy: 0.5467
Epoch 46/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7136 - accuracy: 0.6350 - val_loss: 1.3325 - val_accuracy: 0.5421
Epoch 47/1000
4/4 [=====] - 0s 15ms/step - loss: 1.5219 - accuracy: 0.6427 - val_loss: 1.3237 - val_accuracy: 0.6916
Epoch 48/1000
4/4 [=====] - 0s 15ms/step - loss: 1.4669 - accuracy: 0.6710 - val_loss: 1.3152 - val_accuracy: 0.6916
Epoch 49/1000
4/4 [=====] - 0s 15ms/step - loss: 1.6011 - accuracy: 0.6632 - val_loss: 1.3078 - val_accuracy: 0.6916
Epoch 50/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3773 - accuracy: 0.6787 - val_loss: 1.2947 - val_accuracy: 0.6916

```
accuracy: 0.6916
Epoch 51/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5074 - accuracy: 0.6555 - val_loss: 1.2796 - val_accuracy: 0.6916
Epoch 52/1000
4/4 [=====] - 0s 15ms/step - loss: 1.4191 - accuracy: 0.6787 - val_loss: 1.2715 - val_accuracy: 0.6916
Epoch 53/1000
4/4 [=====] - 0s 15ms/step - loss: 1.3895 - accuracy: 0.6889 - val_loss: 1.2543 - val_accuracy: 0.6869
Epoch 54/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2989 - accuracy: 0.6761 - val_loss: 1.2403 - val_accuracy: 0.6822
Epoch 55/1000
4/4 [=====] - 0s 16ms/step - loss: 1.2051 - accuracy: 0.6658 - val_loss: 1.2241 - val_accuracy: 0.6822
Epoch 56/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1410 - accuracy: 0.6607 - val_loss: 1.2061 - val_accuracy: 0.6822
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1559 - accuracy: 0.6427 - val_loss: 1.1910 - val_accuracy: 0.6776
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0097 - accuracy: 0.6735 - val_loss: 1.1140 - val_accuracy: 0.6729
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0581 - accuracy: 0.6555 - val_loss: 1.0982 - val_accuracy: 0.6869
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9699 - accuracy: 0.6864 - val_loss: 1.0772 - val_accuracy: 0.6916
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9094 - accuracy: 0.6710 - val_loss: 1.0825 - val_accuracy: 0.6636
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9369 - accuracy: 0.6838 - val_loss: 1.0763 - val_accuracy: 0.6682
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8778 - accuracy: 0.6761 - val_loss: 1.0510 - val_accuracy: 0.6776
Epoch 64/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9651 - accuracy: 0.6658 - val_loss: 0.9677 - val_accuracy: 0.6729
Epoch 65/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8895 - accuracy: 0.6761 - val_loss: 0.9865 - val_accuracy: 0.6682
Epoch 66/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8964 - accuracy: 0.6864 - val_loss: 1.0118 - val_accuracy: 0.6682
Epoch 67/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9023 - accuracy: 0.6838 - val_loss: 0.9394 - val_accuracy: 0.6682
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7937 - accuracy: 0.6838 - val_loss: 0.9174 - val_accuracy: 0.6729
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9452 - accuracy: 0.6761 - val_loss: 0.8952 - val_accuracy: 0.6636
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7280 - accuracy: 0.6761 - val_loss: 0.8955 - val_accuracy: 0.6682
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8587 - accuracy: 0.6710 - val_loss: 0.8896 - val_accuracy: 0.6822
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7838 - accuracy: 0.6992 - val_loss: 0.8858 - val_accuracy: 0.6822
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7351 - accuracy: 0.6967 - val_loss: 0.9087 - val_accuracy: 0.6822
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7767 - accuracy: 0.6992 - val_loss: 0.8267 - val_accuracy: 0.6869
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7243 - accuracy: 0.6889 - val_loss: 0.8154 - val_accuracy: 0.6776
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7549 - accuracy: 0.7018 - val_loss: 0.8314 - val_accuracy: 0.6869
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8002 - accuracy: 0.6992 - val_loss: 0.8300 - val_accuracy: 0.6822
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6931 - accuracy: 0.6864 - val_loss: 0.8135 - val_accuracy: 0.6916
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6864 - accuracy: 0.6710 - val_loss: 0.8344 - val_accuracy: 0.6869
Epoch 80/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.6875 - accuracy: 0.6838 - val_loss: 0.8247 - val_accuracy: 0.6916
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6834 - accuracy: 0.6735 - val_loss: 0.8043 - val_accuracy: 0.6963
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6921 - accuracy: 0.7044 - val_loss: 0.8059 - val_accuracy: 0.6916
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6803 - accuracy: 0.7069 - val_loss: 0.7760 - val_accuracy: 0.6822
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7041 - accuracy: 0.7044 - val_loss: 0.7876 - val_accuracy: 0.6776
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7537 - accuracy: 0.6838 - val_loss: 0.7686 - val_accuracy: 0.7196
Epoch 86/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6860 - accuracy: 0.7455 - val_loss: 0.7540 - val_accuracy: 0.7243
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6415 - accuracy: 0.7635 - val_loss: 0.7524 - val_accuracy: 0.7243
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6123 - accuracy: 0.7301 - val_loss: 0.7337 - val_accuracy: 0.6636
Epoch 89/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8105 - accuracy: 0.6967 - val_loss: 0.7279 - val_accuracy: 0.6636
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6419 - accuracy: 0.7172 - val_loss: 0.7615 - val_accuracy: 0.6682
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7110 - accuracy: 0.7172 - val_loss: 0.7618 - val_accuracy: 0.6729
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6232 - accuracy: 0.7198 - val_loss: 0.7486 - val_accuracy: 0.6729
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5601 - accuracy: 0.7044 - val_loss: 0.7684 - val_accuracy: 0.6916
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6298 - accuracy: 0.7121 - val_loss: 0.7809 - val_accuracy: 0.6963
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6389 - accuracy: 0.7301 - val_loss: 0.7755 - val_accuracy: 0.6963
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6470 - accuracy: 0.7069 - val_loss: 0.7729 - val_accuracy: 0.6963
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6449 - accuracy: 0.7172 - val_loss: 0.7714 - val_accuracy: 0.6963
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7035 - accuracy: 0.7121 - val_loss: 0.7879 - val_accuracy: 0.6963
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5527 - accuracy: 0.7404 - val_loss: 0.8219 - val_accuracy: 0.7056
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6238 - accuracy: 0.7352 - val_loss: 0.7396 - val_accuracy: 0.6869
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6362 - accuracy: 0.7121 - val_loss: 0.7269 - val_accuracy: 0.7009
Epoch 102/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6039 - accuracy: 0.7147 - val_loss: 0.7227 - val_accuracy: 0.6869
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5216 - accuracy: 0.6992 - val_loss: 0.7253 - val_accuracy: 0.6542
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5910 - accuracy: 0.7121 - val_loss: 0.7266 - val_accuracy: 0.6636
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6875 - accuracy: 0.6787 - val_loss: 0.7611 - val_accuracy: 0.6542
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5473 - accuracy: 0.6992 - val_loss: 0.7763 - val_accuracy: 0.6682
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6476 - accuracy: 0.6967 - val_loss: 0.7935 - val_accuracy: 0.6729
Epoch 108/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6275 - accuracy: 0.7147 - val_loss: 0.7694 - val_accuracy: 0.6822
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6148 - accuracy: 0.6992 - val_loss: 0.7816 - val_accuracy: 0.6776
```

Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6380 - accuracy: 0.7069 - val_loss: 0.7831 - val_accuracy: 0.6776
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5836 - accuracy: 0.7249 - val_loss: 0.8118 - val_accuracy: 0.6776
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6480 - accuracy: 0.6915 - val_loss: 0.7259 - val_accuracy: 0.6869
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5055 - accuracy: 0.7147 - val_loss: 0.7213 - val_accuracy: 0.6963
Epoch 114/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6064 - accuracy: 0.7198 - val_loss: 0.6913 - val_accuracy: 0.6916
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5972 - accuracy: 0.6992 - val_loss: 0.6837 - val_accuracy: 0.6916
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5993 - accuracy: 0.7095 - val_loss: 0.6934 - val_accuracy: 0.6822
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5362 - accuracy: 0.7095 - val_loss: 0.7133 - val_accuracy: 0.6729
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6195 - accuracy: 0.6889 - val_loss: 0.7060 - val_accuracy: 0.6729
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5235 - accuracy: 0.7147 - val_loss: 0.6814 - val_accuracy: 0.6776
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6205 - accuracy: 0.7147 - val_loss: 0.6963 - val_accuracy: 0.6729
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5553 - accuracy: 0.6889 - val_loss: 0.7565 - val_accuracy: 0.6682
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5162 - accuracy: 0.7044 - val_loss: 0.7622 - val_accuracy: 0.6776
Epoch 123/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5020 - accuracy: 0.6992 - val_loss: 0.7407 - val_accuracy: 0.6729
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6326 - accuracy: 0.7018 - val_loss: 0.6971 - val_accuracy: 0.6682
Epoch 125/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5447 - accuracy: 0.7095 - val_loss: 0.7392 - val_accuracy: 0.6729
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5026 - accuracy: 0.7095 - val_loss: 0.7642 - val_accuracy: 0.6822
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4995 - accuracy: 0.7095 - val_loss: 0.7553 - val_accuracy: 0.6636
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5341 - accuracy: 0.7069 - val_loss: 0.7436 - val_accuracy: 0.6776
Epoch 129/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5491 - accuracy: 0.7121 - val_loss: 0.7398 - val_accuracy: 0.6822
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4642 - accuracy: 0.7326 - val_loss: 0.7376 - val_accuracy: 0.6776
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4496 - accuracy: 0.7249 - val_loss: 0.7816 - val_accuracy: 0.6916
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5215 - accuracy: 0.6941 - val_loss: 0.6822 - val_accuracy: 0.6682
Epoch 133/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5090 - accuracy: 0.7147 - val_loss: 0.6772 - val_accuracy: 0.6729
Epoch 134/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5200 - accuracy: 0.6915 - val_loss: 0.6728 - val_accuracy: 0.6776
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5035 - accuracy: 0.7069 - val_loss: 0.6959 - val_accuracy: 0.6682
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4848 - accuracy: 0.7249 - val_loss: 0.7183 - val_accuracy: 0.6729
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4944 - accuracy: 0.6992 - val_loss: 0.7677 - val_accuracy: 0.6636
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4736 - accuracy: 0.7224 - val_loss: 0.7646 - val_accuracy: 0.6729
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5016 - accuracy: 0.7121 - val_loss: 0.6950 - val_accuracy: 0.6950

```
accuracy: 0.6729
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5844 - accuracy: 0.7121 - val_loss: 0.6937 - val_
accuracy: 0.6636
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5111 - accuracy: 0.7095 - val_loss: 0.6944 - val_
accuracy: 0.6682
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4738 - accuracy: 0.7301 - val_loss: 0.6418 - val_
accuracy: 0.6589
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5695 - accuracy: 0.7147 - val_loss: 0.6948 - val_
accuracy: 0.6589
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4691 - accuracy: 0.7044 - val_loss: 0.6470 - val_
accuracy: 0.6542
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4271 - accuracy: 0.7172 - val_loss: 0.6831 - val_
accuracy: 0.6776
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5000 - accuracy: 0.7378 - val_loss: 0.7338 - val_
accuracy: 0.6682
Epoch 147/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4698 - accuracy: 0.7121 - val_loss: 0.7608 - val_
accuracy: 0.6682
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4090 - accuracy: 0.7301 - val_loss: 0.7533 - val_
accuracy: 0.6776
Epoch 149/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4423 - accuracy: 0.7301 - val_loss: 0.7599 - val_
accuracy: 0.6729
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4345 - accuracy: 0.7275 - val_loss: 0.8717 - val_
accuracy: 0.6542
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5265 - accuracy: 0.7224 - val_loss: 0.8375 - val_
accuracy: 0.6542
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5060 - accuracy: 0.7224 - val_loss: 0.8298 - val_
accuracy: 0.6542
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4685 - accuracy: 0.7506 - val_loss: 0.8549 - val_
accuracy: 0.6589
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4497 - accuracy: 0.7352 - val_loss: 0.9137 - val_
accuracy: 0.6542
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4838 - accuracy: 0.7481 - val_loss: 0.8927 - val_
accuracy: 0.6636
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4277 - accuracy: 0.7404 - val_loss: 0.8597 - val_
accuracy: 0.6682
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5079 - accuracy: 0.7275 - val_loss: 0.8148 - val_
accuracy: 0.6636
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4038 - accuracy: 0.7018 - val_loss: 0.8198 - val_
accuracy: 0.6636
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4651 - accuracy: 0.7044 - val_loss: 0.9029 - val_
accuracy: 0.6589
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5284 - accuracy: 0.6838 - val_loss: 0.8588 - val_
accuracy: 0.6589
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5107 - accuracy: 0.6967 - val_loss: 0.8795 - val_
accuracy: 0.6636
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4331 - accuracy: 0.7018 - val_loss: 0.9040 - val_
accuracy: 0.6729
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4916 - accuracy: 0.6735 - val_loss: 0.9002 - val_
accuracy: 0.6542
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4909 - accuracy: 0.6889 - val_loss: 0.9021 - val_
accuracy: 0.6495
Epoch 165/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4353 - accuracy: 0.7018 - val_loss: 0.9014 - val_
accuracy: 0.6495
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4249 - accuracy: 0.6992 - val_loss: 0.9074 - val_
accuracy: 0.6636
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4172 - accuracy: 0.6864 - val_loss: 0.8889 - val_
accuracy: 0.6776
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4618 - accuracy: 0.6838 - val_loss: 0.9351 - val_
accuracy: 0.6776
Epoch 169/1000
```

4/4 [=====] - 0s 12ms/step - loss: 0.4029 - accuracy: 0.6941 - val_loss: 0.9308 - val_accuracy: 0.6682
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4454 - accuracy: 0.7095 - val_loss: 0.8860 - val_accuracy: 0.6729
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4681 - accuracy: 0.6967 - val_loss: 0.9111 - val_accuracy: 0.6636
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4688 - accuracy: 0.6838 - val_loss: 0.9082 - val_accuracy: 0.6729
Epoch 173/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5430 - accuracy: 0.7147 - val_loss: 0.9114 - val_accuracy: 0.6729
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4075 - accuracy: 0.7069 - val_loss: 0.9303 - val_accuracy: 0.6589
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5346 - accuracy: 0.7044 - val_loss: 0.9336 - val_accuracy: 0.6636
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4627 - accuracy: 0.7249 - val_loss: 0.8484 - val_accuracy: 0.6682
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4451 - accuracy: 0.7275 - val_loss: 0.8409 - val_accuracy: 0.6589
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4370 - accuracy: 0.7686 - val_loss: 0.8906 - val_accuracy: 0.6589
Epoch 179/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5134 - accuracy: 0.7609 - val_loss: 0.9211 - val_accuracy: 0.7290
Epoch 180/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4693 - accuracy: 0.7609 - val_loss: 0.8785 - val_accuracy: 0.7336
Epoch 181/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4879 - accuracy: 0.7532 - val_loss: 0.8705 - val_accuracy: 0.7383
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4269 - accuracy: 0.7506 - val_loss: 0.8662 - val_accuracy: 0.7430
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4301 - accuracy: 0.7661 - val_loss: 0.8665 - val_accuracy: 0.7336
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3670 - accuracy: 0.7584 - val_loss: 0.8629 - val_accuracy: 0.7243
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4231 - accuracy: 0.7558 - val_loss: 0.8562 - val_accuracy: 0.7383
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5084 - accuracy: 0.7455 - val_loss: 0.8609 - val_accuracy: 0.7336
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4044 - accuracy: 0.7738 - val_loss: 0.8625 - val_accuracy: 0.7383
Epoch 188/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4574 - accuracy: 0.7686 - val_loss: 0.9192 - val_accuracy: 0.7103
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5047 - accuracy: 0.7661 - val_loss: 0.9514 - val_accuracy: 0.7243
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4054 - accuracy: 0.7892 - val_loss: 0.9120 - val_accuracy: 0.7290
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4359 - accuracy: 0.7763 - val_loss: 0.9116 - val_accuracy: 0.7290
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4647 - accuracy: 0.7815 - val_loss: 0.9597 - val_accuracy: 0.7196
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4290 - accuracy: 0.7686 - val_loss: 0.9606 - val_accuracy: 0.7103
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4884 - accuracy: 0.7789 - val_loss: 0.9589 - val_accuracy: 0.7150
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4748 - accuracy: 0.7609 - val_loss: 0.9239 - val_accuracy: 0.7150
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4319 - accuracy: 0.7943 - val_loss: 0.9261 - val_accuracy: 0.7103
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4417 - accuracy: 0.7841 - val_loss: 0.9230 - val_accuracy: 0.7150
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4584 - accuracy: 0.7918 - val_loss: 0.9093 - val_accuracy: 0.7103

Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4233 - accuracy: 0.7789 - val_loss: 0.9149 - val_accuracy: 0.7150
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3976 - accuracy: 0.7892 - val_loss: 0.9213 - val_accuracy: 0.7103
Epoch 201/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3755 - accuracy: 0.7969 - val_loss: 0.9313 - val_accuracy: 0.7196
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3835 - accuracy: 0.8021 - val_loss: 0.8813 - val_accuracy: 0.7290
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4068 - accuracy: 0.7918 - val_loss: 0.8975 - val_accuracy: 0.7196
Epoch 204/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4137 - accuracy: 0.7789 - val_loss: 0.8434 - val_accuracy: 0.7103
Epoch 205/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4672 - accuracy: 0.7738 - val_loss: 0.8349 - val_accuracy: 0.7196
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4608 - accuracy: 0.7635 - val_loss: 0.9072 - val_accuracy: 0.7056
Epoch 207/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4970 - accuracy: 0.7532 - val_loss: 0.8300 - val_accuracy: 0.7150
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4396 - accuracy: 0.7635 - val_loss: 0.8334 - val_accuracy: 0.7103
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4123 - accuracy: 0.7943 - val_loss: 0.7848 - val_accuracy: 0.7196
Epoch 210/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3986 - accuracy: 0.7841 - val_loss: 0.8223 - val_accuracy: 0.7150
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4943 - accuracy: 0.7738 - val_loss: 0.9326 - val_accuracy: 0.6495
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3852 - accuracy: 0.7352 - val_loss: 0.8790 - val_accuracy: 0.6495
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4159 - accuracy: 0.7352 - val_loss: 0.8832 - val_accuracy: 0.6636
Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4430 - accuracy: 0.7121 - val_loss: 0.8783 - val_accuracy: 0.6449
Epoch 215/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4821 - accuracy: 0.7198 - val_loss: 0.9294 - val_accuracy: 0.6542
Epoch 216/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6240 - accuracy: 0.7147 - val_loss: 0.9305 - val_accuracy: 0.6682
Epoch 217/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5069 - accuracy: 0.7172 - val_loss: 0.9307 - val_accuracy: 0.6682
Epoch 218/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4208 - accuracy: 0.7301 - val_loss: 0.8781 - val_accuracy: 0.6355
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4728 - accuracy: 0.7172 - val_loss: 0.8767 - val_accuracy: 0.6449
Epoch 220/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4773 - accuracy: 0.7121 - val_loss: 0.7981 - val_accuracy: 0.6542
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4861 - accuracy: 0.7275 - val_loss: 0.9037 - val_accuracy: 0.6355
Epoch 222/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5214 - accuracy: 0.7121 - val_loss: 0.8772 - val_accuracy: 0.6355
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5408 - accuracy: 0.7121 - val_loss: 0.8483 - val_accuracy: 0.6308
Epoch 224/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4583 - accuracy: 0.7095 - val_loss: 0.8445 - val_accuracy: 0.6308
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4794 - accuracy: 0.6941 - val_loss: 0.7788 - val_accuracy: 0.6308
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3745 - accuracy: 0.7172 - val_loss: 0.8171 - val_accuracy: 0.6402
Epoch 227/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3934 - accuracy: 0.7172 - val_loss: 0.8126 - val_accuracy: 0.6308
Epoch 228/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4077 - accuracy: 0.7224 - val_loss: 0.8088 - val_accuracy: 0.6308

```
accuracy: 0.6542
Epoch 229/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3696 - accuracy: 0.7044 - val_loss: 0.7588 - val_accuracy: 0.6449
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4081 - accuracy: 0.7429 - val_loss: 0.6651 - val_accuracy: 0.6589
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3991 - accuracy: 0.7301 - val_loss: 0.6680 - val_accuracy: 0.6495
Epoch 232/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4298 - accuracy: 0.7378 - val_loss: 0.7022 - val_accuracy: 0.6589
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4209 - accuracy: 0.7455 - val_loss: 0.7899 - val_accuracy: 0.6355
Epoch 234/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4087 - accuracy: 0.7275 - val_loss: 0.7868 - val_accuracy: 0.6449
Epoch 235/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3970 - accuracy: 0.7301 - val_loss: 0.7869 - val_accuracy: 0.6449
Epoch 236/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3941 - accuracy: 0.7224 - val_loss: 0.7800 - val_accuracy: 0.6449
Epoch 237/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4306 - accuracy: 0.7455 - val_loss: 0.7815 - val_accuracy: 0.6682
Epoch 238/1000
4/4 [=====] - 0s 18ms/step - loss: 0.4130 - accuracy: 0.7301 - val_loss: 0.7307 - val_accuracy: 0.6636
Epoch 239/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3684 - accuracy: 0.7429 - val_loss: 0.7371 - val_accuracy: 0.6822
Epoch 240/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3909 - accuracy: 0.7506 - val_loss: 0.7079 - val_accuracy: 0.6729
Epoch 241/1000
4/4 [=====] - 0s 23ms/step - loss: 0.5079 - accuracy: 0.7249 - val_loss: 0.7569 - val_accuracy: 0.6822
Epoch 242/1000
4/4 [=====] - 0s 17ms/step - loss: 0.3892 - accuracy: 0.7532 - val_loss: 0.7061 - val_accuracy: 0.6822
Epoch 243/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4305 - accuracy: 0.7224 - val_loss: 0.7507 - val_accuracy: 0.6729
Epoch 244/1000
4/4 [=====] - 0s 18ms/step - loss: 0.3714 - accuracy: 0.7326 - val_loss: 0.7358 - val_accuracy: 0.6916
Epoch 245/1000
4/4 [=====] - 0s 18ms/step - loss: 0.3444 - accuracy: 0.7301 - val_loss: 0.8124 - val_accuracy: 0.6822
Epoch 246/1000
4/4 [=====] - 0s 18ms/step - loss: 0.3531 - accuracy: 0.7532 - val_loss: 0.7891 - val_accuracy: 0.6822
Epoch 247/1000
4/4 [=====] - 0s 17ms/step - loss: 0.3293 - accuracy: 0.7532 - val_loss: 0.8094 - val_accuracy: 0.6822
Epoch 248/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4565 - accuracy: 0.7429 - val_loss: 0.7568 - val_accuracy: 0.6916
Epoch 249/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4122 - accuracy: 0.7455 - val_loss: 0.7576 - val_accuracy: 0.6916
Epoch 250/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3615 - accuracy: 0.7095 - val_loss: 0.6776 - val_accuracy: 0.6776
Epoch 251/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3388 - accuracy: 0.7301 - val_loss: 0.6733 - val_accuracy: 0.6729
Epoch 252/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4265 - accuracy: 0.6787 - val_loss: 0.6697 - val_accuracy: 0.6776
Epoch 253/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3426 - accuracy: 0.7224 - val_loss: 0.7030 - val_accuracy: 0.6729
Epoch 254/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4347 - accuracy: 0.7404 - val_loss: 0.7498 - val_accuracy: 0.6589
Epoch 255/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5012 - accuracy: 0.7378 - val_loss: 0.7975 - val_accuracy: 0.7150
Epoch 256/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4787 - accuracy: 0.7789 - val_loss: 0.7895 - val_accuracy: 0.7196
Epoch 257/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3837 - accuracy: 0.7635 - val_loss: 0.7735 - val_accuracy: 0.7196
Epoch 258/1000
```

```
4/4 [=====] - 0s 15ms/step - loss: 0.4585 - accuracy: 0.7738 - val_loss: 0.7755 - val_accuracy: 0.7056
Epoch 259/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4085 - accuracy: 0.7661 - val_loss: 0.7967 - val_accuracy: 0.7103
Epoch 260/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4188 - accuracy: 0.7326 - val_loss: 0.7931 - val_accuracy: 0.6636
Epoch 261/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5069 - accuracy: 0.7147 - val_loss: 0.7816 - val_accuracy: 0.6636
Epoch 262/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4527 - accuracy: 0.7198 - val_loss: 0.8029 - val_accuracy: 0.6682
Epoch 263/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4873 - accuracy: 0.7224 - val_loss: 0.8061 - val_accuracy: 0.6729
Epoch 264/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4706 - accuracy: 0.7095 - val_loss: 0.8016 - val_accuracy: 0.6589
Epoch 265/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3905 - accuracy: 0.7121 - val_loss: 0.8186 - val_accuracy: 0.6776
Epoch 266/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3719 - accuracy: 0.7147 - val_loss: 0.7905 - val_accuracy: 0.6776
Epoch 267/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4473 - accuracy: 0.7224 - val_loss: 0.8170 - val_accuracy: 0.6776
Epoch 268/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3545 - accuracy: 0.7018 - val_loss: 0.8258 - val_accuracy: 0.6869
Epoch 269/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3557 - accuracy: 0.7301 - val_loss: 0.8691 - val_accuracy: 0.6916
Epoch 270/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3937 - accuracy: 0.7147 - val_loss: 0.8664 - val_accuracy: 0.6916
Epoch 271/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3994 - accuracy: 0.7198 - val_loss: 0.8365 - val_accuracy: 0.6963
Epoch 272/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3932 - accuracy: 0.7044 - val_loss: 0.8334 - val_accuracy: 0.7009
Epoch 273/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3360 - accuracy: 0.7172 - val_loss: 0.8247 - val_accuracy: 0.6963
Epoch 274/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4858 - accuracy: 0.7172 - val_loss: 0.7934 - val_accuracy: 0.6963
Epoch 275/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4635 - accuracy: 0.7404 - val_loss: 0.7880 - val_accuracy: 0.7009
Epoch 276/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3808 - accuracy: 0.7224 - val_loss: 0.7843 - val_accuracy: 0.6963
Epoch 277/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3713 - accuracy: 0.7069 - val_loss: 0.7570 - val_accuracy: 0.6916
Epoch 278/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3608 - accuracy: 0.7455 - val_loss: 0.8186 - val_accuracy: 0.6869
Epoch 279/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3804 - accuracy: 0.7378 - val_loss: 0.8146 - val_accuracy: 0.6916
Epoch 280/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3806 - accuracy: 0.7224 - val_loss: 0.8096 - val_accuracy: 0.7009
Epoch 281/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4728 - accuracy: 0.7352 - val_loss: 0.8137 - val_accuracy: 0.6963
Epoch 282/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4249 - accuracy: 0.7378 - val_loss: 0.7823 - val_accuracy: 0.7103
Epoch 283/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3993 - accuracy: 0.7404 - val_loss: 0.7504 - val_accuracy: 0.7103
Epoch 284/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4033 - accuracy: 0.7404 - val_loss: 0.6461 - val_accuracy: 0.7103
Epoch 285/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3563 - accuracy: 0.7378 - val_loss: 0.7051 - val_accuracy: 0.6963
Epoch 286/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3694 - accuracy: 0.7352 - val_loss: 0.7578 - val_accuracy: 0.7056
Epoch 287/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3171 - accuracy: 0.7429 - val_loss: 0.7565 - val_accuracy: 0.7056
```

Epoch 288/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3599 - accuracy: 0.7584 - val_loss: 0.7621 - val_accuracy: 0.7009
Epoch 289/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3486 - accuracy: 0.7506 - val_loss: 0.8117 - val_accuracy: 0.6776
Epoch 290/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3277 - accuracy: 0.7558 - val_loss: 0.7899 - val_accuracy: 0.6963
Epoch 291/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3417 - accuracy: 0.7609 - val_loss: 0.8499 - val_accuracy: 0.7056
Epoch 292/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3322 - accuracy: 0.7404 - val_loss: 0.7901 - val_accuracy: 0.7009
Epoch 293/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3269 - accuracy: 0.7249 - val_loss: 0.8385 - val_accuracy: 0.7103
Epoch 294/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3618 - accuracy: 0.7147 - val_loss: 0.8052 - val_accuracy: 0.7103
Epoch 295/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3433 - accuracy: 0.7224 - val_loss: 0.8308 - val_accuracy: 0.7196
Epoch 296/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4476 - accuracy: 0.7172 - val_loss: 0.8705 - val_accuracy: 0.7009
Epoch 297/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4601 - accuracy: 0.7147 - val_loss: 0.8909 - val_accuracy: 0.6916
Epoch 298/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3777 - accuracy: 0.6787 - val_loss: 0.8363 - val_accuracy: 0.6776
Epoch 299/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4347 - accuracy: 0.6838 - val_loss: 1.0174 - val_accuracy: 0.6916
Epoch 300/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3895 - accuracy: 0.7249 - val_loss: 0.9758 - val_accuracy: 0.7056
Epoch 301/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3709 - accuracy: 0.6915 - val_loss: 0.9714 - val_accuracy: 0.7009
Epoch 302/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3576 - accuracy: 0.7224 - val_loss: 1.0273 - val_accuracy: 0.7150
Epoch 303/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3868 - accuracy: 0.7224 - val_loss: 0.9377 - val_accuracy: 0.7196
Epoch 304/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4485 - accuracy: 0.7095 - val_loss: 0.9001 - val_accuracy: 0.7290
Epoch 305/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4240 - accuracy: 0.7018 - val_loss: 0.8769 - val_accuracy: 0.6916
Epoch 306/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3483 - accuracy: 0.7352 - val_loss: 0.9318 - val_accuracy: 0.7009
Epoch 307/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4944 - accuracy: 0.7095 - val_loss: 0.9250 - val_accuracy: 0.6822
Epoch 308/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4197 - accuracy: 0.7275 - val_loss: 0.9339 - val_accuracy: 0.6682
Epoch 309/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3470 - accuracy: 0.7326 - val_loss: 0.8841 - val_accuracy: 0.6963
Epoch 310/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3286 - accuracy: 0.7224 - val_loss: 0.8881 - val_accuracy: 0.7009
Epoch 311/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3773 - accuracy: 0.7275 - val_loss: 0.8806 - val_accuracy: 0.7009
Epoch 312/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3850 - accuracy: 0.7558 - val_loss: 0.8541 - val_accuracy: 0.6963
Epoch 313/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3357 - accuracy: 0.7121 - val_loss: 0.8885 - val_accuracy: 0.7056
Epoch 314/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3892 - accuracy: 0.7301 - val_loss: 1.0481 - val_accuracy: 0.6963
Epoch 315/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3337 - accuracy: 0.7506 - val_loss: 0.9683 - val_accuracy: 0.6869
Epoch 316/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3114 - accuracy: 0.7532 - val_loss: 1.0028 - val_accuracy: 0.7056
Epoch 317/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3777 - accuracy: 0.7532 - val_loss: 0.9651 - val_accuracy: 0.7056

```
accuracy: 0.7150
Epoch 318/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3732 - accuracy: 0.7429 - val_loss: 0.8791 - val_accuracy: 0.7196
Epoch 319/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3844 - accuracy: 0.7352 - val_loss: 0.8728 - val_accuracy: 0.7196
Epoch 320/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3937 - accuracy: 0.7301 - val_loss: 0.8713 - val_accuracy: 0.7243
Epoch 321/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3740 - accuracy: 0.7558 - val_loss: 0.8676 - val_accuracy: 0.7196
Epoch 322/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3595 - accuracy: 0.7506 - val_loss: 0.8670 - val_accuracy: 0.7430
Epoch 323/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4381 - accuracy: 0.7481 - val_loss: 0.8845 - val_accuracy: 0.7196
Epoch 324/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3958 - accuracy: 0.7429 - val_loss: 0.8879 - val_accuracy: 0.7103
Epoch 325/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3335 - accuracy: 0.7455 - val_loss: 0.9343 - val_accuracy: 0.7336
Epoch 326/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4100 - accuracy: 0.7147 - val_loss: 0.9292 - val_accuracy: 0.7477
Epoch 327/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3633 - accuracy: 0.7198 - val_loss: 0.8554 - val_accuracy: 0.7430
Epoch 328/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3854 - accuracy: 0.7352 - val_loss: 0.8527 - val_accuracy: 0.7383
Epoch 329/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4542 - accuracy: 0.7147 - val_loss: 0.8500 - val_accuracy: 0.7430
Epoch 330/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3262 - accuracy: 0.7609 - val_loss: 0.9413 - val_accuracy: 0.7290
Epoch 331/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4253 - accuracy: 0.7481 - val_loss: 0.8881 - val_accuracy: 0.7710
Epoch 332/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3539 - accuracy: 0.7995 - val_loss: 0.8782 - val_accuracy: 0.7570
Epoch 333/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3873 - accuracy: 0.7892 - val_loss: 0.8428 - val_accuracy: 0.7477
Epoch 334/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3522 - accuracy: 0.8123 - val_loss: 0.8426 - val_accuracy: 0.7477
Epoch 335/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3067 - accuracy: 0.8046 - val_loss: 0.8369 - val_accuracy: 0.7570
Epoch 336/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3620 - accuracy: 0.8098 - val_loss: 0.8373 - val_accuracy: 0.7617
Epoch 337/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3466 - accuracy: 0.8021 - val_loss: 0.8412 - val_accuracy: 0.7617
Epoch 338/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3180 - accuracy: 0.8046 - val_loss: 0.8336 - val_accuracy: 0.7664
Epoch 339/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4481 - accuracy: 0.8072 - val_loss: 0.8473 - val_accuracy: 0.7477
Epoch 340/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4264 - accuracy: 0.8123 - val_loss: 0.8322 - val_accuracy: 0.7243
Epoch 341/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3718 - accuracy: 0.8021 - val_loss: 0.8462 - val_accuracy: 0.7056
Epoch 342/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3193 - accuracy: 0.8303 - val_loss: 0.8085 - val_accuracy: 0.7290
Epoch 343/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2894 - accuracy: 0.8201 - val_loss: 0.8186 - val_accuracy: 0.7336
Epoch 344/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3029 - accuracy: 0.8175 - val_loss: 0.6461 - val_accuracy: 0.6636
Epoch 345/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3261 - accuracy: 0.7789 - val_loss: 0.7574 - val_accuracy: 0.7523
Epoch 346/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4068 - accuracy: 0.8303 - val_loss: 0.7470 - val_accuracy: 0.7336
Epoch 347/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.3579 - accuracy: 0.8072 - val_loss: 0.7838 - val_accuracy: 0.7383
Epoch 348/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3791 - accuracy: 0.7969 - val_loss: 1.0926 - val_accuracy: 0.7056
Epoch 349/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4343 - accuracy: 0.7455 - val_loss: 1.1415 - val_accuracy: 0.6869
Epoch 350/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3107 - accuracy: 0.7378 - val_loss: 1.1843 - val_accuracy: 0.6963
Epoch 351/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3573 - accuracy: 0.7352 - val_loss: 0.9478 - val_accuracy: 0.6682
Epoch 352/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3117 - accuracy: 0.7378 - val_loss: 0.9949 - val_accuracy: 0.6682
Epoch 353/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3453 - accuracy: 0.7378 - val_loss: 1.1954 - val_accuracy: 0.7103
Epoch 354/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4682 - accuracy: 0.7841 - val_loss: 1.2922 - val_accuracy: 0.7009
Epoch 355/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4290 - accuracy: 0.7198 - val_loss: 1.2719 - val_accuracy: 0.7103
Epoch 356/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3231 - accuracy: 0.7224 - val_loss: 1.2131 - val_accuracy: 0.6916
Epoch 357/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3351 - accuracy: 0.7506 - val_loss: 1.0539 - val_accuracy: 0.6869
Epoch 358/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3369 - accuracy: 0.7429 - val_loss: 0.9463 - val_accuracy: 0.6869
Epoch 359/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3675 - accuracy: 0.7481 - val_loss: 0.8808 - val_accuracy: 0.6682
Epoch 360/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3247 - accuracy: 0.7275 - val_loss: 0.9673 - val_accuracy: 0.6776
Epoch 361/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4035 - accuracy: 0.7506 - val_loss: 1.0713 - val_accuracy: 0.7056
Epoch 362/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3725 - accuracy: 0.8021 - val_loss: 1.1385 - val_accuracy: 0.7056
Epoch 363/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3147 - accuracy: 0.7635 - val_loss: 1.1109 - val_accuracy: 0.6869
Epoch 364/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3272 - accuracy: 0.7661 - val_loss: 1.0810 - val_accuracy: 0.7150
Epoch 365/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3277 - accuracy: 0.7558 - val_loss: 1.1076 - val_accuracy: 0.6869
Epoch 366/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3384 - accuracy: 0.7841 - val_loss: 0.9062 - val_accuracy: 0.6449
Epoch 367/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3689 - accuracy: 0.7481 - val_loss: 0.8355 - val_accuracy: 0.6589
Epoch 368/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3329 - accuracy: 0.7404 - val_loss: 1.1227 - val_accuracy: 0.6355
Epoch 369/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3725 - accuracy: 0.7635 - val_loss: 1.0383 - val_accuracy: 0.6589
Epoch 370/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3820 - accuracy: 0.7481 - val_loss: 1.0153 - val_accuracy: 0.6916
Epoch 371/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3362 - accuracy: 0.7429 - val_loss: 1.0462 - val_accuracy: 0.6822
Epoch 372/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3464 - accuracy: 0.7352 - val_loss: 1.0492 - val_accuracy: 0.6869
Epoch 373/1000
4/4 [=====] - 0s 19ms/step - loss: 0.3410 - accuracy: 0.7558 - val_loss: 1.0887 - val_accuracy: 0.6869
Epoch 374/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3652 - accuracy: 0.7558 - val_loss: 1.0388 - val_accuracy: 0.6963
Epoch 375/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3205 - accuracy: 0.7661 - val_loss: 0.9992 - val_accuracy: 0.6963
Epoch 376/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2994 - accuracy: 0.7686 - val_loss: 0.9302 - val_accuracy: 0.7009
```

Epoch 377/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4238 - accuracy: 0.7558 - val_loss: 1.2346 - val_accuracy: 0.7523
Epoch 378/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2902 - accuracy: 0.7558 - val_loss: 1.1503 - val_accuracy: 0.7757
Epoch 379/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4250 - accuracy: 0.7584 - val_loss: 0.9940 - val_accuracy: 0.7290
Epoch 380/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3928 - accuracy: 0.7789 - val_loss: 0.9602 - val_accuracy: 0.7290
Epoch 381/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2833 - accuracy: 0.7738 - val_loss: 1.0404 - val_accuracy: 0.7430
Epoch 382/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3949 - accuracy: 0.7789 - val_loss: 1.0026 - val_accuracy: 0.7196
Epoch 383/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3284 - accuracy: 0.7661 - val_loss: 0.9844 - val_accuracy: 0.7430
Epoch 384/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3494 - accuracy: 0.7815 - val_loss: 1.0525 - val_accuracy: 0.7570
Epoch 385/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2840 - accuracy: 0.8329 - val_loss: 1.0746 - val_accuracy: 0.7570
Epoch 386/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2770 - accuracy: 0.8252 - val_loss: 0.9381 - val_accuracy: 0.7477
Epoch 387/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3467 - accuracy: 0.8226 - val_loss: 0.9367 - val_accuracy: 0.7523
Epoch 388/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3311 - accuracy: 0.8252 - val_loss: 1.0049 - val_accuracy: 0.7477
Epoch 389/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3634 - accuracy: 0.8406 - val_loss: 1.0510 - val_accuracy: 0.7570
Epoch 390/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2666 - accuracy: 0.8226 - val_loss: 0.9841 - val_accuracy: 0.7196
Epoch 391/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3177 - accuracy: 0.7789 - val_loss: 0.9983 - val_accuracy: 0.7477
Epoch 392/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3253 - accuracy: 0.7892 - val_loss: 1.0101 - val_accuracy: 0.7477
Epoch 393/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3347 - accuracy: 0.7892 - val_loss: 1.0744 - val_accuracy: 0.7804
Epoch 394/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3027 - accuracy: 0.8123 - val_loss: 1.0312 - val_accuracy: 0.7710
Epoch 395/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2777 - accuracy: 0.8021 - val_loss: 1.1529 - val_accuracy: 0.7523
Epoch 396/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4494 - accuracy: 0.7558 - val_loss: 1.1544 - val_accuracy: 0.7570
Epoch 397/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3372 - accuracy: 0.8098 - val_loss: 1.1413 - val_accuracy: 0.7664
Epoch 398/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3124 - accuracy: 0.8201 - val_loss: 1.2852 - val_accuracy: 0.7664
Epoch 399/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3604 - accuracy: 0.7969 - val_loss: 1.0253 - val_accuracy: 0.7850
Epoch 400/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3599 - accuracy: 0.7738 - val_loss: 0.9997 - val_accuracy: 0.7850
Epoch 401/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3093 - accuracy: 0.7918 - val_loss: 1.0215 - val_accuracy: 0.7850
Epoch 402/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3764 - accuracy: 0.7815 - val_loss: 1.0301 - val_accuracy: 0.7710
Epoch 403/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2391 - accuracy: 0.8021 - val_loss: 1.2160 - val_accuracy: 0.7757
Epoch 404/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2883 - accuracy: 0.7738 - val_loss: 1.1328 - val_accuracy: 0.7804
Epoch 405/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3138 - accuracy: 0.7789 - val_loss: 0.9645 - val_accuracy: 0.7430
Epoch 406/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4020 - accuracy: 0.7224 - val_loss: 0.9332 - val_accuracy: 0.7290

accuracy: 0.7477
Epoch 407/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3422 - accuracy: 0.7532 - val_loss: 0.9718 - val_accuracy: 0.7430
Epoch 408/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2632 - accuracy: 0.7661 - val_loss: 0.9848 - val_accuracy: 0.7430
Epoch 409/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3181 - accuracy: 0.7892 - val_loss: 0.9253 - val_accuracy: 0.7570
Epoch 410/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2848 - accuracy: 0.8046 - val_loss: 0.9778 - val_accuracy: 0.7523
Epoch 411/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2746 - accuracy: 0.7661 - val_loss: 1.0050 - val_accuracy: 0.7477
Epoch 412/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3614 - accuracy: 0.7918 - val_loss: 1.0265 - val_accuracy: 0.7570
Epoch 413/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3846 - accuracy: 0.7918 - val_loss: 1.0375 - val_accuracy: 0.7570
Epoch 414/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2559 - accuracy: 0.7789 - val_loss: 1.0627 - val_accuracy: 0.7617
Epoch 415/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3774 - accuracy: 0.7995 - val_loss: 1.1178 - val_accuracy: 0.7196
Epoch 416/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2762 - accuracy: 0.7635 - val_loss: 1.0928 - val_accuracy: 0.7290
Epoch 417/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3504 - accuracy: 0.8098 - val_loss: 0.9945 - val_accuracy: 0.7243
Epoch 418/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3247 - accuracy: 0.7969 - val_loss: 0.9630 - val_accuracy: 0.7336
Epoch 419/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2650 - accuracy: 0.7969 - val_loss: 0.9930 - val_accuracy: 0.7430
Epoch 420/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2896 - accuracy: 0.8098 - val_loss: 0.9787 - val_accuracy: 0.7196
Epoch 421/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4068 - accuracy: 0.7635 - val_loss: 0.9826 - val_accuracy: 0.7243
Epoch 422/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3731 - accuracy: 0.7481 - val_loss: 0.9922 - val_accuracy: 0.7336
Epoch 423/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3150 - accuracy: 0.7635 - val_loss: 1.0105 - val_accuracy: 0.7383
Epoch 424/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2363 - accuracy: 0.7892 - val_loss: 1.0268 - val_accuracy: 0.7523
Epoch 425/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3343 - accuracy: 0.7918 - val_loss: 1.0064 - val_accuracy: 0.7523
Epoch 426/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2469 - accuracy: 0.7918 - val_loss: 1.0641 - val_accuracy: 0.7710
Epoch 427/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3519 - accuracy: 0.8175 - val_loss: 1.1155 - val_accuracy: 0.7617
Epoch 428/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2797 - accuracy: 0.7969 - val_loss: 1.1278 - val_accuracy: 0.7570
Epoch 429/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2558 - accuracy: 0.7892 - val_loss: 1.1070 - val_accuracy: 0.7617
Epoch 430/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3022 - accuracy: 0.7712 - val_loss: 1.1234 - val_accuracy: 0.7617
Epoch 431/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3549 - accuracy: 0.7866 - val_loss: 1.1304 - val_accuracy: 0.7617
Epoch 432/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2985 - accuracy: 0.7943 - val_loss: 1.3666 - val_accuracy: 0.7477
Epoch 433/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2588 - accuracy: 0.8149 - val_loss: 1.1534 - val_accuracy: 0.7617
Epoch 434/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3202 - accuracy: 0.7866 - val_loss: 1.0945 - val_accuracy: 0.7056
Epoch 435/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3319 - accuracy: 0.7841 - val_loss: 1.0938 - val_accuracy: 0.7056
Epoch 436/1000

```
4/4 [=====] - 0s 14ms/step - loss: 0.3730 - accuracy: 0.7738 - val_loss: 1.0874 - val_accuracy: 0.7243
Epoch 437/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3627 - accuracy: 0.7763 - val_loss: 1.0842 - val_accuracy: 0.7150
Epoch 438/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3410 - accuracy: 0.7892 - val_loss: 1.0589 - val_accuracy: 0.7243
Epoch 439/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3662 - accuracy: 0.7661 - val_loss: 1.0848 - val_accuracy: 0.7336
Epoch 440/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2757 - accuracy: 0.7661 - val_loss: 1.1118 - val_accuracy: 0.7383
Epoch 441/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2674 - accuracy: 0.7995 - val_loss: 1.1289 - val_accuracy: 0.7290
Epoch 442/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2913 - accuracy: 0.8072 - val_loss: 1.0928 - val_accuracy: 0.7430
Epoch 443/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3237 - accuracy: 0.8046 - val_loss: 1.0878 - val_accuracy: 0.7336
Epoch 444/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3751 - accuracy: 0.8098 - val_loss: 1.0698 - val_accuracy: 0.7523
Epoch 445/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2414 - accuracy: 0.8123 - val_loss: 1.0858 - val_accuracy: 0.7664
Epoch 446/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2676 - accuracy: 0.8149 - val_loss: 1.0689 - val_accuracy: 0.7664
Epoch 447/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3863 - accuracy: 0.8380 - val_loss: 1.0598 - val_accuracy: 0.7570
Epoch 448/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3394 - accuracy: 0.8329 - val_loss: 1.0599 - val_accuracy: 0.7617
Epoch 449/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3264 - accuracy: 0.8329 - val_loss: 1.1521 - val_accuracy: 0.7617
Epoch 450/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2588 - accuracy: 0.8278 - val_loss: 1.2118 - val_accuracy: 0.7804
Epoch 451/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3702 - accuracy: 0.8355 - val_loss: 1.2963 - val_accuracy: 0.7850
Epoch 452/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2793 - accuracy: 0.8303 - val_loss: 1.3304 - val_accuracy: 0.7617
Epoch 453/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2739 - accuracy: 0.8560 - val_loss: 1.3977 - val_accuracy: 0.7944
Epoch 454/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2860 - accuracy: 0.8432 - val_loss: 1.3399 - val_accuracy: 0.7804
Epoch 455/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3326 - accuracy: 0.8355 - val_loss: 1.4384 - val_accuracy: 0.8037
Epoch 456/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3796 - accuracy: 0.8278 - val_loss: 1.4014 - val_accuracy: 0.7944
Epoch 457/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3218 - accuracy: 0.8458 - val_loss: 1.3670 - val_accuracy: 0.7944
Epoch 458/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3584 - accuracy: 0.8175 - val_loss: 1.3999 - val_accuracy: 0.7944
Epoch 459/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2720 - accuracy: 0.8278 - val_loss: 1.3482 - val_accuracy: 0.7897
Epoch 460/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2486 - accuracy: 0.8458 - val_loss: 1.3239 - val_accuracy: 0.7944
Epoch 461/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2870 - accuracy: 0.8252 - val_loss: 1.3161 - val_accuracy: 0.7850
Epoch 462/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2998 - accuracy: 0.8483 - val_loss: 1.2907 - val_accuracy: 0.7664
Epoch 463/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3732 - accuracy: 0.8149 - val_loss: 1.2907 - val_accuracy: 0.7710
Epoch 464/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3134 - accuracy: 0.8252 - val_loss: 1.3309 - val_accuracy: 0.7710
Epoch 465/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2933 - accuracy: 0.8380 - val_loss: 1.3270 - val_accuracy: 0.7757
```

Epoch 466/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2736 - accuracy: 0.8355 - val_loss: 1.3591 - val_accuracy: 0.7710
Epoch 467/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2656 - accuracy: 0.8252 - val_loss: 1.3940 - val_accuracy: 0.7430
Epoch 468/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2246 - accuracy: 0.8355 - val_loss: 1.3918 - val_accuracy: 0.7430
Epoch 469/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2789 - accuracy: 0.8303 - val_loss: 1.3622 - val_accuracy: 0.7336
Epoch 470/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2639 - accuracy: 0.8355 - val_loss: 1.2994 - val_accuracy: 0.7336
Epoch 471/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2880 - accuracy: 0.8432 - val_loss: 1.1029 - val_accuracy: 0.7570
Epoch 472/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2830 - accuracy: 0.8380 - val_loss: 1.0637 - val_accuracy: 0.7664
Epoch 473/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3062 - accuracy: 0.8201 - val_loss: 1.0430 - val_accuracy: 0.7430
Epoch 474/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2683 - accuracy: 0.8483 - val_loss: 1.0237 - val_accuracy: 0.7430
Epoch 475/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2663 - accuracy: 0.8380 - val_loss: 1.0504 - val_accuracy: 0.7430
Epoch 476/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2944 - accuracy: 0.8406 - val_loss: 0.9261 - val_accuracy: 0.7570
Epoch 477/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2743 - accuracy: 0.8535 - val_loss: 1.0080 - val_accuracy: 0.7570
Epoch 478/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2658 - accuracy: 0.8483 - val_loss: 0.9351 - val_accuracy: 0.7617
Epoch 479/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2261 - accuracy: 0.8483 - val_loss: 1.1243 - val_accuracy: 0.7570
Epoch 480/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3408 - accuracy: 0.8123 - val_loss: 1.1605 - val_accuracy: 0.7336
Epoch 481/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3634 - accuracy: 0.8252 - val_loss: 1.1311 - val_accuracy: 0.7290
Epoch 482/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4517 - accuracy: 0.8149 - val_loss: 1.2594 - val_accuracy: 0.7617
Epoch 483/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3162 - accuracy: 0.8252 - val_loss: 1.3389 - val_accuracy: 0.7757
Epoch 484/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3190 - accuracy: 0.8252 - val_loss: 1.3289 - val_accuracy: 0.7617
Epoch 485/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3110 - accuracy: 0.8201 - val_loss: 1.1688 - val_accuracy: 0.7570
Epoch 486/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2693 - accuracy: 0.8278 - val_loss: 1.0725 - val_accuracy: 0.7430
Epoch 487/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2991 - accuracy: 0.8201 - val_loss: 1.0345 - val_accuracy: 0.7383
Epoch 488/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2555 - accuracy: 0.8021 - val_loss: 0.9863 - val_accuracy: 0.7477
Epoch 489/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2511 - accuracy: 0.7995 - val_loss: 0.9888 - val_accuracy: 0.7523
Epoch 490/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2607 - accuracy: 0.8046 - val_loss: 0.9028 - val_accuracy: 0.7430
Epoch 491/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2834 - accuracy: 0.8329 - val_loss: 0.9024 - val_accuracy: 0.7430
Epoch 492/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2705 - accuracy: 0.8329 - val_loss: 0.8918 - val_accuracy: 0.7430
Epoch 493/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2422 - accuracy: 0.8278 - val_loss: 0.8942 - val_accuracy: 0.7430
Epoch 494/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2676 - accuracy: 0.8252 - val_loss: 0.9543 - val_accuracy: 0.7523
Epoch 495/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3341 - accuracy: 0.7301 - val_loss: 0.9573 - val_accuracy: 0.7523

```
accuracy: 0.7383
Epoch 496/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2882 - accuracy: 0.7326 - val_loss: 0.9268 - val_accuracy: 0.7570
Epoch 497/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2795 - accuracy: 0.7378 - val_loss: 0.8271 - val_accuracy: 0.7336
Epoch 498/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3247 - accuracy: 0.7198 - val_loss: 0.8279 - val_accuracy: 0.7383
Epoch 499/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2834 - accuracy: 0.7121 - val_loss: 0.8318 - val_accuracy: 0.7196
Epoch 500/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3691 - accuracy: 0.6941 - val_loss: 0.8487 - val_accuracy: 0.7196
Epoch 501/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3339 - accuracy: 0.7018 - val_loss: 0.8295 - val_accuracy: 0.7150
Epoch 502/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3460 - accuracy: 0.7249 - val_loss: 0.8793 - val_accuracy: 0.7150
Epoch 503/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2595 - accuracy: 0.7147 - val_loss: 0.8785 - val_accuracy: 0.7103
Epoch 504/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3069 - accuracy: 0.7198 - val_loss: 0.8719 - val_accuracy: 0.7150
Epoch 505/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2618 - accuracy: 0.7506 - val_loss: 0.8741 - val_accuracy: 0.7103
Epoch 506/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2653 - accuracy: 0.7558 - val_loss: 0.8741 - val_accuracy: 0.7196
Epoch 507/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3269 - accuracy: 0.7841 - val_loss: 0.8673 - val_accuracy: 0.7103
Epoch 508/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2787 - accuracy: 0.7532 - val_loss: 0.8249 - val_accuracy: 0.7009
Epoch 509/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3290 - accuracy: 0.8175 - val_loss: 0.8421 - val_accuracy: 0.6963
Epoch 510/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3508 - accuracy: 0.7584 - val_loss: 0.8723 - val_accuracy: 0.6869
Epoch 511/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3389 - accuracy: 0.7095 - val_loss: 0.8766 - val_accuracy: 0.7056
Epoch 512/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3828 - accuracy: 0.7763 - val_loss: 0.8272 - val_accuracy: 0.7056
Epoch 513/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2973 - accuracy: 0.7943 - val_loss: 0.8195 - val_accuracy: 0.7150
Epoch 514/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2463 - accuracy: 0.7969 - val_loss: 0.8102 - val_accuracy: 0.7196
Epoch 515/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2655 - accuracy: 0.7815 - val_loss: 0.8529 - val_accuracy: 0.7150
Epoch 516/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2666 - accuracy: 0.7815 - val_loss: 0.8805 - val_accuracy: 0.6402
Epoch 517/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4604 - accuracy: 0.7558 - val_loss: 0.8680 - val_accuracy: 0.6542
Epoch 518/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4179 - accuracy: 0.7866 - val_loss: 0.8705 - val_accuracy: 0.6495
Epoch 519/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3610 - accuracy: 0.7943 - val_loss: 0.8664 - val_accuracy: 0.6542
Epoch 520/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3068 - accuracy: 0.7661 - val_loss: 0.8872 - val_accuracy: 0.6776
Epoch 521/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3176 - accuracy: 0.7995 - val_loss: 0.8607 - val_accuracy: 0.6636
Epoch 522/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2714 - accuracy: 0.8175 - val_loss: 0.8450 - val_accuracy: 0.6776
Epoch 523/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2614 - accuracy: 0.7918 - val_loss: 0.8608 - val_accuracy: 0.7009
Epoch 524/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3168 - accuracy: 0.7866 - val_loss: 0.9150 - val_accuracy: 0.6916
Epoch 525/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 0.3843 - accuracy: 0.7506 - val_loss: 0.9050 - val_accuracy: 0.7056
Epoch 526/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3749 - accuracy: 0.7249 - val_loss: 0.8688 - val_accuracy: 0.6916
Epoch 527/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3527 - accuracy: 0.7532 - val_loss: 0.8942 - val_accuracy: 0.6963
Epoch 528/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3018 - accuracy: 0.7918 - val_loss: 0.8368 - val_accuracy: 0.7664
Epoch 529/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3577 - accuracy: 0.8380 - val_loss: 0.8270 - val_accuracy: 0.7710
Epoch 530/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3072 - accuracy: 0.8123 - val_loss: 0.8477 - val_accuracy: 0.7617
Epoch 531/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3139 - accuracy: 0.8201 - val_loss: 0.8159 - val_accuracy: 0.7383
Epoch 532/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2866 - accuracy: 0.8278 - val_loss: 0.8963 - val_accuracy: 0.7336
Epoch 533/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2740 - accuracy: 0.8072 - val_loss: 0.9310 - val_accuracy: 0.7383
Epoch 534/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2963 - accuracy: 0.8072 - val_loss: 0.9428 - val_accuracy: 0.7196
Epoch 535/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2417 - accuracy: 0.8278 - val_loss: 0.9653 - val_accuracy: 0.7196
Epoch 536/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3783 - accuracy: 0.8123 - val_loss: 0.9380 - val_accuracy: 0.7290
Epoch 537/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2864 - accuracy: 0.8201 - val_loss: 0.9688 - val_accuracy: 0.7243
Epoch 538/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2994 - accuracy: 0.8123 - val_loss: 1.0622 - val_accuracy: 0.7290
Epoch 539/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2564 - accuracy: 0.8432 - val_loss: 1.0996 - val_accuracy: 0.7336
Epoch 540/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2720 - accuracy: 0.8329 - val_loss: 0.9858 - val_accuracy: 0.7290
Epoch 541/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2220 - accuracy: 0.8252 - val_loss: 0.9814 - val_accuracy: 0.7056
Epoch 542/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2540 - accuracy: 0.8226 - val_loss: 1.0491 - val_accuracy: 0.7383
Epoch 543/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2068 - accuracy: 0.8483 - val_loss: 1.0090 - val_accuracy: 0.7383
Epoch 544/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2697 - accuracy: 0.8303 - val_loss: 1.0478 - val_accuracy: 0.7103
Epoch 545/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2859 - accuracy: 0.7943 - val_loss: 1.1427 - val_accuracy: 0.7056
Epoch 546/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2904 - accuracy: 0.8046 - val_loss: 1.1107 - val_accuracy: 0.7243
Epoch 547/1000
4/4 [=====] - 0s 18ms/step - loss: 0.2473 - accuracy: 0.8201 - val_loss: 1.0667 - val_accuracy: 0.7336
Epoch 548/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2318 - accuracy: 0.8226 - val_loss: 1.0634 - val_accuracy: 0.7336
Epoch 549/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2065 - accuracy: 0.8509 - val_loss: 1.1271 - val_accuracy: 0.7196
Epoch 550/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2323 - accuracy: 0.8123 - val_loss: 1.0899 - val_accuracy: 0.7056
Epoch 551/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2461 - accuracy: 0.7892 - val_loss: 1.0355 - val_accuracy: 0.7056
Epoch 552/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2823 - accuracy: 0.7969 - val_loss: 1.0970 - val_accuracy: 0.6963
Epoch 553/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2617 - accuracy: 0.8329 - val_loss: 1.0910 - val_accuracy: 0.7056
Epoch 554/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2259 - accuracy: 0.8355 - val_loss: 1.0580 - val_accuracy: 0.7056
```

Epoch 555/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2422 - accuracy: 0.8252 - val_loss: 1.0937 - val_accuracy: 0.7009
Epoch 556/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2310 - accuracy: 0.8278 - val_loss: 1.0650 - val_accuracy: 0.7243
Epoch 557/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2330 - accuracy: 0.8458 - val_loss: 1.0653 - val_accuracy: 0.7103
Epoch 558/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2275 - accuracy: 0.8355 - val_loss: 1.0380 - val_accuracy: 0.7056
Epoch 559/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3440 - accuracy: 0.7841 - val_loss: 1.0270 - val_accuracy: 0.6636
Epoch 560/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1964 - accuracy: 0.8432 - val_loss: 1.0242 - val_accuracy: 0.6636
Epoch 561/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2892 - accuracy: 0.8098 - val_loss: 1.0123 - val_accuracy: 0.6963
Epoch 562/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2487 - accuracy: 0.8458 - val_loss: 1.0983 - val_accuracy: 0.7056
Epoch 563/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2181 - accuracy: 0.8252 - val_loss: 1.0890 - val_accuracy: 0.6776
Epoch 564/1000
4/4 [=====] - 0s 19ms/step - loss: 0.2381 - accuracy: 0.7661 - val_loss: 1.1310 - val_accuracy: 0.6869
Epoch 565/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2611 - accuracy: 0.7763 - val_loss: 1.2484 - val_accuracy: 0.6916
Epoch 566/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3614 - accuracy: 0.7352 - val_loss: 1.2450 - val_accuracy: 0.6869
Epoch 567/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2197 - accuracy: 0.7506 - val_loss: 1.2737 - val_accuracy: 0.7056
Epoch 568/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2949 - accuracy: 0.7326 - val_loss: 1.2995 - val_accuracy: 0.7150
Epoch 569/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3621 - accuracy: 0.7609 - val_loss: 1.1795 - val_accuracy: 0.6729
Epoch 570/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2292 - accuracy: 0.8252 - val_loss: 1.1761 - val_accuracy: 0.6869
Epoch 571/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2502 - accuracy: 0.8380 - val_loss: 1.1966 - val_accuracy: 0.6682
Epoch 572/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2998 - accuracy: 0.8278 - val_loss: 1.1873 - val_accuracy: 0.6822
Epoch 573/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2578 - accuracy: 0.8278 - val_loss: 1.1809 - val_accuracy: 0.6916
Epoch 574/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2758 - accuracy: 0.8329 - val_loss: 1.2191 - val_accuracy: 0.6776
Epoch 575/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1954 - accuracy: 0.8329 - val_loss: 1.1622 - val_accuracy: 0.7056
Epoch 576/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2356 - accuracy: 0.7892 - val_loss: 1.1051 - val_accuracy: 0.7009
Epoch 577/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2662 - accuracy: 0.8046 - val_loss: 1.0883 - val_accuracy: 0.7056
Epoch 578/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3005 - accuracy: 0.8175 - val_loss: 1.1161 - val_accuracy: 0.7056
Epoch 579/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2107 - accuracy: 0.8483 - val_loss: 1.1755 - val_accuracy: 0.7103
Epoch 580/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2418 - accuracy: 0.7969 - val_loss: 1.1230 - val_accuracy: 0.7056
Epoch 581/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2150 - accuracy: 0.8123 - val_loss: 1.1348 - val_accuracy: 0.6916
Epoch 582/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2379 - accuracy: 0.7943 - val_loss: 1.1496 - val_accuracy: 0.7009
Epoch 583/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2133 - accuracy: 0.7943 - val_loss: 1.0337 - val_accuracy: 0.7196
Epoch 584/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2373 - accuracy: 0.8123 - val_loss: 1.0434 - val_accuracy: 0.7009

accuracy: 0.7056
Epoch 585/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2785 - accuracy: 0.7532 - val_loss: 1.1252 - val_accuracy: 0.6916
Epoch 586/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2781 - accuracy: 0.7969 - val_loss: 1.1153 - val_accuracy: 0.6916
Epoch 587/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2890 - accuracy: 0.8226 - val_loss: 1.1108 - val_accuracy: 0.7009
Epoch 588/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1898 - accuracy: 0.8072 - val_loss: 1.1221 - val_accuracy: 0.7009
Epoch 589/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3066 - accuracy: 0.7815 - val_loss: 1.1066 - val_accuracy: 0.6869
Epoch 590/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2641 - accuracy: 0.7866 - val_loss: 1.1943 - val_accuracy: 0.6869
Epoch 591/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2199 - accuracy: 0.7738 - val_loss: 1.2047 - val_accuracy: 0.6636
Epoch 592/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3607 - accuracy: 0.7815 - val_loss: 1.0885 - val_accuracy: 0.6869
Epoch 593/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3479 - accuracy: 0.7841 - val_loss: 1.0883 - val_accuracy: 0.6916
Epoch 594/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2772 - accuracy: 0.7661 - val_loss: 1.1651 - val_accuracy: 0.6822
Epoch 595/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2907 - accuracy: 0.7532 - val_loss: 1.1784 - val_accuracy: 0.7056
Epoch 596/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2983 - accuracy: 0.7841 - val_loss: 1.3525 - val_accuracy: 0.6963
Epoch 597/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2727 - accuracy: 0.8046 - val_loss: 1.3250 - val_accuracy: 0.6916
Epoch 598/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3037 - accuracy: 0.7584 - val_loss: 1.3194 - val_accuracy: 0.7009
Epoch 599/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2290 - accuracy: 0.7918 - val_loss: 1.3152 - val_accuracy: 0.7009
Epoch 600/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2316 - accuracy: 0.8123 - val_loss: 1.3050 - val_accuracy: 0.7103
Epoch 601/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2803 - accuracy: 0.8021 - val_loss: 1.3067 - val_accuracy: 0.7009
Epoch 602/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3695 - accuracy: 0.8123 - val_loss: 1.3682 - val_accuracy: 0.7196
Epoch 603/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3900 - accuracy: 0.7943 - val_loss: 1.3905 - val_accuracy: 0.7430
Epoch 604/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2492 - accuracy: 0.7969 - val_loss: 1.4175 - val_accuracy: 0.7383
Epoch 605/1000
1/4 [====>.....] - ETA: 0s - loss: 0.2808 - accuracy: 0.7266Restoring model weights from the end of the best epoch: 455.
4/4 [=====] - 0s 13ms/step - loss: 0.3860 - accuracy: 0.7918 - val_loss: 1.3607 - val_accuracy: 0.7477
Epoch 605: early stopping
2/2 [=====] - 0s 6ms/step - loss: 1.1825 - accuracy: 0.7907
[CV] ENDDense1=100, Dense2=10; total time= 30.1s
Model: "sequential_74"

Layer (type)	Output Shape	Param #
dense_296 (Dense)	(None, 100)	700
batch_normalization_222 (BatchNormalization)	(None, 100)	400
activation_222 (Activation)	(None, 100)	0
dense_297 (Dense)	(None, 10)	1010
batch_normalization_223 (BatchNormalization)	(None, 10)	40
activation_223 (Activation)	(None, 10)	0
dense_298 (Dense)	(None, 10)	110

batch_normalization_224 (Batch Normalization)	(None, 10)	40
activation_224 (Activation)	(None, 10)	0
dense_299 (Dense)	(None, 2)	22

Total params: 2,322
Trainable params: 2,082
Non-trainable params: 240

Epoch 1/1000
4/4 [=====] - 2s 55ms/step - loss: 4.7773 - accuracy: 0.4730 - val_loss: 3.8695 - val_accuracy: 0.4673
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2318 - accuracy: 0.5270 - val_loss: 3.1729 - val_accuracy: 0.4486
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8411 - accuracy: 0.5321 - val_loss: 3.1025 - val_accuracy: 0.4533
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6086 - accuracy: 0.5527 - val_loss: 2.9148 - val_accuracy: 0.3925
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 2.6053 - accuracy: 0.5373 - val_loss: 2.6376 - val_accuracy: 0.5561
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5740 - accuracy: 0.5758 - val_loss: 2.6956 - val_accuracy: 0.5607
Epoch 7/1000
4/4 [=====] - 0s 15ms/step - loss: 2.3783 - accuracy: 0.5733 - val_loss: 2.6803 - val_accuracy: 0.5654
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3266 - accuracy: 0.5656 - val_loss: 2.4889 - val_accuracy: 0.5561
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3612 - accuracy: 0.5553 - val_loss: 2.4373 - val_accuracy: 0.5654
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2924 - accuracy: 0.5476 - val_loss: 2.3910 - val_accuracy: 0.5607
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2804 - accuracy: 0.5193 - val_loss: 2.3519 - val_accuracy: 0.5607
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2291 - accuracy: 0.5630 - val_loss: 2.2901 - val_accuracy: 0.5654
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2499 - accuracy: 0.5758 - val_loss: 2.2215 - val_accuracy: 0.5654
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0907 - accuracy: 0.5527 - val_loss: 2.0901 - val_accuracy: 0.5701
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0226 - accuracy: 0.5707 - val_loss: 2.1592 - val_accuracy: 0.4626
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1695 - accuracy: 0.5527 - val_loss: 2.1285 - val_accuracy: 0.5654
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1030 - accuracy: 0.5450 - val_loss: 2.0160 - val_accuracy: 0.5654
Epoch 18/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9778 - accuracy: 0.5424 - val_loss: 1.9905 - val_accuracy: 0.5654
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0150 - accuracy: 0.5758 - val_loss: 2.0057 - val_accuracy: 0.5701
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0228 - accuracy: 0.5656 - val_loss: 1.9936 - val_accuracy: 0.5701
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9942 - accuracy: 0.5630 - val_loss: 1.9387 - val_accuracy: 0.5701
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9279 - accuracy: 0.5733 - val_loss: 1.9272 - val_accuracy: 0.5701
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9460 - accuracy: 0.5578 - val_loss: 1.9357 - val_accuracy: 0.5701
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9311 - accuracy: 0.5758 - val_loss: 1.9391 - val_accuracy: 0.5701
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9655 - accuracy: 0.5476 - val_loss: 1.9305 - val_accuracy: 0.5654
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9436 - accuracy: 0.5270 - val_loss: 1.9153 - val_accuracy: 0.5654

```
accuracy: 0.5654
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8391 - accuracy: 0.5321 - val_loss: 1.9350 - val_accuracy: 0.5654
Epoch 28/1000
4/4 [=====] - 0s 15ms/step - loss: 1.8449 - accuracy: 0.5244 - val_loss: 1.9066 - val_accuracy: 0.5654
Epoch 29/1000
4/4 [=====] - 0s 15ms/step - loss: 1.8826 - accuracy: 0.5450 - val_loss: 1.9210 - val_accuracy: 0.5654
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8722 - accuracy: 0.5604 - val_loss: 1.8900 - val_accuracy: 0.5654
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7310 - accuracy: 0.5476 - val_loss: 1.8767 - val_accuracy: 0.5654
Epoch 32/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8614 - accuracy: 0.5476 - val_loss: 1.8674 - val_accuracy: 0.5654
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7694 - accuracy: 0.5373 - val_loss: 1.8521 - val_accuracy: 0.5654
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7872 - accuracy: 0.5244 - val_loss: 1.8425 - val_accuracy: 0.5654
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7158 - accuracy: 0.5450 - val_loss: 1.8258 - val_accuracy: 0.5654
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6988 - accuracy: 0.5219 - val_loss: 1.8200 - val_accuracy: 0.4439
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8424 - accuracy: 0.5630 - val_loss: 1.8131 - val_accuracy: 0.5607
Epoch 38/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7776 - accuracy: 0.5630 - val_loss: 1.7930 - val_accuracy: 0.4439
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6723 - accuracy: 0.5887 - val_loss: 1.7753 - val_accuracy: 0.4486
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7070 - accuracy: 0.5733 - val_loss: 1.7592 - val_accuracy: 0.4486
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7169 - accuracy: 0.6041 - val_loss: 1.7484 - val_accuracy: 0.4486
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6089 - accuracy: 0.5758 - val_loss: 1.7392 - val_accuracy: 0.4486
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6200 - accuracy: 0.5835 - val_loss: 1.7326 - val_accuracy: 0.5654
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6134 - accuracy: 0.5398 - val_loss: 1.7208 - val_accuracy: 0.5607
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5551 - accuracy: 0.5476 - val_loss: 1.7066 - val_accuracy: 0.5607
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5618 - accuracy: 0.4704 - val_loss: 1.7096 - val_accuracy: 0.5467
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6086 - accuracy: 0.5090 - val_loss: 1.7047 - val_accuracy: 0.5467
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5413 - accuracy: 0.5244 - val_loss: 1.6986 - val_accuracy: 0.5421
Epoch 49/1000
4/4 [=====] - 0s 15ms/step - loss: 1.5552 - accuracy: 0.4859 - val_loss: 1.6917 - val_accuracy: 0.5421
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5372 - accuracy: 0.4884 - val_loss: 1.6783 - val_accuracy: 0.5467
Epoch 51/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5447 - accuracy: 0.4781 - val_loss: 1.6683 - val_accuracy: 0.5374
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5391 - accuracy: 0.4833 - val_loss: 1.6645 - val_accuracy: 0.5514
Epoch 53/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4624 - accuracy: 0.5167 - val_loss: 1.6640 - val_accuracy: 0.5561
Epoch 54/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4317 - accuracy: 0.4987 - val_loss: 1.6549 - val_accuracy: 0.5514
Epoch 55/1000
4/4 [=====] - 0s 16ms/step - loss: 1.4159 - accuracy: 0.4987 - val_loss: 1.6737 - val_accuracy: 0.5561
Epoch 56/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 1.4020 - accuracy: 0.4910 - val_loss: 1.6950 - val_accuracy: 0.5654
Epoch 57/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3337 - accuracy: 0.4859 - val_loss: 1.6547 - val_accuracy: 0.5607
Epoch 58/1000
4/4 [=====] - 0s 15ms/step - loss: 1.3311 - accuracy: 0.4987 - val_loss: 1.6270 - val_accuracy: 0.5514
Epoch 59/1000
4/4 [=====] - 0s 18ms/step - loss: 1.3096 - accuracy: 0.4807 - val_loss: 1.6708 - val_accuracy: 0.5514
Epoch 60/1000
4/4 [=====] - 0s 16ms/step - loss: 1.3379 - accuracy: 0.4936 - val_loss: 1.6164 - val_accuracy: 0.5561
Epoch 61/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2841 - accuracy: 0.4730 - val_loss: 1.7018 - val_accuracy: 0.5514
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2556 - accuracy: 0.4859 - val_loss: 1.6886 - val_accuracy: 0.5467
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2424 - accuracy: 0.5193 - val_loss: 1.6299 - val_accuracy: 0.5421
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1371 - accuracy: 0.4704 - val_loss: 1.6256 - val_accuracy: 0.5514
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1837 - accuracy: 0.4627 - val_loss: 1.6352 - val_accuracy: 0.5467
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1456 - accuracy: 0.4781 - val_loss: 1.6258 - val_accuracy: 0.5514
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1950 - accuracy: 0.5244 - val_loss: 1.6303 - val_accuracy: 0.5654
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1979 - accuracy: 0.5090 - val_loss: 1.6037 - val_accuracy: 0.5701
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1654 - accuracy: 0.5219 - val_loss: 1.5858 - val_accuracy: 0.5561
Epoch 70/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1514 - accuracy: 0.5039 - val_loss: 1.5698 - val_accuracy: 0.5607
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1123 - accuracy: 0.4987 - val_loss: 1.5590 - val_accuracy: 0.5607
Epoch 72/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1024 - accuracy: 0.4859 - val_loss: 1.5412 - val_accuracy: 0.5561
Epoch 73/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1088 - accuracy: 0.4936 - val_loss: 1.5347 - val_accuracy: 0.5607
Epoch 74/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0705 - accuracy: 0.5244 - val_loss: 1.5111 - val_accuracy: 0.5701
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1268 - accuracy: 0.5373 - val_loss: 1.5116 - val_accuracy: 0.5561
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0792 - accuracy: 0.5296 - val_loss: 1.5046 - val_accuracy: 0.5561
Epoch 77/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1472 - accuracy: 0.5450 - val_loss: 1.4832 - val_accuracy: 0.5561
Epoch 78/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0929 - accuracy: 0.5476 - val_loss: 1.4807 - val_accuracy: 0.5654
Epoch 79/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1037 - accuracy: 0.5681 - val_loss: 1.4374 - val_accuracy: 0.5748
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1254 - accuracy: 0.5450 - val_loss: 1.4226 - val_accuracy: 0.5748
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0640 - accuracy: 0.5501 - val_loss: 1.4191 - val_accuracy: 0.5748
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1347 - accuracy: 0.5707 - val_loss: 1.4125 - val_accuracy: 0.5748
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0408 - accuracy: 0.5527 - val_loss: 1.3662 - val_accuracy: 0.5654
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0999 - accuracy: 0.5424 - val_loss: 1.3455 - val_accuracy: 0.5748
Epoch 85/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0538 - accuracy: 0.5373 - val_loss: 1.2842 - val_accuracy: 0.5794
```

Epoch 86/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0123 - accuracy: 0.5501 - val_loss: 1.3367 - val_accuracy: 0.5701
Epoch 87/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0213 - accuracy: 0.5604 - val_loss: 1.3500 - val_accuracy: 0.5748
Epoch 88/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9793 - accuracy: 0.5424 - val_loss: 1.3471 - val_accuracy: 0.5748
Epoch 89/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9982 - accuracy: 0.5810 - val_loss: 1.3320 - val_accuracy: 0.5701
Epoch 90/1000
4/4 [=====] - 0s 16ms/step - loss: 1.0383 - accuracy: 0.5501 - val_loss: 1.3182 - val_accuracy: 0.5701
Epoch 91/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0607 - accuracy: 0.5578 - val_loss: 1.2801 - val_accuracy: 0.5794
Epoch 92/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9711 - accuracy: 0.5219 - val_loss: 1.2676 - val_accuracy: 0.5748
Epoch 93/1000
4/4 [=====] - 0s 16ms/step - loss: 1.0097 - accuracy: 0.5090 - val_loss: 1.2833 - val_accuracy: 0.5701
Epoch 94/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9944 - accuracy: 0.5373 - val_loss: 1.2718 - val_accuracy: 0.5701
Epoch 95/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0178 - accuracy: 0.5244 - val_loss: 1.2845 - val_accuracy: 0.5561
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0217 - accuracy: 0.5527 - val_loss: 1.2318 - val_accuracy: 0.5421
Epoch 97/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0325 - accuracy: 0.5450 - val_loss: 1.2173 - val_accuracy: 0.5607
Epoch 98/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9843 - accuracy: 0.5321 - val_loss: 1.1505 - val_accuracy: 0.5748
Epoch 99/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0039 - accuracy: 0.5707 - val_loss: 1.1798 - val_accuracy: 0.5748
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9818 - accuracy: 0.5039 - val_loss: 1.1357 - val_accuracy: 0.5654
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8972 - accuracy: 0.4961 - val_loss: 1.0124 - val_accuracy: 0.5374
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9386 - accuracy: 0.5013 - val_loss: 0.9789 - val_accuracy: 0.5187
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9376 - accuracy: 0.4833 - val_loss: 0.9612 - val_accuracy: 0.4953
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9066 - accuracy: 0.5064 - val_loss: 1.0298 - val_accuracy: 0.5280
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8818 - accuracy: 0.5270 - val_loss: 1.0294 - val_accuracy: 0.5280
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9740 - accuracy: 0.5321 - val_loss: 1.0305 - val_accuracy: 0.5187
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8377 - accuracy: 0.5013 - val_loss: 1.0231 - val_accuracy: 0.5374
Epoch 108/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8428 - accuracy: 0.5167 - val_loss: 0.9958 - val_accuracy: 0.5327
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8452 - accuracy: 0.5193 - val_loss: 0.9873 - val_accuracy: 0.5327
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8465 - accuracy: 0.5167 - val_loss: 0.9912 - val_accuracy: 0.5467
Epoch 111/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8539 - accuracy: 0.5270 - val_loss: 0.9918 - val_accuracy: 0.5467
Epoch 112/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9031 - accuracy: 0.5476 - val_loss: 0.9923 - val_accuracy: 0.5467
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8555 - accuracy: 0.5398 - val_loss: 0.9933 - val_accuracy: 0.5421
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8723 - accuracy: 0.5373 - val_loss: 0.9955 - val_accuracy: 0.5421
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9392 - accuracy: 0.5244 - val_loss: 0.9923 - val_accuracy: 0.5244

```
accuracy: 0.5327
Epoch 116/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8955 - accuracy: 0.5501 - val_loss: 0.9896 - val_accuracy: 0.5374
Epoch 117/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8426 - accuracy: 0.5373 - val_loss: 0.9852 - val_accuracy: 0.5327
Epoch 118/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9149 - accuracy: 0.5578 - val_loss: 0.9805 - val_accuracy: 0.5234
Epoch 119/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8037 - accuracy: 0.5219 - val_loss: 0.9741 - val_accuracy: 0.5280
Epoch 120/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8297 - accuracy: 0.5476 - val_loss: 0.9817 - val_accuracy: 0.5327
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9163 - accuracy: 0.5501 - val_loss: 0.9730 - val_accuracy: 0.5327
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8656 - accuracy: 0.5347 - val_loss: 0.9418 - val_accuracy: 0.5187
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8131 - accuracy: 0.5347 - val_loss: 0.9340 - val_accuracy: 0.4907
Epoch 124/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7734 - accuracy: 0.5193 - val_loss: 0.9342 - val_accuracy: 0.4953
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8026 - accuracy: 0.5398 - val_loss: 0.9217 - val_accuracy: 0.4860
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8879 - accuracy: 0.5347 - val_loss: 0.9165 - val_accuracy: 0.4720
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7587 - accuracy: 0.5141 - val_loss: 0.9180 - val_accuracy: 0.4766
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8756 - accuracy: 0.4987 - val_loss: 0.9106 - val_accuracy: 0.4813
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7880 - accuracy: 0.5039 - val_loss: 0.8897 - val_accuracy: 0.4626
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7882 - accuracy: 0.5193 - val_loss: 0.8859 - val_accuracy: 0.4579
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8159 - accuracy: 0.4807 - val_loss: 0.8838 - val_accuracy: 0.4673
Epoch 132/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8035 - accuracy: 0.4936 - val_loss: 0.8925 - val_accuracy: 0.4673
Epoch 133/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7905 - accuracy: 0.5090 - val_loss: 0.9032 - val_accuracy: 0.4673
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8363 - accuracy: 0.5219 - val_loss: 0.9004 - val_accuracy: 0.4766
Epoch 135/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8058 - accuracy: 0.5064 - val_loss: 0.9193 - val_accuracy: 0.4720
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7883 - accuracy: 0.5244 - val_loss: 0.9222 - val_accuracy: 0.4813
Epoch 137/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8128 - accuracy: 0.5039 - val_loss: 0.9095 - val_accuracy: 0.4720
Epoch 138/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7748 - accuracy: 0.4781 - val_loss: 0.9255 - val_accuracy: 0.5000
Epoch 139/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7405 - accuracy: 0.5373 - val_loss: 0.8999 - val_accuracy: 0.5374
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8296 - accuracy: 0.5141 - val_loss: 0.9259 - val_accuracy: 0.5280
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7848 - accuracy: 0.5244 - val_loss: 0.9180 - val_accuracy: 0.5374
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8548 - accuracy: 0.5373 - val_loss: 0.9130 - val_accuracy: 0.5421
Epoch 143/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8552 - accuracy: 0.5424 - val_loss: 0.8862 - val_accuracy: 0.5514
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7789 - accuracy: 0.5244 - val_loss: 0.8411 - val_accuracy: 0.5374
Epoch 145/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 0.7094 - accuracy: 0.5347 - val_loss: 0.8397 - val_accuracy: 0.5327
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7934 - accuracy: 0.5501 - val_loss: 0.8504 - val_accuracy: 0.5187
Epoch 147/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7919 - accuracy: 0.5450 - val_loss: 0.8527 - val_accuracy: 0.5467
Epoch 148/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8458 - accuracy: 0.5116 - val_loss: 0.8982 - val_accuracy: 0.5467
Epoch 149/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7394 - accuracy: 0.5270 - val_loss: 0.9397 - val_accuracy: 0.5561
Epoch 150/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8414 - accuracy: 0.5681 - val_loss: 0.9356 - val_accuracy: 0.5701
Epoch 151/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7382 - accuracy: 0.5373 - val_loss: 0.9329 - val_accuracy: 0.5374
Epoch 152/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7349 - accuracy: 0.5501 - val_loss: 0.9451 - val_accuracy: 0.5374
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8210 - accuracy: 0.5501 - val_loss: 0.9341 - val_accuracy: 0.5421
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7672 - accuracy: 0.5450 - val_loss: 0.9501 - val_accuracy: 0.5514
Epoch 155/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7290 - accuracy: 0.5398 - val_loss: 1.1255 - val_accuracy: 0.4252
Epoch 156/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7457 - accuracy: 0.5476 - val_loss: 1.1318 - val_accuracy: 0.4393
Epoch 157/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6998 - accuracy: 0.5707 - val_loss: 0.9972 - val_accuracy: 0.4766
Epoch 158/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7101 - accuracy: 0.5578 - val_loss: 0.9929 - val_accuracy: 0.4393
Epoch 159/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7518 - accuracy: 0.5604 - val_loss: 1.0763 - val_accuracy: 0.4486
Epoch 160/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7588 - accuracy: 0.5784 - val_loss: 1.0113 - val_accuracy: 0.4720
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8385 - accuracy: 0.5398 - val_loss: 1.0357 - val_accuracy: 0.5000
Epoch 162/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7413 - accuracy: 0.5398 - val_loss: 1.0244 - val_accuracy: 0.4860
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7576 - accuracy: 0.5784 - val_loss: 0.9741 - val_accuracy: 0.4953
Epoch 164/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7027 - accuracy: 0.5296 - val_loss: 0.9742 - val_accuracy: 0.5093
Epoch 165/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6837 - accuracy: 0.5501 - val_loss: 0.9571 - val_accuracy: 0.4860
Epoch 166/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7022 - accuracy: 0.5424 - val_loss: 0.9106 - val_accuracy: 0.5421
Epoch 167/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7614 - accuracy: 0.5039 - val_loss: 0.9331 - val_accuracy: 0.5374
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6685 - accuracy: 0.5270 - val_loss: 0.9653 - val_accuracy: 0.5467
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6786 - accuracy: 0.5270 - val_loss: 0.9158 - val_accuracy: 0.5374
Epoch 170/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7544 - accuracy: 0.5039 - val_loss: 0.9232 - val_accuracy: 0.5280
Epoch 171/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7089 - accuracy: 0.5064 - val_loss: 0.9188 - val_accuracy: 0.5421
Epoch 172/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7213 - accuracy: 0.5270 - val_loss: 0.9365 - val_accuracy: 0.5514
Epoch 173/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6779 - accuracy: 0.5347 - val_loss: 0.9231 - val_accuracy: 0.5467
Epoch 174/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7675 - accuracy: 0.5553 - val_loss: 0.9368 - val_accuracy: 0.5234
```

Epoch 175/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7294 - accuracy: 0.4884 - val_loss: 0.9683 - val_accuracy: 0.5187
Epoch 176/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6640 - accuracy: 0.5321 - val_loss: 0.9345 - val_accuracy: 0.5093
Epoch 177/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6842 - accuracy: 0.4987 - val_loss: 1.0008 - val_accuracy: 0.4953
Epoch 178/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7000 - accuracy: 0.4961 - val_loss: 1.0311 - val_accuracy: 0.5234
Epoch 179/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6764 - accuracy: 0.5167 - val_loss: 1.0414 - val_accuracy: 0.5234
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6811 - accuracy: 0.5090 - val_loss: 1.0904 - val_accuracy: 0.5187
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6792 - accuracy: 0.5219 - val_loss: 1.0511 - val_accuracy: 0.4907
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7096 - accuracy: 0.5064 - val_loss: 1.1328 - val_accuracy: 0.4813
Epoch 183/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6703 - accuracy: 0.5039 - val_loss: 1.1714 - val_accuracy: 0.5140
Epoch 184/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7120 - accuracy: 0.4704 - val_loss: 1.0205 - val_accuracy: 0.5514
Epoch 185/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7453 - accuracy: 0.5244 - val_loss: 1.0054 - val_accuracy: 0.5467
Epoch 186/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7274 - accuracy: 0.5167 - val_loss: 0.9593 - val_accuracy: 0.5234
Epoch 187/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7064 - accuracy: 0.5244 - val_loss: 0.9433 - val_accuracy: 0.4953
Epoch 188/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6713 - accuracy: 0.4704 - val_loss: 1.0405 - val_accuracy: 0.5140
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6301 - accuracy: 0.5424 - val_loss: 1.0052 - val_accuracy: 0.5187
Epoch 190/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6570 - accuracy: 0.5270 - val_loss: 1.0137 - val_accuracy: 0.5187
Epoch 191/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7105 - accuracy: 0.5398 - val_loss: 1.1095 - val_accuracy: 0.5327
Epoch 192/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6915 - accuracy: 0.5373 - val_loss: 1.0925 - val_accuracy: 0.5374
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6697 - accuracy: 0.5347 - val_loss: 1.1614 - val_accuracy: 0.5187
Epoch 194/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6407 - accuracy: 0.5527 - val_loss: 1.2471 - val_accuracy: 0.5187
Epoch 195/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6040 - accuracy: 0.5527 - val_loss: 1.1490 - val_accuracy: 0.5234
Epoch 196/1000
4/4 [=====] - 0s 17ms/step - loss: 0.5672 - accuracy: 0.5553 - val_loss: 1.1135 - val_accuracy: 0.5374
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6573 - accuracy: 0.5244 - val_loss: 1.1088 - val_accuracy: 0.5374
Epoch 198/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6791 - accuracy: 0.5398 - val_loss: 1.1368 - val_accuracy: 0.5467
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5704 - accuracy: 0.5347 - val_loss: 1.1381 - val_accuracy: 0.5187
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6437 - accuracy: 0.5296 - val_loss: 1.4177 - val_accuracy: 0.4486
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6113 - accuracy: 0.5424 - val_loss: 1.2614 - val_accuracy: 0.5140
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5587 - accuracy: 0.5527 - val_loss: 1.1794 - val_accuracy: 0.5234
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5519 - accuracy: 0.5398 - val_loss: 1.2757 - val_accuracy: 0.5514
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5887 - accuracy: 0.5501 - val_loss: 1.1601 - val_accuracy: 0.5187

```
accuracy: 0.5280
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5537 - accuracy: 0.5398 - val_loss: 1.1374 - val_
accuracy: 0.5654
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5265 - accuracy: 0.5604 - val_loss: 1.0735 - val_
accuracy: 0.5888
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5658 - accuracy: 0.5476 - val_loss: 1.1209 - val_
accuracy: 0.5794
Epoch 208/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5197 - accuracy: 0.5321 - val_loss: 1.0696 - val_
accuracy: 0.5748
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5447 - accuracy: 0.5219 - val_loss: 1.2331 - val_
accuracy: 0.5607
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5817 - accuracy: 0.5141 - val_loss: 1.1095 - val_
accuracy: 0.5701
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4381 - accuracy: 0.5707 - val_loss: 1.0480 - val_
accuracy: 0.5888
Epoch 212/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6011 - accuracy: 0.5321 - val_loss: 1.0982 - val_
accuracy: 0.5888
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4061 - accuracy: 0.5553 - val_loss: 1.1409 - val_
accuracy: 0.5748
Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6020 - accuracy: 0.5064 - val_loss: 1.1304 - val_
accuracy: 0.5140
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5368 - accuracy: 0.5707 - val_loss: 1.0328 - val_
accuracy: 0.5421
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4339 - accuracy: 0.5039 - val_loss: 1.3966 - val_
accuracy: 0.4720
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4742 - accuracy: 0.5090 - val_loss: 1.3693 - val_
accuracy: 0.4766
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5418 - accuracy: 0.5219 - val_loss: 1.2839 - val_
accuracy: 0.4673
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4646 - accuracy: 0.5090 - val_loss: 1.2268 - val_
accuracy: 0.4626
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3992 - accuracy: 0.5013 - val_loss: 1.2732 - val_
accuracy: 0.4486
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3451 - accuracy: 0.4884 - val_loss: 1.2866 - val_
accuracy: 0.4346
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4840 - accuracy: 0.5219 - val_loss: 1.1767 - val_
accuracy: 0.4393
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4140 - accuracy: 0.5064 - val_loss: 1.1637 - val_
accuracy: 0.4206
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4143 - accuracy: 0.5244 - val_loss: 1.2355 - val_
accuracy: 0.4112
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3692 - accuracy: 0.5450 - val_loss: 1.2565 - val_
accuracy: 0.4112
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4025 - accuracy: 0.5707 - val_loss: 1.3202 - val_
accuracy: 0.4159
Epoch 227/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3177 - accuracy: 0.5656 - val_loss: 1.2878 - val_
accuracy: 0.4206
Epoch 228/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3853 - accuracy: 0.5938 - val_loss: 1.2912 - val_
accuracy: 0.4299
Epoch 229/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3819 - accuracy: 0.5835 - val_loss: 1.2912 - val_
accuracy: 0.4860
Epoch 230/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3810 - accuracy: 0.6170 - val_loss: 1.2547 - val_
accuracy: 0.4766
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3612 - accuracy: 0.6067 - val_loss: 1.2322 - val_
accuracy: 0.4626
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3081 - accuracy: 0.6041 - val_loss: 1.1986 - val_
accuracy: 0.4720
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3456 - accuracy: 0.6272 - val_loss: 1.2003 - val_
accuracy: 0.4766
Epoch 234/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.4170 - accuracy: 0.6272 - val_loss: 0.9997 - val_accuracy: 0.4766
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3110 - accuracy: 0.6247 - val_loss: 1.1602 - val_accuracy: 0.4673
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3111 - accuracy: 0.6144 - val_loss: 1.0696 - val_accuracy: 0.4766
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3029 - accuracy: 0.6041 - val_loss: 1.1278 - val_accuracy: 0.5047
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3356 - accuracy: 0.6504 - val_loss: 1.1314 - val_accuracy: 0.5000
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3856 - accuracy: 0.6015 - val_loss: 0.8932 - val_accuracy: 0.5514
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3163 - accuracy: 0.6170 - val_loss: 1.1260 - val_accuracy: 0.4486
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3174 - accuracy: 0.5835 - val_loss: 0.9359 - val_accuracy: 0.4533
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3652 - accuracy: 0.5501 - val_loss: 0.8858 - val_accuracy: 0.5140
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2775 - accuracy: 0.5733 - val_loss: 0.8916 - val_accuracy: 0.5421
Epoch 244/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2976 - accuracy: 0.5424 - val_loss: 0.8186 - val_accuracy: 0.5654
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3362 - accuracy: 0.5810 - val_loss: 1.0020 - val_accuracy: 0.5701
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3726 - accuracy: 0.5553 - val_loss: 0.8832 - val_accuracy: 0.5327
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4079 - accuracy: 0.5141 - val_loss: 0.8547 - val_accuracy: 0.5514
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2865 - accuracy: 0.5501 - val_loss: 0.8512 - val_accuracy: 0.5327
Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2890 - accuracy: 0.5630 - val_loss: 0.9993 - val_accuracy: 0.5093
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4134 - accuracy: 0.5784 - val_loss: 1.1467 - val_accuracy: 0.5000
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3124 - accuracy: 0.5707 - val_loss: 1.0215 - val_accuracy: 0.5000
Epoch 252/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3066 - accuracy: 0.5733 - val_loss: 0.9685 - val_accuracy: 0.4486
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3822 - accuracy: 0.5296 - val_loss: 1.2419 - val_accuracy: 0.4673
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3228 - accuracy: 0.5116 - val_loss: 1.2011 - val_accuracy: 0.4720
Epoch 255/1000
4/4 [=====] - 0s 19ms/step - loss: 0.2844 - accuracy: 0.5373 - val_loss: 1.0624 - val_accuracy: 0.5093
Epoch 256/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2826 - accuracy: 0.5630 - val_loss: 1.1443 - val_accuracy: 0.4860
Epoch 257/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3280 - accuracy: 0.5630 - val_loss: 1.0687 - val_accuracy: 0.4533
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3349 - accuracy: 0.5450 - val_loss: 1.0741 - val_accuracy: 0.4579
Epoch 259/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3541 - accuracy: 0.5501 - val_loss: 1.1324 - val_accuracy: 0.4673
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3425 - accuracy: 0.5296 - val_loss: 1.1676 - val_accuracy: 0.4907
Epoch 261/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3890 - accuracy: 0.5630 - val_loss: 1.1707 - val_accuracy: 0.4953
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3009 - accuracy: 0.5270 - val_loss: 1.1209 - val_accuracy: 0.4533
Epoch 263/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2628 - accuracy: 0.5476 - val_loss: 1.2290 - val_accuracy: 0.4533
```

Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4163 - accuracy: 0.5373 - val_loss: 1.2109 - val_accuracy: 0.4486
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3388 - accuracy: 0.5604 - val_loss: 0.9751 - val_accuracy: 0.5654
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3605 - accuracy: 0.6144 - val_loss: 0.9570 - val_accuracy: 0.5701
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2775 - accuracy: 0.5835 - val_loss: 0.9457 - val_accuracy: 0.5561
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3453 - accuracy: 0.5707 - val_loss: 0.9139 - val_accuracy: 0.5514
Epoch 269/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3546 - accuracy: 0.5810 - val_loss: 0.9150 - val_accuracy: 0.5561
Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3175 - accuracy: 0.5424 - val_loss: 0.9257 - val_accuracy: 0.5514
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2686 - accuracy: 0.5501 - val_loss: 0.9436 - val_accuracy: 0.5794
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3904 - accuracy: 0.5604 - val_loss: 0.7941 - val_accuracy: 0.5654
Epoch 273/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3858 - accuracy: 0.5990 - val_loss: 0.7947 - val_accuracy: 0.5654
Epoch 274/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3603 - accuracy: 0.5964 - val_loss: 0.8325 - val_accuracy: 0.5561
Epoch 275/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3527 - accuracy: 0.5758 - val_loss: 0.8326 - val_accuracy: 0.5421
Epoch 276/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3735 - accuracy: 0.5887 - val_loss: 0.8059 - val_accuracy: 0.5374
Epoch 277/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3162 - accuracy: 0.5861 - val_loss: 0.7968 - val_accuracy: 0.5374
Epoch 278/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3570 - accuracy: 0.5990 - val_loss: 0.7941 - val_accuracy: 0.5421
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3812 - accuracy: 0.5501 - val_loss: 0.7913 - val_accuracy: 0.5374
Epoch 280/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3842 - accuracy: 0.5887 - val_loss: 0.8180 - val_accuracy: 0.5327
Epoch 281/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3296 - accuracy: 0.5733 - val_loss: 0.8378 - val_accuracy: 0.5234
Epoch 282/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3532 - accuracy: 0.5707 - val_loss: 0.8348 - val_accuracy: 0.5280
Epoch 283/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3131 - accuracy: 0.5604 - val_loss: 0.8298 - val_accuracy: 0.5280
Epoch 284/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2895 - accuracy: 0.5707 - val_loss: 0.8275 - val_accuracy: 0.5467
Epoch 285/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3494 - accuracy: 0.5604 - val_loss: 0.8276 - val_accuracy: 0.5327
Epoch 286/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3370 - accuracy: 0.5707 - val_loss: 0.8815 - val_accuracy: 0.5280
Epoch 287/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3606 - accuracy: 0.5758 - val_loss: 0.9032 - val_accuracy: 0.5187
Epoch 288/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3385 - accuracy: 0.5501 - val_loss: 0.9043 - val_accuracy: 0.5280
Epoch 289/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2951 - accuracy: 0.5141 - val_loss: 0.8646 - val_accuracy: 0.5187
Epoch 290/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3141 - accuracy: 0.5296 - val_loss: 0.8208 - val_accuracy: 0.5140
Epoch 291/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3084 - accuracy: 0.5039 - val_loss: 0.8173 - val_accuracy: 0.5234
Epoch 292/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2798 - accuracy: 0.5167 - val_loss: 0.8413 - val_accuracy: 0.5093
Epoch 293/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3902 - accuracy: 0.5141 - val_loss: 0.8697 - val_accuracy: 0.5141

```
accuracy: 0.5234
Epoch 294/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3038 - accuracy: 0.5219 - val_loss: 0.8929 - val_accuracy: 0.5187
Epoch 295/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2687 - accuracy: 0.5064 - val_loss: 0.9376 - val_accuracy: 0.5234
Epoch 296/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2809 - accuracy: 0.5244 - val_loss: 0.9434 - val_accuracy: 0.5187
Epoch 297/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2725 - accuracy: 0.4936 - val_loss: 0.9054 - val_accuracy: 0.5047
Epoch 298/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3310 - accuracy: 0.4859 - val_loss: 0.9349 - val_accuracy: 0.4953
Epoch 299/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2986 - accuracy: 0.5013 - val_loss: 1.0755 - val_accuracy: 0.4626
Epoch 300/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3274 - accuracy: 0.5167 - val_loss: 0.8419 - val_accuracy: 0.5327
Epoch 301/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3043 - accuracy: 0.4833 - val_loss: 0.8941 - val_accuracy: 0.5140
Epoch 302/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3042 - accuracy: 0.5090 - val_loss: 1.0964 - val_accuracy: 0.4626
Epoch 303/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2405 - accuracy: 0.5141 - val_loss: 1.0379 - val_accuracy: 0.4579
Epoch 304/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3103 - accuracy: 0.4961 - val_loss: 1.0789 - val_accuracy: 0.4299
Epoch 305/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2495 - accuracy: 0.4576 - val_loss: 1.0763 - val_accuracy: 0.4299
Epoch 306/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3784 - accuracy: 0.4679 - val_loss: 0.9630 - val_accuracy: 0.4533
Epoch 307/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2779 - accuracy: 0.4576 - val_loss: 0.9931 - val_accuracy: 0.4579
Epoch 308/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3088 - accuracy: 0.4627 - val_loss: 0.8796 - val_accuracy: 0.4393
Epoch 309/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2491 - accuracy: 0.4627 - val_loss: 0.9462 - val_accuracy: 0.4439
Epoch 310/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2309 - accuracy: 0.4602 - val_loss: 0.8452 - val_accuracy: 0.4766
Epoch 311/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3647 - accuracy: 0.4679 - val_loss: 0.8437 - val_accuracy: 0.5000
Epoch 312/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3892 - accuracy: 0.4499 - val_loss: 0.8635 - val_accuracy: 0.4860
Epoch 313/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2950 - accuracy: 0.4833 - val_loss: 0.9294 - val_accuracy: 0.4953
Epoch 314/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3077 - accuracy: 0.4833 - val_loss: 0.9521 - val_accuracy: 0.5000
Epoch 315/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2531 - accuracy: 0.4807 - val_loss: 0.8030 - val_accuracy: 0.5000
Epoch 316/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2812 - accuracy: 0.4627 - val_loss: 0.8101 - val_accuracy: 0.4907
Epoch 317/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3767 - accuracy: 0.4859 - val_loss: 0.7379 - val_accuracy: 0.5514
Epoch 318/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2381 - accuracy: 0.5219 - val_loss: 0.7689 - val_accuracy: 0.5327
Epoch 319/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2177 - accuracy: 0.5219 - val_loss: 0.7690 - val_accuracy: 0.5280
Epoch 320/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2238 - accuracy: 0.5450 - val_loss: 0.7998 - val_accuracy: 0.5187
Epoch 321/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2842 - accuracy: 0.5244 - val_loss: 0.8211 - val_accuracy: 0.4720
Epoch 322/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2350 - accuracy: 0.5167 - val_loss: 0.7337 - val_accuracy: 0.5654
Epoch 323/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.2013 - accuracy: 0.5270 - val_loss: 0.7231 - val_accuracy: 0.5374
Epoch 324/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2529 - accuracy: 0.5090 - val_loss: 0.8060 - val_accuracy: 0.5234
Epoch 325/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2131 - accuracy: 0.5296 - val_loss: 0.7628 - val_accuracy: 0.5374
Epoch 326/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2523 - accuracy: 0.4987 - val_loss: 0.7367 - val_accuracy: 0.5467
Epoch 327/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2081 - accuracy: 0.5321 - val_loss: 0.7596 - val_accuracy: 0.5467
Epoch 328/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2206 - accuracy: 0.5219 - val_loss: 0.8577 - val_accuracy: 0.5421
Epoch 329/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2240 - accuracy: 0.5347 - val_loss: 0.8380 - val_accuracy: 0.5374
Epoch 330/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3185 - accuracy: 0.5347 - val_loss: 0.6574 - val_accuracy: 0.4813
Epoch 331/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2871 - accuracy: 0.5039 - val_loss: 0.8838 - val_accuracy: 0.4533
Epoch 332/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3073 - accuracy: 0.4859 - val_loss: 0.8149 - val_accuracy: 0.4766
Epoch 333/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3123 - accuracy: 0.4627 - val_loss: 0.8270 - val_accuracy: 0.4626
Epoch 334/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2722 - accuracy: 0.4859 - val_loss: 0.7552 - val_accuracy: 0.4626
Epoch 335/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2378 - accuracy: 0.5064 - val_loss: 0.8305 - val_accuracy: 0.4720
Epoch 336/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2046 - accuracy: 0.5219 - val_loss: 0.9181 - val_accuracy: 0.4953
Epoch 337/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2430 - accuracy: 0.5013 - val_loss: 1.0599 - val_accuracy: 0.4766
Epoch 338/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2540 - accuracy: 0.4833 - val_loss: 0.8594 - val_accuracy: 0.4533
Epoch 339/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2420 - accuracy: 0.4576 - val_loss: 0.8790 - val_accuracy: 0.4860
Epoch 340/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2078 - accuracy: 0.5039 - val_loss: 0.9238 - val_accuracy: 0.4766
Epoch 341/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3331 - accuracy: 0.4961 - val_loss: 0.8386 - val_accuracy: 0.5374
Epoch 342/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2623 - accuracy: 0.5296 - val_loss: 0.7824 - val_accuracy: 0.5467
Epoch 343/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2511 - accuracy: 0.4807 - val_loss: 0.8813 - val_accuracy: 0.5327
Epoch 344/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2493 - accuracy: 0.5321 - val_loss: 0.8891 - val_accuracy: 0.5047
Epoch 345/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2596 - accuracy: 0.5141 - val_loss: 0.9135 - val_accuracy: 0.5000
Epoch 346/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2135 - accuracy: 0.5116 - val_loss: 0.9900 - val_accuracy: 0.4813
Epoch 347/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3282 - accuracy: 0.5141 - val_loss: 0.9874 - val_accuracy: 0.4673
Epoch 348/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2194 - accuracy: 0.5064 - val_loss: 0.9528 - val_accuracy: 0.4907
Epoch 349/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3570 - accuracy: 0.5296 - val_loss: 0.9082 - val_accuracy: 0.5000
Epoch 350/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2910 - accuracy: 0.5296 - val_loss: 0.8518 - val_accuracy: 0.5140
Epoch 351/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2557 - accuracy: 0.5424 - val_loss: 0.9613 - val_accuracy: 0.5467
Epoch 352/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3772 - accuracy: 0.5219 - val_loss: 0.9797 - val_accuracy: 0.5093
```

```

Epoch 353/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2277 - accuracy: 0.5476 - val_loss: 1.0019 - val_accuracy: 0.5000
Epoch 354/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3552 - accuracy: 0.5398 - val_loss: 0.8365 - val_accuracy: 0.5280
Epoch 355/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2586 - accuracy: 0.5347 - val_loss: 0.7750 - val_accuracy: 0.5467
Epoch 356/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3427 - accuracy: 0.5859Restoring model weights from th
e end of the best epoch: 206.
4/4 [=====] - 0s 14ms/step - loss: 0.2913 - accuracy: 0.5244 - val_loss: 0.8154 - val_accuracy: 0.5000
Epoch 356: early stopping
2/2 [=====] - 0s 3ms/step - loss: 0.9020 - accuracy: 0.5814
[CV] END .....Dense1=100, Dense2=10; total time= 18.8s
Model: "sequential_75"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_300 (Dense)	(None, 100)	700
batch_normalization_225 (BatchNormalization)	(None, 100)	400
activation_225 (Activation)	(None, 100)	0
dense_301 (Dense)	(None, 10)	1010
batch_normalization_226 (BatchNormalization)	(None, 10)	40
activation_226 (Activation)	(None, 10)	0
dense_302 (Dense)	(None, 10)	110
batch_normalization_227 (BatchNormalization)	(None, 10)	40
activation_227 (Activation)	(None, 10)	0
dense_303 (Dense)	(None, 2)	22
<hr/>		

Total params: 2,322
Trainable params: 2,082
Non-trainable params: 240

```

Epoch 1/1000
4/4 [=====] - 1s 56ms/step - loss: 3.9483 - accuracy: 0.5013 - val_loss: 2.5840 - val_accuracy: 0.4720
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 2.9730 - accuracy: 0.4524 - val_loss: 2.1500 - val_accuracy: 0.4626
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5547 - accuracy: 0.4627 - val_loss: 2.0530 - val_accuracy: 0.3037
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2019 - accuracy: 0.4833 - val_loss: 1.9767 - val_accuracy: 0.3178
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9966 - accuracy: 0.4704 - val_loss: 1.9206 - val_accuracy: 0.3598
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9115 - accuracy: 0.4370 - val_loss: 1.9148 - val_accuracy: 0.3318
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9206 - accuracy: 0.4473 - val_loss: 1.8842 - val_accuracy: 0.3598
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7724 - accuracy: 0.4165 - val_loss: 1.8372 - val_accuracy: 0.3458
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6425 - accuracy: 0.4344 - val_loss: 1.8202 - val_accuracy: 0.4766
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7625 - accuracy: 0.4190 - val_loss: 1.7971 - val_accuracy: 0.3972
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7005 - accuracy: 0.4370 - val_loss: 1.7752 - val_accuracy: 0.4206
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7048 - accuracy: 0.4062 - val_loss: 1.7545 - val_accuracy: 0.4252
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6499 - accuracy: 0.4242 - val_loss: 1.7210 - val_accuracy: 0.4439
Epoch 14/1000

```

```
4/4 [=====] - 0s 13ms/step - loss: 1.4440 - accuracy: 0.4396 - val_loss: 1.6754 - val_accuracy: 0.3972
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4899 - accuracy: 0.4036 - val_loss: 1.6591 - val_accuracy: 0.3645
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4983 - accuracy: 0.4344 - val_loss: 1.6429 - val_accuracy: 0.3598
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5009 - accuracy: 0.4807 - val_loss: 1.6294 - val_accuracy: 0.3458
Epoch 18/1000
4/4 [=====] - 0s 15ms/step - loss: 1.4756 - accuracy: 0.4781 - val_loss: 1.5909 - val_accuracy: 0.3318
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3340 - accuracy: 0.4679 - val_loss: 1.5491 - val_accuracy: 0.2757
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3223 - accuracy: 0.4679 - val_loss: 1.5407 - val_accuracy: 0.2664
Epoch 21/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2467 - accuracy: 0.4473 - val_loss: 1.5077 - val_accuracy: 0.3458
Epoch 22/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2275 - accuracy: 0.4576 - val_loss: 1.4864 - val_accuracy: 0.3364
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1110 - accuracy: 0.4473 - val_loss: 1.4866 - val_accuracy: 0.3037
Epoch 24/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1954 - accuracy: 0.4293 - val_loss: 1.4747 - val_accuracy: 0.4486
Epoch 25/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1496 - accuracy: 0.4267 - val_loss: 1.4462 - val_accuracy: 0.4439
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1091 - accuracy: 0.4422 - val_loss: 1.4377 - val_accuracy: 0.4393
Epoch 27/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0983 - accuracy: 0.4576 - val_loss: 1.4195 - val_accuracy: 0.4393
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0359 - accuracy: 0.4524 - val_loss: 1.3877 - val_accuracy: 0.4346
Epoch 29/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0021 - accuracy: 0.4370 - val_loss: 1.3707 - val_accuracy: 0.4439
Epoch 30/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0482 - accuracy: 0.4550 - val_loss: 1.3520 - val_accuracy: 0.4579
Epoch 31/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9805 - accuracy: 0.4833 - val_loss: 1.3459 - val_accuracy: 0.3224
Epoch 32/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9842 - accuracy: 0.4679 - val_loss: 1.3587 - val_accuracy: 0.3271
Epoch 33/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9623 - accuracy: 0.4576 - val_loss: 1.3115 - val_accuracy: 0.3411
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9739 - accuracy: 0.4781 - val_loss: 1.3061 - val_accuracy: 0.3505
Epoch 35/1000
4/4 [=====] - 0s 16ms/step - loss: 0.9567 - accuracy: 0.4653 - val_loss: 1.2836 - val_accuracy: 0.3084
Epoch 36/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9943 - accuracy: 0.4704 - val_loss: 1.2911 - val_accuracy: 0.3224
Epoch 37/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9061 - accuracy: 0.4602 - val_loss: 1.2845 - val_accuracy: 0.3084
Epoch 38/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8814 - accuracy: 0.4781 - val_loss: 1.2746 - val_accuracy: 0.3131
Epoch 39/1000
4/4 [=====] - 0s 17ms/step - loss: 0.9120 - accuracy: 0.4936 - val_loss: 1.3271 - val_accuracy: 0.3551
Epoch 40/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9734 - accuracy: 0.4961 - val_loss: 1.3130 - val_accuracy: 0.3505
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9226 - accuracy: 0.4756 - val_loss: 1.2605 - val_accuracy: 0.3551
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9292 - accuracy: 0.5013 - val_loss: 1.2622 - val_accuracy: 0.3364
Epoch 43/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8879 - accuracy: 0.4833 - val_loss: 1.2477 - val_accuracy: 0.3411
```

Epoch 44/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9281 - accuracy: 0.4807 - val_loss: 1.2585 - val_accuracy: 0.3318
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8813 - accuracy: 0.5090 - val_loss: 1.2554 - val_accuracy: 0.4673
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8592 - accuracy: 0.5116 - val_loss: 1.2190 - val_accuracy: 0.4626
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9173 - accuracy: 0.4961 - val_loss: 1.2167 - val_accuracy: 0.4533
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8959 - accuracy: 0.4987 - val_loss: 1.2070 - val_accuracy: 0.4533
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9349 - accuracy: 0.5090 - val_loss: 1.2196 - val_accuracy: 0.4486
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0554 - accuracy: 0.5013 - val_loss: 1.2213 - val_accuracy: 0.4579
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8433 - accuracy: 0.5064 - val_loss: 1.2194 - val_accuracy: 0.4579
Epoch 52/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8441 - accuracy: 0.5373 - val_loss: 1.2161 - val_accuracy: 0.4579
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8419 - accuracy: 0.4833 - val_loss: 1.2057 - val_accuracy: 0.4579
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7833 - accuracy: 0.5013 - val_loss: 1.2016 - val_accuracy: 0.4486
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7924 - accuracy: 0.4987 - val_loss: 1.2158 - val_accuracy: 0.4579
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8257 - accuracy: 0.5347 - val_loss: 1.1822 - val_accuracy: 0.4393
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7339 - accuracy: 0.5373 - val_loss: 1.1809 - val_accuracy: 0.4393
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8470 - accuracy: 0.5244 - val_loss: 1.1772 - val_accuracy: 0.4486
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7671 - accuracy: 0.5527 - val_loss: 1.1635 - val_accuracy: 0.4299
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7053 - accuracy: 0.5039 - val_loss: 1.1510 - val_accuracy: 0.4393
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7958 - accuracy: 0.5219 - val_loss: 1.1489 - val_accuracy: 0.4393
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7863 - accuracy: 0.5296 - val_loss: 1.1430 - val_accuracy: 0.4393
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7849 - accuracy: 0.5116 - val_loss: 1.1341 - val_accuracy: 0.4346
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7446 - accuracy: 0.5013 - val_loss: 1.1270 - val_accuracy: 0.4252
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7823 - accuracy: 0.4756 - val_loss: 1.1200 - val_accuracy: 0.4299
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7301 - accuracy: 0.4833 - val_loss: 1.1126 - val_accuracy: 0.4299
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7378 - accuracy: 0.4859 - val_loss: 1.0802 - val_accuracy: 0.4252
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6691 - accuracy: 0.4961 - val_loss: 1.0701 - val_accuracy: 0.4393
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7072 - accuracy: 0.5270 - val_loss: 1.0449 - val_accuracy: 0.4346
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8050 - accuracy: 0.5141 - val_loss: 1.0094 - val_accuracy: 0.4393
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7952 - accuracy: 0.5064 - val_loss: 1.0088 - val_accuracy: 0.4112
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6963 - accuracy: 0.5193 - val_loss: 0.9971 - val_accuracy: 0.4112
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7901 - accuracy: 0.5373 - val_loss: 1.0366 - val_accuracy: 0.4112

```
accuracy: 0.4299
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7253 - accuracy: 0.5424 - val_loss: 0.9789 - val_accuracy: 0.4299
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7629 - accuracy: 0.5630 - val_loss: 1.0079 - val_accuracy: 0.4533
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6667 - accuracy: 0.5450 - val_loss: 1.0229 - val_accuracy: 0.4486
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7730 - accuracy: 0.5630 - val_loss: 0.9351 - val_accuracy: 0.4439
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8492 - accuracy: 0.5578 - val_loss: 0.9175 - val_accuracy: 0.4486
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6264 - accuracy: 0.5476 - val_loss: 0.8995 - val_accuracy: 0.4393
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7269 - accuracy: 0.5578 - val_loss: 0.8875 - val_accuracy: 0.4626
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7010 - accuracy: 0.5861 - val_loss: 0.8872 - val_accuracy: 0.4486
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6173 - accuracy: 0.5630 - val_loss: 0.9072 - val_accuracy: 0.4579
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6577 - accuracy: 0.5938 - val_loss: 0.9084 - val_accuracy: 0.4673
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6355 - accuracy: 0.5810 - val_loss: 0.8950 - val_accuracy: 0.4720
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7419 - accuracy: 0.5861 - val_loss: 0.8556 - val_accuracy: 0.4579
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6242 - accuracy: 0.5990 - val_loss: 0.8346 - val_accuracy: 0.4720
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6375 - accuracy: 0.5938 - val_loss: 0.8127 - val_accuracy: 0.4766
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6796 - accuracy: 0.6247 - val_loss: 0.8102 - val_accuracy: 0.4907
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5710 - accuracy: 0.5630 - val_loss: 0.7130 - val_accuracy: 0.5047
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7656 - accuracy: 0.5964 - val_loss: 0.7287 - val_accuracy: 0.5093
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6649 - accuracy: 0.5990 - val_loss: 0.7111 - val_accuracy: 0.5000
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6456 - accuracy: 0.5758 - val_loss: 0.7045 - val_accuracy: 0.4907
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6240 - accuracy: 0.5656 - val_loss: 0.7001 - val_accuracy: 0.4860
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6021 - accuracy: 0.5733 - val_loss: 0.6938 - val_accuracy: 0.5000
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5239 - accuracy: 0.5810 - val_loss: 0.7530 - val_accuracy: 0.5000
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6934 - accuracy: 0.5913 - val_loss: 0.7485 - val_accuracy: 0.4766
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6111 - accuracy: 0.5784 - val_loss: 0.6653 - val_accuracy: 0.4907
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6132 - accuracy: 0.5707 - val_loss: 0.6706 - val_accuracy: 0.5000
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5333 - accuracy: 0.5913 - val_loss: 0.6461 - val_accuracy: 0.5000
Epoch 100/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5833 - accuracy: 0.5861 - val_loss: 0.6031 - val_accuracy: 0.5187
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5606 - accuracy: 0.6170 - val_loss: 0.6107 - val_accuracy: 0.5234
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5992 - accuracy: 0.5707 - val_loss: 0.6217 - val_accuracy: 0.4860
Epoch 103/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.5047 - accuracy: 0.5810 - val_loss: 0.6055 - val_accuracy: 0.4813
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5120 - accuracy: 0.5527 - val_loss: 0.6363 - val_accuracy: 0.4626
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5164 - accuracy: 0.5810 - val_loss: 0.6307 - val_accuracy: 0.4766
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5195 - accuracy: 0.5656 - val_loss: 0.6444 - val_accuracy: 0.4579
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5558 - accuracy: 0.5578 - val_loss: 0.6217 - val_accuracy: 0.4673
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5605 - accuracy: 0.5450 - val_loss: 0.6560 - val_accuracy: 0.4626
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5783 - accuracy: 0.6041 - val_loss: 0.6622 - val_accuracy: 0.4673
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5754 - accuracy: 0.5501 - val_loss: 0.6544 - val_accuracy: 0.4673
Epoch 111/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6317 - accuracy: 0.5835 - val_loss: 0.6763 - val_accuracy: 0.4626
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5791 - accuracy: 0.5553 - val_loss: 0.6762 - val_accuracy: 0.4860
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6461 - accuracy: 0.5733 - val_loss: 0.6705 - val_accuracy: 0.4860
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5324 - accuracy: 0.5270 - val_loss: 0.6609 - val_accuracy: 0.4860
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5551 - accuracy: 0.5501 - val_loss: 0.6560 - val_accuracy: 0.4860
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5157 - accuracy: 0.5373 - val_loss: 0.6542 - val_accuracy: 0.4953
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5180 - accuracy: 0.5090 - val_loss: 0.6517 - val_accuracy: 0.4813
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6153 - accuracy: 0.5553 - val_loss: 0.7029 - val_accuracy: 0.4346
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5308 - accuracy: 0.5321 - val_loss: 0.6483 - val_accuracy: 0.4299
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4936 - accuracy: 0.5476 - val_loss: 0.6450 - val_accuracy: 0.4299
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5231 - accuracy: 0.5347 - val_loss: 0.6634 - val_accuracy: 0.4346
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5555 - accuracy: 0.5630 - val_loss: 0.6749 - val_accuracy: 0.4252
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4750 - accuracy: 0.5167 - val_loss: 0.6973 - val_accuracy: 0.4486
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4956 - accuracy: 0.5604 - val_loss: 0.7513 - val_accuracy: 0.4346
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5743 - accuracy: 0.5527 - val_loss: 0.7812 - val_accuracy: 0.4486
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5383 - accuracy: 0.5450 - val_loss: 0.7030 - val_accuracy: 0.4439
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5249 - accuracy: 0.5347 - val_loss: 0.8473 - val_accuracy: 0.4766
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4295 - accuracy: 0.5476 - val_loss: 0.8779 - val_accuracy: 0.4766
Epoch 129/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5430 - accuracy: 0.5604 - val_loss: 0.7498 - val_accuracy: 0.5000
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5199 - accuracy: 0.5604 - val_loss: 0.7230 - val_accuracy: 0.4579
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4763 - accuracy: 0.5887 - val_loss: 0.7155 - val_accuracy: 0.4953
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5115 - accuracy: 0.5861 - val_loss: 0.6882 - val_accuracy: 0.4346
```

Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5111 - accuracy: 0.5630 - val_loss: 0.6942 - val_accuracy: 0.4393
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5226 - accuracy: 0.6093 - val_loss: 0.6897 - val_accuracy: 0.4439
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4385 - accuracy: 0.6015 - val_loss: 0.6886 - val_accuracy: 0.4299
Epoch 136/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4520 - accuracy: 0.5887 - val_loss: 0.7009 - val_accuracy: 0.4346
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5494 - accuracy: 0.5758 - val_loss: 0.6996 - val_accuracy: 0.4439
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5338 - accuracy: 0.6093 - val_loss: 0.7214 - val_accuracy: 0.4579
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4524 - accuracy: 0.5913 - val_loss: 0.6725 - val_accuracy: 0.4626
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4337 - accuracy: 0.5707 - val_loss: 0.7164 - val_accuracy: 0.4673
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4669 - accuracy: 0.5810 - val_loss: 0.7183 - val_accuracy: 0.4626
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5001 - accuracy: 0.5887 - val_loss: 0.7151 - val_accuracy: 0.4766
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4826 - accuracy: 0.5810 - val_loss: 0.7421 - val_accuracy: 0.4533
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4882 - accuracy: 0.5887 - val_loss: 0.7871 - val_accuracy: 0.4907
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4353 - accuracy: 0.5887 - val_loss: 0.7195 - val_accuracy: 0.4813
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5478 - accuracy: 0.5861 - val_loss: 0.7211 - val_accuracy: 0.4813
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4769 - accuracy: 0.6067 - val_loss: 0.7470 - val_accuracy: 0.5000
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4720 - accuracy: 0.5578 - val_loss: 0.7759 - val_accuracy: 0.5701
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4724 - accuracy: 0.5887 - val_loss: 0.7769 - val_accuracy: 0.5514
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4312 - accuracy: 0.5758 - val_loss: 0.7785 - val_accuracy: 0.5514
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4741 - accuracy: 0.5784 - val_loss: 0.7756 - val_accuracy: 0.5561
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4353 - accuracy: 0.5913 - val_loss: 0.7530 - val_accuracy: 0.5467
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4370 - accuracy: 0.6015 - val_loss: 0.9261 - val_accuracy: 0.5280
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5067 - accuracy: 0.6247 - val_loss: 0.9040 - val_accuracy: 0.5187
Epoch 155/1000
4/4 [=====] - 0s 18ms/step - loss: 0.4181 - accuracy: 0.6093 - val_loss: 0.8442 - val_accuracy: 0.5234
Epoch 156/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4920 - accuracy: 0.5861 - val_loss: 0.8124 - val_accuracy: 0.5234
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4734 - accuracy: 0.6015 - val_loss: 0.9370 - val_accuracy: 0.5654
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4716 - accuracy: 0.6015 - val_loss: 0.9512 - val_accuracy: 0.5514
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4379 - accuracy: 0.6170 - val_loss: 0.9259 - val_accuracy: 0.5981
Epoch 160/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4882 - accuracy: 0.6170 - val_loss: 0.9349 - val_accuracy: 0.5607
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4060 - accuracy: 0.6272 - val_loss: 0.9438 - val_accuracy: 0.5654
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4869 - accuracy: 0.6170 - val_loss: 0.9297 - val_accuracy: 0.5981

```
accuracy: 0.5841
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4209 - accuracy: 0.5784 - val_loss: 0.8838 - val_
accuracy: 0.5888
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4333 - accuracy: 0.5964 - val_loss: 0.8736 - val_
accuracy: 0.5981
Epoch 165/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4738 - accuracy: 0.6093 - val_loss: 0.7981 - val_
accuracy: 0.6028
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4913 - accuracy: 0.6247 - val_loss: 0.8186 - val_
accuracy: 0.6121
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4461 - accuracy: 0.6170 - val_loss: 0.9065 - val_
accuracy: 0.5748
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4251 - accuracy: 0.6093 - val_loss: 0.9716 - val_
accuracy: 0.5467
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4096 - accuracy: 0.6427 - val_loss: 0.9204 - val_
accuracy: 0.5187
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4334 - accuracy: 0.5656 - val_loss: 0.8133 - val_
accuracy: 0.5514
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3945 - accuracy: 0.6067 - val_loss: 0.8134 - val_
accuracy: 0.5514
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4558 - accuracy: 0.6041 - val_loss: 0.8199 - val_
accuracy: 0.5888
Epoch 173/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3985 - accuracy: 0.5938 - val_loss: 0.8686 - val_
accuracy: 0.5748
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4509 - accuracy: 0.5990 - val_loss: 0.8820 - val_
accuracy: 0.6215
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4004 - accuracy: 0.5887 - val_loss: 0.8782 - val_
accuracy: 0.5981
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4376 - accuracy: 0.5913 - val_loss: 0.8455 - val_
accuracy: 0.5981
Epoch 177/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5159 - accuracy: 0.5656 - val_loss: 0.8443 - val_
accuracy: 0.6262
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4660 - accuracy: 0.6041 - val_loss: 0.9009 - val_
accuracy: 0.6449
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4561 - accuracy: 0.5887 - val_loss: 1.1399 - val_
accuracy: 0.6168
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4821 - accuracy: 0.5656 - val_loss: 1.0535 - val_
accuracy: 0.6168
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4132 - accuracy: 0.5938 - val_loss: 1.0823 - val_
accuracy: 0.6168
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3980 - accuracy: 0.5964 - val_loss: 1.0437 - val_
accuracy: 0.6215
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4634 - accuracy: 0.5990 - val_loss: 1.0475 - val_
accuracy: 0.6121
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4703 - accuracy: 0.5784 - val_loss: 0.8955 - val_
accuracy: 0.5701
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4398 - accuracy: 0.6015 - val_loss: 0.9408 - val_
accuracy: 0.5421
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4244 - accuracy: 0.6118 - val_loss: 0.8342 - val_
accuracy: 0.5047
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4028 - accuracy: 0.5707 - val_loss: 0.8077 - val_
accuracy: 0.5093
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4367 - accuracy: 0.5656 - val_loss: 0.8002 - val_
accuracy: 0.5140
Epoch 189/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5008 - accuracy: 0.5681 - val_loss: 0.8033 - val_
accuracy: 0.5140
Epoch 190/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3825 - accuracy: 0.5450 - val_loss: 0.8029 - val_
accuracy: 0.5093
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4261 - accuracy: 0.5810 - val_loss: 0.8078 - val_
accuracy: 0.5280
Epoch 192/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.4261 - accuracy: 0.5784 - val_loss: 0.8030 - val_accuracy: 0.5187
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4205 - accuracy: 0.5707 - val_loss: 0.8059 - val_accuracy: 0.5093
Epoch 194/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3872 - accuracy: 0.5681 - val_loss: 0.8326 - val_accuracy: 0.5093
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3895 - accuracy: 0.5810 - val_loss: 0.8818 - val_accuracy: 0.5000
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4706 - accuracy: 0.5424 - val_loss: 0.9141 - val_accuracy: 0.5000
Epoch 197/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4030 - accuracy: 0.5810 - val_loss: 0.8879 - val_accuracy: 0.5187
Epoch 198/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4757 - accuracy: 0.6118 - val_loss: 0.8978 - val_accuracy: 0.5093
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4129 - accuracy: 0.5964 - val_loss: 0.8784 - val_accuracy: 0.5047
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4687 - accuracy: 0.5784 - val_loss: 0.9178 - val_accuracy: 0.5234
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4602 - accuracy: 0.5887 - val_loss: 0.8855 - val_accuracy: 0.4953
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4288 - accuracy: 0.5810 - val_loss: 0.8888 - val_accuracy: 0.5093
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4087 - accuracy: 0.5861 - val_loss: 0.9411 - val_accuracy: 0.5234
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4562 - accuracy: 0.6041 - val_loss: 0.9103 - val_accuracy: 0.5140
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4571 - accuracy: 0.6067 - val_loss: 0.8851 - val_accuracy: 0.5234
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4512 - accuracy: 0.5707 - val_loss: 0.8888 - val_accuracy: 0.5280
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4196 - accuracy: 0.5681 - val_loss: 0.8406 - val_accuracy: 0.5187
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4564 - accuracy: 0.5656 - val_loss: 0.8861 - val_accuracy: 0.4860
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3823 - accuracy: 0.5835 - val_loss: 0.8775 - val_accuracy: 0.5234
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3997 - accuracy: 0.5758 - val_loss: 0.8987 - val_accuracy: 0.4766
Epoch 211/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4694 - accuracy: 0.6067 - val_loss: 0.9794 - val_accuracy: 0.5000
Epoch 212/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4486 - accuracy: 0.5553 - val_loss: 0.8509 - val_accuracy: 0.5467
Epoch 213/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4133 - accuracy: 0.5964 - val_loss: 0.8508 - val_accuracy: 0.5421
Epoch 214/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3899 - accuracy: 0.5990 - val_loss: 0.8305 - val_accuracy: 0.5234
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4206 - accuracy: 0.5861 - val_loss: 0.8815 - val_accuracy: 0.4907
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4674 - accuracy: 0.5938 - val_loss: 0.9583 - val_accuracy: 0.4953
Epoch 217/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4307 - accuracy: 0.5938 - val_loss: 0.9248 - val_accuracy: 0.4673
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4199 - accuracy: 0.5527 - val_loss: 0.9112 - val_accuracy: 0.4579
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4079 - accuracy: 0.5604 - val_loss: 0.9076 - val_accuracy: 0.5327
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3854 - accuracy: 0.5861 - val_loss: 0.8895 - val_accuracy: 0.5187
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4166 - accuracy: 0.5733 - val_loss: 0.8532 - val_accuracy: 0.5140
```

Epoch 222/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4978 - accuracy: 0.5964 - val_loss: 0.8784 - val_accuracy: 0.4953
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4238 - accuracy: 0.6195 - val_loss: 0.8080 - val_accuracy: 0.4953
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4066 - accuracy: 0.6015 - val_loss: 0.8424 - val_accuracy: 0.5701
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4626 - accuracy: 0.6632 - val_loss: 0.8208 - val_accuracy: 0.5467
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4238 - accuracy: 0.6375 - val_loss: 0.8159 - val_accuracy: 0.5467
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4585 - accuracy: 0.6144 - val_loss: 1.0356 - val_accuracy: 0.6121
Epoch 228/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5302 - accuracy: 0.6452 - val_loss: 1.0239 - val_accuracy: 0.6168
Epoch 229/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5182 - accuracy: 0.6375 - val_loss: 1.0368 - val_accuracy: 0.5981
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3722 - accuracy: 0.6298 - val_loss: 1.0346 - val_accuracy: 0.6215
Epoch 231/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4234 - accuracy: 0.6221 - val_loss: 1.2619 - val_accuracy: 0.5701
Epoch 232/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4655 - accuracy: 0.6247 - val_loss: 1.2828 - val_accuracy: 0.5841
Epoch 233/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4381 - accuracy: 0.6324 - val_loss: 0.9297 - val_accuracy: 0.6542
Epoch 234/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4455 - accuracy: 0.6350 - val_loss: 0.9280 - val_accuracy: 0.6495
Epoch 235/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4645 - accuracy: 0.6375 - val_loss: 0.8993 - val_accuracy: 0.6402
Epoch 236/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3604 - accuracy: 0.6144 - val_loss: 0.8970 - val_accuracy: 0.6215
Epoch 237/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3842 - accuracy: 0.6041 - val_loss: 0.9187 - val_accuracy: 0.6262
Epoch 238/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3757 - accuracy: 0.6170 - val_loss: 0.9426 - val_accuracy: 0.6215
Epoch 239/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3959 - accuracy: 0.6093 - val_loss: 0.9583 - val_accuracy: 0.6168
Epoch 240/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3714 - accuracy: 0.6581 - val_loss: 0.9364 - val_accuracy: 0.6168
Epoch 241/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3698 - accuracy: 0.6504 - val_loss: 0.9294 - val_accuracy: 0.6262
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3838 - accuracy: 0.6401 - val_loss: 0.9906 - val_accuracy: 0.6121
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4089 - accuracy: 0.6452 - val_loss: 1.0430 - val_accuracy: 0.6168
Epoch 244/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3746 - accuracy: 0.6298 - val_loss: 1.0119 - val_accuracy: 0.6121
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4180 - accuracy: 0.6041 - val_loss: 1.0388 - val_accuracy: 0.6075
Epoch 246/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3742 - accuracy: 0.6478 - val_loss: 0.9089 - val_accuracy: 0.6121
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4581 - accuracy: 0.6015 - val_loss: 0.8658 - val_accuracy: 0.6028
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4067 - accuracy: 0.6324 - val_loss: 0.8697 - val_accuracy: 0.5981
Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4841 - accuracy: 0.5990 - val_loss: 0.8618 - val_accuracy: 0.6121
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4833 - accuracy: 0.6247 - val_loss: 0.8798 - val_accuracy: 0.6262
Epoch 251/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4184 - accuracy: 0.6015 - val_loss: 0.8845 - val_accuracy: 0.6121

```
accuracy: 0.6168
Epoch 252/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3568 - accuracy: 0.6555 - val_loss: 0.9095 - val_accuracy: 0.5981
Epoch 253/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3605 - accuracy: 0.6375 - val_loss: 0.9427 - val_accuracy: 0.6075
Epoch 254/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3793 - accuracy: 0.6298 - val_loss: 0.9594 - val_accuracy: 0.5748
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3737 - accuracy: 0.6530 - val_loss: 0.9793 - val_accuracy: 0.5794
Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3873 - accuracy: 0.6761 - val_loss: 0.9408 - val_accuracy: 0.5654
Epoch 257/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3646 - accuracy: 0.6684 - val_loss: 1.0268 - val_accuracy: 0.5234
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4480 - accuracy: 0.6170 - val_loss: 1.1428 - val_accuracy: 0.5047
Epoch 259/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3541 - accuracy: 0.6401 - val_loss: 1.0546 - val_accuracy: 0.5093
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3569 - accuracy: 0.6324 - val_loss: 0.9443 - val_accuracy: 0.5234
Epoch 261/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3628 - accuracy: 0.6555 - val_loss: 0.9507 - val_accuracy: 0.5421
Epoch 262/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4043 - accuracy: 0.6247 - val_loss: 0.8804 - val_accuracy: 0.5140
Epoch 263/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3884 - accuracy: 0.6658 - val_loss: 0.9160 - val_accuracy: 0.5093
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3728 - accuracy: 0.6195 - val_loss: 0.9167 - val_accuracy: 0.5093
Epoch 265/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3947 - accuracy: 0.6170 - val_loss: 0.9292 - val_accuracy: 0.5187
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4269 - accuracy: 0.6658 - val_loss: 0.8684 - val_accuracy: 0.5280
Epoch 267/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4225 - accuracy: 0.6555 - val_loss: 0.8711 - val_accuracy: 0.5888
Epoch 268/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3369 - accuracy: 0.6761 - val_loss: 0.9199 - val_accuracy: 0.5794
Epoch 269/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4643 - accuracy: 0.6324 - val_loss: 1.1571 - val_accuracy: 0.6168
Epoch 270/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4540 - accuracy: 0.6581 - val_loss: 1.0319 - val_accuracy: 0.5981
Epoch 271/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3897 - accuracy: 0.6632 - val_loss: 1.0232 - val_accuracy: 0.6168
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4521 - accuracy: 0.6324 - val_loss: 1.0195 - val_accuracy: 0.5981
Epoch 273/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3729 - accuracy: 0.6658 - val_loss: 1.0261 - val_accuracy: 0.6028
Epoch 274/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4219 - accuracy: 0.6684 - val_loss: 1.0318 - val_accuracy: 0.6075
Epoch 275/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3520 - accuracy: 0.6787 - val_loss: 1.0673 - val_accuracy: 0.5701
Epoch 276/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3909 - accuracy: 0.6632 - val_loss: 1.1148 - val_accuracy: 0.5748
Epoch 277/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4020 - accuracy: 0.6632 - val_loss: 1.1187 - val_accuracy: 0.5654
Epoch 278/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3414 - accuracy: 0.6864 - val_loss: 1.0745 - val_accuracy: 0.5607
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3151 - accuracy: 0.6555 - val_loss: 1.0111 - val_accuracy: 0.6308
Epoch 280/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3262 - accuracy: 0.6607 - val_loss: 0.9485 - val_accuracy: 0.6495
Epoch 281/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.3670 - accuracy: 0.6864 - val_loss: 0.9759 - val_accuracy: 0.6262
Epoch 282/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4581 - accuracy: 0.6812 - val_loss: 0.9761 - val_accuracy: 0.6028
Epoch 283/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4148 - accuracy: 0.6658 - val_loss: 0.9287 - val_accuracy: 0.5935
Epoch 284/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4016 - accuracy: 0.6452 - val_loss: 0.9988 - val_accuracy: 0.6262
Epoch 285/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3645 - accuracy: 0.6735 - val_loss: 1.0018 - val_accuracy: 0.6121
Epoch 286/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3818 - accuracy: 0.6478 - val_loss: 0.9556 - val_accuracy: 0.6075
Epoch 287/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3750 - accuracy: 0.6350 - val_loss: 0.9787 - val_accuracy: 0.6075
Epoch 288/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3819 - accuracy: 0.6658 - val_loss: 0.9117 - val_accuracy: 0.6028
Epoch 289/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3773 - accuracy: 0.6632 - val_loss: 0.8880 - val_accuracy: 0.6168
Epoch 290/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3833 - accuracy: 0.6787 - val_loss: 0.8562 - val_accuracy: 0.6215
Epoch 291/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3148 - accuracy: 0.6967 - val_loss: 0.8317 - val_accuracy: 0.5935
Epoch 292/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3469 - accuracy: 0.6889 - val_loss: 0.8841 - val_accuracy: 0.5514
Epoch 293/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3829 - accuracy: 0.6684 - val_loss: 0.8717 - val_accuracy: 0.5935
Epoch 294/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4373 - accuracy: 0.6967 - val_loss: 0.9050 - val_accuracy: 0.6075
Epoch 295/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4326 - accuracy: 0.6195 - val_loss: 0.8421 - val_accuracy: 0.5701
Epoch 296/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3729 - accuracy: 0.6684 - val_loss: 0.8365 - val_accuracy: 0.5234
Epoch 297/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3232 - accuracy: 0.6272 - val_loss: 0.8816 - val_accuracy: 0.5234
Epoch 298/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3665 - accuracy: 0.6555 - val_loss: 0.8978 - val_accuracy: 0.5514
Epoch 299/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4066 - accuracy: 0.6864 - val_loss: 0.8773 - val_accuracy: 0.5234
Epoch 300/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3508 - accuracy: 0.6452 - val_loss: 0.8651 - val_accuracy: 0.5280
Epoch 301/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3487 - accuracy: 0.6710 - val_loss: 0.9819 - val_accuracy: 0.5234
Epoch 302/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3845 - accuracy: 0.6787 - val_loss: 0.9878 - val_accuracy: 0.5187
Epoch 303/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4028 - accuracy: 0.6684 - val_loss: 0.9631 - val_accuracy: 0.5000
Epoch 304/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4219 - accuracy: 0.6658 - val_loss: 1.1326 - val_accuracy: 0.4766
Epoch 305/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3782 - accuracy: 0.6324 - val_loss: 1.0856 - val_accuracy: 0.5093
Epoch 306/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4007 - accuracy: 0.6324 - val_loss: 1.0386 - val_accuracy: 0.5093
Epoch 307/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4301 - accuracy: 0.6735 - val_loss: 1.0453 - val_accuracy: 0.5421
Epoch 308/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3470 - accuracy: 0.6478 - val_loss: 0.9817 - val_accuracy: 0.5187
Epoch 309/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3366 - accuracy: 0.6427 - val_loss: 1.0858 - val_accuracy: 0.5514
Epoch 310/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3627 - accuracy: 0.6684 - val_loss: 1.0917 - val_accuracy: 0.5327
```

Epoch 311/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3424 - accuracy: 0.6530 - val_loss: 1.0622 - val_accuracy: 0.5561
Epoch 312/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3706 - accuracy: 0.6812 - val_loss: 1.0446 - val_accuracy: 0.5467
Epoch 313/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3861 - accuracy: 0.6530 - val_loss: 1.0045 - val_accuracy: 0.5607
Epoch 314/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3713 - accuracy: 0.6478 - val_loss: 0.9928 - val_accuracy: 0.5607
Epoch 315/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3441 - accuracy: 0.6350 - val_loss: 1.0755 - val_accuracy: 0.5467
Epoch 316/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3953 - accuracy: 0.6504 - val_loss: 1.0435 - val_accuracy: 0.5327
Epoch 317/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3659 - accuracy: 0.6555 - val_loss: 1.0725 - val_accuracy: 0.5421
Epoch 318/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3493 - accuracy: 0.6761 - val_loss: 1.1112 - val_accuracy: 0.6028
Epoch 319/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4201 - accuracy: 0.6658 - val_loss: 1.1141 - val_accuracy: 0.6075
Epoch 320/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3703 - accuracy: 0.6530 - val_loss: 1.1397 - val_accuracy: 0.6355
Epoch 321/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4112 - accuracy: 0.6504 - val_loss: 1.0651 - val_accuracy: 0.6542
Epoch 322/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3796 - accuracy: 0.6761 - val_loss: 1.0298 - val_accuracy: 0.6542
Epoch 323/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3686 - accuracy: 0.6632 - val_loss: 1.0884 - val_accuracy: 0.6636
Epoch 324/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3477 - accuracy: 0.6735 - val_loss: 1.0658 - val_accuracy: 0.6682
Epoch 325/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3329 - accuracy: 0.6581 - val_loss: 1.0471 - val_accuracy: 0.6495
Epoch 326/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3805 - accuracy: 0.6555 - val_loss: 1.0540 - val_accuracy: 0.6449
Epoch 327/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3515 - accuracy: 0.6812 - val_loss: 1.0534 - val_accuracy: 0.6215
Epoch 328/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3207 - accuracy: 0.6761 - val_loss: 1.0840 - val_accuracy: 0.6308
Epoch 329/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4081 - accuracy: 0.6632 - val_loss: 1.0434 - val_accuracy: 0.6495
Epoch 330/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3516 - accuracy: 0.6272 - val_loss: 1.0535 - val_accuracy: 0.6402
Epoch 331/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3139 - accuracy: 0.6555 - val_loss: 1.0842 - val_accuracy: 0.6636
Epoch 332/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3597 - accuracy: 0.6324 - val_loss: 1.0729 - val_accuracy: 0.6636
Epoch 333/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3195 - accuracy: 0.6350 - val_loss: 1.0263 - val_accuracy: 0.6495
Epoch 334/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3881 - accuracy: 0.6581 - val_loss: 1.0480 - val_accuracy: 0.6636
Epoch 335/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2913 - accuracy: 0.6478 - val_loss: 1.1641 - val_accuracy: 0.6682
Epoch 336/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3557 - accuracy: 0.6478 - val_loss: 1.2460 - val_accuracy: 0.6822
Epoch 337/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3445 - accuracy: 0.6452 - val_loss: 1.2022 - val_accuracy: 0.6542
Epoch 338/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3607 - accuracy: 0.6632 - val_loss: 1.1594 - val_accuracy: 0.6542
Epoch 339/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3433 - accuracy: 0.6632 - val_loss: 1.2192 - val_accuracy: 0.6402
Epoch 340/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3712 - accuracy: 0.6504 - val_loss: 1.0823 - val_accuracy: 0.6504

accuracy: 0.6449
Epoch 341/1000
4/4 [=====] - 0s 17ms/step - loss: 0.3369 - accuracy: 0.6684 - val_loss: 1.0531 - val_accuracy: 0.6449
Epoch 342/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3212 - accuracy: 0.6350 - val_loss: 1.1101 - val_accuracy: 0.6402
Epoch 343/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3335 - accuracy: 0.6427 - val_loss: 1.1187 - val_accuracy: 0.6449
Epoch 344/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3708 - accuracy: 0.6298 - val_loss: 1.0862 - val_accuracy: 0.6449
Epoch 345/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3154 - accuracy: 0.6710 - val_loss: 1.0945 - val_accuracy: 0.6449
Epoch 346/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3424 - accuracy: 0.6632 - val_loss: 1.1480 - val_accuracy: 0.6355
Epoch 347/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3117 - accuracy: 0.6607 - val_loss: 1.0781 - val_accuracy: 0.6262
Epoch 348/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3171 - accuracy: 0.6761 - val_loss: 1.1647 - val_accuracy: 0.6075
Epoch 349/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4305 - accuracy: 0.6478 - val_loss: 1.2676 - val_accuracy: 0.6542
Epoch 350/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3426 - accuracy: 0.6761 - val_loss: 1.1922 - val_accuracy: 0.6495
Epoch 351/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3086 - accuracy: 0.6401 - val_loss: 1.2526 - val_accuracy: 0.6449
Epoch 352/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3344 - accuracy: 0.6375 - val_loss: 1.2286 - val_accuracy: 0.6449
Epoch 353/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4919 - accuracy: 0.6350 - val_loss: 1.2032 - val_accuracy: 0.6589
Epoch 354/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3909 - accuracy: 0.6581 - val_loss: 1.1781 - val_accuracy: 0.6776
Epoch 355/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3876 - accuracy: 0.6067 - val_loss: 1.3847 - val_accuracy: 0.6916
Epoch 356/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3889 - accuracy: 0.6350 - val_loss: 1.2688 - val_accuracy: 0.6636
Epoch 357/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3233 - accuracy: 0.6504 - val_loss: 1.2363 - val_accuracy: 0.6542
Epoch 358/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3955 - accuracy: 0.6504 - val_loss: 1.2057 - val_accuracy: 0.6589
Epoch 359/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3410 - accuracy: 0.6195 - val_loss: 1.3508 - val_accuracy: 0.6589
Epoch 360/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3588 - accuracy: 0.6684 - val_loss: 1.1545 - val_accuracy: 0.6308
Epoch 361/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3649 - accuracy: 0.6272 - val_loss: 1.1140 - val_accuracy: 0.6402
Epoch 362/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3048 - accuracy: 0.6427 - val_loss: 1.1423 - val_accuracy: 0.6308
Epoch 363/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4021 - accuracy: 0.6427 - val_loss: 1.0967 - val_accuracy: 0.6869
Epoch 364/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3571 - accuracy: 0.6530 - val_loss: 1.0855 - val_accuracy: 0.6449
Epoch 365/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3417 - accuracy: 0.6761 - val_loss: 1.1088 - val_accuracy: 0.6589
Epoch 366/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3940 - accuracy: 0.6658 - val_loss: 1.0843 - val_accuracy: 0.6589
Epoch 367/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3193 - accuracy: 0.6889 - val_loss: 1.0821 - val_accuracy: 0.6636
Epoch 368/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3815 - accuracy: 0.6812 - val_loss: 1.0875 - val_accuracy: 0.6589
Epoch 369/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3319 - accuracy: 0.6555 - val_loss: 1.0468 - val_accuracy: 0.6168
Epoch 370/1000

```
4/4 [=====] - 0s 14ms/step - loss: 0.3776 - accuracy: 0.7018 - val_loss: 1.0514 - val_accuracy: 0.5981
Epoch 371/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3151 - accuracy: 0.6170 - val_loss: 1.0196 - val_accuracy: 0.5981
Epoch 372/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3767 - accuracy: 0.6504 - val_loss: 1.0423 - val_accuracy: 0.5981
Epoch 373/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3755 - accuracy: 0.6632 - val_loss: 1.0246 - val_accuracy: 0.6215
Epoch 374/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3148 - accuracy: 0.6761 - val_loss: 1.0056 - val_accuracy: 0.6355
Epoch 375/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3712 - accuracy: 0.6452 - val_loss: 0.9895 - val_accuracy: 0.6262
Epoch 376/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3709 - accuracy: 0.7018 - val_loss: 1.0757 - val_accuracy: 0.6262
Epoch 377/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3606 - accuracy: 0.6761 - val_loss: 1.1412 - val_accuracy: 0.6262
Epoch 378/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3044 - accuracy: 0.6735 - val_loss: 1.1436 - val_accuracy: 0.6262
Epoch 379/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3640 - accuracy: 0.6889 - val_loss: 1.0398 - val_accuracy: 0.6121
Epoch 380/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3796 - accuracy: 0.6787 - val_loss: 1.0167 - val_accuracy: 0.6028
Epoch 381/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2806 - accuracy: 0.6941 - val_loss: 1.0175 - val_accuracy: 0.6355
Epoch 382/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3346 - accuracy: 0.6915 - val_loss: 1.0514 - val_accuracy: 0.6542
Epoch 383/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3578 - accuracy: 0.6555 - val_loss: 1.0398 - val_accuracy: 0.6729
Epoch 384/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3278 - accuracy: 0.6915 - val_loss: 1.0040 - val_accuracy: 0.6869
Epoch 385/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2918 - accuracy: 0.6992 - val_loss: 1.0515 - val_accuracy: 0.6776
Epoch 386/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3796 - accuracy: 0.6889 - val_loss: 0.9288 - val_accuracy: 0.6495
Epoch 387/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3217 - accuracy: 0.6864 - val_loss: 0.9134 - val_accuracy: 0.6355
Epoch 388/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3424 - accuracy: 0.6889 - val_loss: 0.9199 - val_accuracy: 0.6262
Epoch 389/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3478 - accuracy: 0.6530 - val_loss: 0.9354 - val_accuracy: 0.5888
Epoch 390/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3176 - accuracy: 0.6658 - val_loss: 0.9183 - val_accuracy: 0.5981
Epoch 391/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3970 - accuracy: 0.6838 - val_loss: 0.9871 - val_accuracy: 0.5981
Epoch 392/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3105 - accuracy: 0.6581 - val_loss: 0.9714 - val_accuracy: 0.6215
Epoch 393/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4217 - accuracy: 0.6581 - val_loss: 0.9318 - val_accuracy: 0.6028
Epoch 394/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4332 - accuracy: 0.6761 - val_loss: 0.9656 - val_accuracy: 0.5981
Epoch 395/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4257 - accuracy: 0.6555 - val_loss: 1.0314 - val_accuracy: 0.5841
Epoch 396/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3163 - accuracy: 0.6658 - val_loss: 1.1065 - val_accuracy: 0.5981
Epoch 397/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3131 - accuracy: 0.6787 - val_loss: 1.1024 - val_accuracy: 0.5981
Epoch 398/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4207 - accuracy: 0.6941 - val_loss: 1.0286 - val_accuracy: 0.5888
Epoch 399/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3437 - accuracy: 0.6889 - val_loss: 1.0815 - val_accuracy: 0.5888
```

```
Epoch 400/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3049 - accuracy: 0.6992 - val_loss: 0.9896 - val_accuracy: 0.5841
Epoch 401/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3563 - accuracy: 0.6941 - val_loss: 0.9576 - val_accuracy: 0.5888
Epoch 402/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3388 - accuracy: 0.6915 - val_loss: 0.9537 - val_accuracy: 0.5421
Epoch 403/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3364 - accuracy: 0.6967 - val_loss: 1.2920 - val_accuracy: 0.6495
Epoch 404/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4124 - accuracy: 0.6710 - val_loss: 1.2131 - val_accuracy: 0.6402
Epoch 405/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3422 - accuracy: 0.6530 - val_loss: 1.1815 - val_accuracy: 0.6215
Epoch 406/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3001 - accuracy: 0.6812 - val_loss: 1.1393 - val_accuracy: 0.6262
Epoch 407/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2826 - accuracy: 0.6401 - val_loss: 1.2165 - val_accuracy: 0.6075
Epoch 408/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3891 - accuracy: 0.6581 - val_loss: 1.0919 - val_accuracy: 0.6355
Epoch 409/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3199 - accuracy: 0.6478 - val_loss: 1.2452 - val_accuracy: 0.5981
Epoch 410/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3166 - accuracy: 0.6735 - val_loss: 1.1420 - val_accuracy: 0.6215
Epoch 411/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3358 - accuracy: 0.6530 - val_loss: 1.1183 - val_accuracy: 0.6308
Epoch 412/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3066 - accuracy: 0.6838 - val_loss: 1.2464 - val_accuracy: 0.6215
Epoch 413/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3453 - accuracy: 0.6632 - val_loss: 1.2061 - val_accuracy: 0.6308
Epoch 414/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3552 - accuracy: 0.6684 - val_loss: 1.2408 - val_accuracy: 0.6355
Epoch 415/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4291 - accuracy: 0.5861 - val_loss: 1.2697 - val_accuracy: 0.6121
Epoch 416/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3720 - accuracy: 0.6195 - val_loss: 1.2276 - val_accuracy: 0.6355
Epoch 417/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3744 - accuracy: 0.6015 - val_loss: 1.2129 - val_accuracy: 0.6449
Epoch 418/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3294 - accuracy: 0.5758 - val_loss: 1.1994 - val_accuracy: 0.6449
Epoch 419/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4021 - accuracy: 0.5990 - val_loss: 1.2040 - val_accuracy: 0.6402
Epoch 420/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3354 - accuracy: 0.5938 - val_loss: 1.1916 - val_accuracy: 0.6028
Epoch 421/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2949 - accuracy: 0.6118 - val_loss: 1.1256 - val_accuracy: 0.5748
Epoch 422/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2747 - accuracy: 0.5630 - val_loss: 1.2104 - val_accuracy: 0.5421
Epoch 423/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3048 - accuracy: 0.5810 - val_loss: 1.3136 - val_accuracy: 0.5654
Epoch 424/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3082 - accuracy: 0.5784 - val_loss: 1.2628 - val_accuracy: 0.5561
Epoch 425/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2914 - accuracy: 0.5810 - val_loss: 1.2300 - val_accuracy: 0.5748
Epoch 426/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2749 - accuracy: 0.5810 - val_loss: 1.1156 - val_accuracy: 0.5514
Epoch 427/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2887 - accuracy: 0.5835 - val_loss: 1.0814 - val_accuracy: 0.5561
Epoch 428/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3103 - accuracy: 0.5578 - val_loss: 1.1580 - val_accuracy: 0.5421
Epoch 429/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3395 - accuracy: 0.5861 - val_loss: 1.1208 - val_accuracy: 0.5421
```

```
accuracy: 0.5047
Epoch 430/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3199 - accuracy: 0.5758 - val_loss: 1.1341 - val_
accuracy: 0.5047
Epoch 431/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3172 - accuracy: 0.5990 - val_loss: 1.0949 - val_
accuracy: 0.4907
Epoch 432/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3396 - accuracy: 0.6298 - val_loss: 1.0870 - val_
accuracy: 0.5187
Epoch 433/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3288 - accuracy: 0.6298 - val_loss: 1.1246 - val_
accuracy: 0.4953
Epoch 434/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3197 - accuracy: 0.6170 - val_loss: 1.0714 - val_
accuracy: 0.5000
Epoch 435/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2614 - accuracy: 0.6195 - val_loss: 1.0490 - val_
accuracy: 0.4953
Epoch 436/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3115 - accuracy: 0.6247 - val_loss: 1.1033 - val_
accuracy: 0.4907
Epoch 437/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2937 - accuracy: 0.5656 - val_loss: 1.0836 - val_
accuracy: 0.4813
Epoch 438/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4245 - accuracy: 0.5681 - val_loss: 1.1909 - val_
accuracy: 0.4813
Epoch 439/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2994 - accuracy: 0.5964 - val_loss: 1.1253 - val_
accuracy: 0.4860
Epoch 440/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3313 - accuracy: 0.6041 - val_loss: 1.3015 - val_
accuracy: 0.4626
Epoch 441/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2676 - accuracy: 0.6375 - val_loss: 1.1703 - val_
accuracy: 0.4673
Epoch 442/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3081 - accuracy: 0.6684 - val_loss: 1.2958 - val_
accuracy: 0.5000
Epoch 443/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4973 - accuracy: 0.6375 - val_loss: 1.1671 - val_
accuracy: 0.5280
Epoch 444/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3731 - accuracy: 0.6581 - val_loss: 1.2832 - val_
accuracy: 0.5234
Epoch 445/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3389 - accuracy: 0.6452 - val_loss: 1.1461 - val_
accuracy: 0.5374
Epoch 446/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3455 - accuracy: 0.6401 - val_loss: 1.0988 - val_
accuracy: 0.5421
Epoch 447/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3058 - accuracy: 0.6812 - val_loss: 1.1966 - val_
accuracy: 0.5561
Epoch 448/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3572 - accuracy: 0.6298 - val_loss: 1.0901 - val_
accuracy: 0.5467
Epoch 449/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2750 - accuracy: 0.6195 - val_loss: 1.0690 - val_
accuracy: 0.5701
Epoch 450/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2668 - accuracy: 0.6298 - val_loss: 1.2217 - val_
accuracy: 0.5748
Epoch 451/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2652 - accuracy: 0.6427 - val_loss: 1.1524 - val_
accuracy: 0.5888
Epoch 452/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3173 - accuracy: 0.6452 - val_loss: 1.1563 - val_
accuracy: 0.5888
Epoch 453/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2632 - accuracy: 0.6530 - val_loss: 1.3123 - val_
accuracy: 0.5935
Epoch 454/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2644 - accuracy: 0.6401 - val_loss: 1.1793 - val_
accuracy: 0.5888
Epoch 455/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2625 - accuracy: 0.6195 - val_loss: 1.1458 - val_
accuracy: 0.5981
Epoch 456/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3479 - accuracy: 0.6478 - val_loss: 1.1409 - val_
accuracy: 0.6215
Epoch 457/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2964 - accuracy: 0.6632 - val_loss: 1.1410 - val_
accuracy: 0.6028
Epoch 458/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3631 - accuracy: 0.6787 - val_loss: 1.1180 - val_
accuracy: 0.5701
Epoch 459/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.2873 - accuracy: 0.6401 - val_loss: 1.0496 - val_accuracy: 0.6028
Epoch 460/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3135 - accuracy: 0.6247 - val_loss: 1.0389 - val_accuracy: 0.5888
Epoch 461/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3367 - accuracy: 0.6144 - val_loss: 1.1367 - val_accuracy: 0.5888
Epoch 462/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2730 - accuracy: 0.6375 - val_loss: 1.1873 - val_accuracy: 0.5935
Epoch 463/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3209 - accuracy: 0.6350 - val_loss: 1.0296 - val_accuracy: 0.6075
Epoch 464/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2494 - accuracy: 0.6272 - val_loss: 1.0779 - val_accuracy: 0.5981
Epoch 465/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4161 - accuracy: 0.6221 - val_loss: 1.1044 - val_accuracy: 0.6308
Epoch 466/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2802 - accuracy: 0.6401 - val_loss: 1.1412 - val_accuracy: 0.6215
Epoch 467/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2929 - accuracy: 0.6555 - val_loss: 1.0459 - val_accuracy: 0.6262
Epoch 468/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3974 - accuracy: 0.6658 - val_loss: 1.0144 - val_accuracy: 0.6729
Epoch 469/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4241 - accuracy: 0.6915 - val_loss: 0.9816 - val_accuracy: 0.6729
Epoch 470/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3344 - accuracy: 0.6735 - val_loss: 1.1049 - val_accuracy: 0.6682
Epoch 471/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3427 - accuracy: 0.6787 - val_loss: 1.0489 - val_accuracy: 0.7150
Epoch 472/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3601 - accuracy: 0.6581 - val_loss: 1.0798 - val_accuracy: 0.7056
Epoch 473/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4107 - accuracy: 0.6812 - val_loss: 0.9730 - val_accuracy: 0.6776
Epoch 474/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3609 - accuracy: 0.6967 - val_loss: 0.9699 - val_accuracy: 0.6636
Epoch 475/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3537 - accuracy: 0.6710 - val_loss: 1.1824 - val_accuracy: 0.6869
Epoch 476/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3106 - accuracy: 0.6838 - val_loss: 1.3155 - val_accuracy: 0.6822
Epoch 477/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3023 - accuracy: 0.6812 - val_loss: 1.3360 - val_accuracy: 0.7009
Epoch 478/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4900 - accuracy: 0.6581 - val_loss: 1.2604 - val_accuracy: 0.7103
Epoch 479/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2739 - accuracy: 0.6812 - val_loss: 1.3704 - val_accuracy: 0.7056
Epoch 480/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3568 - accuracy: 0.6761 - val_loss: 1.3339 - val_accuracy: 0.7150
Epoch 481/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3580 - accuracy: 0.6658 - val_loss: 1.3008 - val_accuracy: 0.7103
Epoch 482/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3585 - accuracy: 0.6555 - val_loss: 1.3445 - val_accuracy: 0.6776
Epoch 483/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3167 - accuracy: 0.6889 - val_loss: 1.3271 - val_accuracy: 0.6589
Epoch 484/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2683 - accuracy: 0.6735 - val_loss: 1.3366 - val_accuracy: 0.6682
Epoch 485/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3785 - accuracy: 0.6812 - val_loss: 1.4709 - val_accuracy: 0.6729
Epoch 486/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3518 - accuracy: 0.6684 - val_loss: 1.5521 - val_accuracy: 0.6682
Epoch 487/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4019 - accuracy: 0.6632 - val_loss: 1.2686 - val_accuracy: 0.6869
Epoch 488/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3732 - accuracy: 0.6607 - val_loss: 1.2425 - val_accuracy: 0.6916
```

Epoch 489/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2830 - accuracy: 0.7044 - val_loss: 1.4746 - val_accuracy: 0.6682
Epoch 490/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2914 - accuracy: 0.6452 - val_loss: 1.4119 - val_accuracy: 0.6822
Epoch 491/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3704 - accuracy: 0.6607 - val_loss: 1.3444 - val_accuracy: 0.6776
Epoch 492/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2979 - accuracy: 0.6710 - val_loss: 1.3904 - val_accuracy: 0.6262
Epoch 493/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3756 - accuracy: 0.6761 - val_loss: 1.4390 - val_accuracy: 0.6262
Epoch 494/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3596 - accuracy: 0.6761 - val_loss: 1.5684 - val_accuracy: 0.6215
Epoch 495/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3258 - accuracy: 0.6838 - val_loss: 1.5133 - val_accuracy: 0.6215
Epoch 496/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2675 - accuracy: 0.6452 - val_loss: 1.4174 - val_accuracy: 0.5981
Epoch 497/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2832 - accuracy: 0.6838 - val_loss: 1.4825 - val_accuracy: 0.5888
Epoch 498/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3907 - accuracy: 0.6915 - val_loss: 1.3804 - val_accuracy: 0.5607
Epoch 499/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2941 - accuracy: 0.6864 - val_loss: 1.3447 - val_accuracy: 0.5701
Epoch 500/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2892 - accuracy: 0.6684 - val_loss: 1.4602 - val_accuracy: 0.5514
Epoch 501/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3016 - accuracy: 0.6710 - val_loss: 1.4215 - val_accuracy: 0.5514
Epoch 502/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2917 - accuracy: 0.6812 - val_loss: 1.5192 - val_accuracy: 0.5748
Epoch 503/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2956 - accuracy: 0.6864 - val_loss: 1.4602 - val_accuracy: 0.5748
Epoch 504/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3210 - accuracy: 0.6632 - val_loss: 1.2680 - val_accuracy: 0.5794
Epoch 505/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3392 - accuracy: 0.6581 - val_loss: 1.2968 - val_accuracy: 0.5514
Epoch 506/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3124 - accuracy: 0.6607 - val_loss: 1.3448 - val_accuracy: 0.5421
Epoch 507/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3167 - accuracy: 0.6195 - val_loss: 1.4091 - val_accuracy: 0.5654
Epoch 508/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3410 - accuracy: 0.6478 - val_loss: 1.2596 - val_accuracy: 0.5748
Epoch 509/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3524 - accuracy: 0.6401 - val_loss: 1.1898 - val_accuracy: 0.5561
Epoch 510/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3422 - accuracy: 0.6530 - val_loss: 1.2555 - val_accuracy: 0.6028
Epoch 511/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3706 - accuracy: 0.6298 - val_loss: 1.2138 - val_accuracy: 0.5981
Epoch 512/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3200 - accuracy: 0.6195 - val_loss: 1.1819 - val_accuracy: 0.6028
Epoch 513/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3032 - accuracy: 0.6350 - val_loss: 1.1354 - val_accuracy: 0.6028
Epoch 514/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3269 - accuracy: 0.6324 - val_loss: 1.1599 - val_accuracy: 0.6075
Epoch 515/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3022 - accuracy: 0.6170 - val_loss: 1.1522 - val_accuracy: 0.6215
Epoch 516/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3335 - accuracy: 0.6298 - val_loss: 1.0967 - val_accuracy: 0.6168
Epoch 517/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3135 - accuracy: 0.6581 - val_loss: 1.1175 - val_accuracy: 0.6121
Epoch 518/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3633 - accuracy: 0.6735 - val_loss: 1.2972 - val_accuracy: 0.6121

```
accuracy: 0.5935
Epoch 519/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2812 - accuracy: 0.6864 - val_loss: 1.2965 - val_accuracy: 0.5981
Epoch 520/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3231 - accuracy: 0.6607 - val_loss: 1.2717 - val_accuracy: 0.6215
Epoch 521/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4193 - accuracy: 0.7018 - val_loss: 1.2777 - val_accuracy: 0.6355
Epoch 522/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3653 - accuracy: 0.6684 - val_loss: 1.2853 - val_accuracy: 0.6402
Epoch 523/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3594 - accuracy: 0.6710 - val_loss: 1.1475 - val_accuracy: 0.6075
Epoch 524/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3127 - accuracy: 0.6812 - val_loss: 1.1556 - val_accuracy: 0.6308
Epoch 525/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2861 - accuracy: 0.7326 - val_loss: 1.3094 - val_accuracy: 0.6028
Epoch 526/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3710 - accuracy: 0.7121 - val_loss: 1.3217 - val_accuracy: 0.6121
Epoch 527/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3259 - accuracy: 0.7069 - val_loss: 1.3396 - val_accuracy: 0.6215
Epoch 528/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3271 - accuracy: 0.6710 - val_loss: 1.5746 - val_accuracy: 0.6308
Epoch 529/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3616 - accuracy: 0.7326 - val_loss: 1.7104 - val_accuracy: 0.6308
Epoch 530/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3360 - accuracy: 0.7044 - val_loss: 1.6141 - val_accuracy: 0.6308
Epoch 531/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3126 - accuracy: 0.6710 - val_loss: 1.2260 - val_accuracy: 0.6355
Epoch 532/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2671 - accuracy: 0.6530 - val_loss: 1.1004 - val_accuracy: 0.6262
Epoch 533/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3194 - accuracy: 0.6710 - val_loss: 1.0466 - val_accuracy: 0.6308
Epoch 534/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3184 - accuracy: 0.7018 - val_loss: 1.1416 - val_accuracy: 0.6495
Epoch 535/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4388 - accuracy: 0.6889 - val_loss: 1.3927 - val_accuracy: 0.6121
Epoch 536/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3936 - accuracy: 0.6632 - val_loss: 1.3927 - val_accuracy: 0.6262
Epoch 537/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4016 - accuracy: 0.6787 - val_loss: 1.5011 - val_accuracy: 0.6308
Epoch 538/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3388 - accuracy: 0.6298 - val_loss: 1.1899 - val_accuracy: 0.6355
Epoch 539/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3901 - accuracy: 0.6350 - val_loss: 1.1685 - val_accuracy: 0.6402
Epoch 540/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2742 - accuracy: 0.6607 - val_loss: 1.0583 - val_accuracy: 0.6075
Epoch 541/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3671 - accuracy: 0.6452 - val_loss: 1.1999 - val_accuracy: 0.6075
Epoch 542/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3550 - accuracy: 0.6375 - val_loss: 1.1662 - val_accuracy: 0.6075
Epoch 543/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2806 - accuracy: 0.7147 - val_loss: 1.1917 - val_accuracy: 0.6402
Epoch 544/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4426 - accuracy: 0.6452 - val_loss: 1.0921 - val_accuracy: 0.6402
Epoch 545/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3346 - accuracy: 0.6504 - val_loss: 1.0391 - val_accuracy: 0.6028
Epoch 546/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2693 - accuracy: 0.6658 - val_loss: 0.9909 - val_accuracy: 0.6028
Epoch 547/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2881 - accuracy: 0.6838 - val_loss: 1.0042 - val_accuracy: 0.6121
Epoch 548/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.3454 - accuracy: 0.6607 - val_loss: 1.1721 - val_accuracy: 0.6355
Epoch 549/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2591 - accuracy: 0.6992 - val_loss: 1.2241 - val_accuracy: 0.6215
Epoch 550/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2998 - accuracy: 0.6581 - val_loss: 1.2840 - val_accuracy: 0.5841
Epoch 551/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2651 - accuracy: 0.6812 - val_loss: 1.2680 - val_accuracy: 0.5841
Epoch 552/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3688 - accuracy: 0.6992 - val_loss: 1.2941 - val_accuracy: 0.5935
Epoch 553/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3493 - accuracy: 0.6864 - val_loss: 1.1833 - val_accuracy: 0.6168
Epoch 554/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2896 - accuracy: 0.7352 - val_loss: 1.2747 - val_accuracy: 0.5935
Epoch 555/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4003 - accuracy: 0.7121 - val_loss: 1.1972 - val_accuracy: 0.6215
Epoch 556/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3217 - accuracy: 0.7326 - val_loss: 1.3141 - val_accuracy: 0.6168
Epoch 557/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2627 - accuracy: 0.6941 - val_loss: 1.1800 - val_accuracy: 0.6308
Epoch 558/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2471 - accuracy: 0.7198 - val_loss: 1.3579 - val_accuracy: 0.6168
Epoch 559/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2818 - accuracy: 0.7095 - val_loss: 1.4002 - val_accuracy: 0.6075
Epoch 560/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3814 - accuracy: 0.7121 - val_loss: 1.3922 - val_accuracy: 0.5981
Epoch 561/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3598 - accuracy: 0.7044 - val_loss: 1.2992 - val_accuracy: 0.6121
Epoch 562/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3435 - accuracy: 0.7121 - val_loss: 1.3113 - val_accuracy: 0.6075
Epoch 563/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3341 - accuracy: 0.7147 - val_loss: 1.4556 - val_accuracy: 0.6028
Epoch 564/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2752 - accuracy: 0.7455 - val_loss: 1.3646 - val_accuracy: 0.6262
Epoch 565/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3607 - accuracy: 0.7018 - val_loss: 1.2466 - val_accuracy: 0.6308
Epoch 566/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2901 - accuracy: 0.7224 - val_loss: 1.3348 - val_accuracy: 0.6495
Epoch 567/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3265 - accuracy: 0.6889 - val_loss: 1.3735 - val_accuracy: 0.6262
Epoch 568/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2690 - accuracy: 0.6967 - val_loss: 1.2971 - val_accuracy: 0.6168
Epoch 569/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2672 - accuracy: 0.6889 - val_loss: 1.1933 - val_accuracy: 0.6262
Epoch 570/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3478 - accuracy: 0.6632 - val_loss: 1.2307 - val_accuracy: 0.6402
Epoch 571/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3092 - accuracy: 0.7044 - val_loss: 1.4136 - val_accuracy: 0.6262
Epoch 572/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2962 - accuracy: 0.6864 - val_loss: 1.1953 - val_accuracy: 0.6262
Epoch 573/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2586 - accuracy: 0.6915 - val_loss: 1.3607 - val_accuracy: 0.5935
Epoch 574/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4017 - accuracy: 0.6607 - val_loss: 1.3742 - val_accuracy: 0.6449
Epoch 575/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3172 - accuracy: 0.6967 - val_loss: 1.5877 - val_accuracy: 0.6215
Epoch 576/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3159 - accuracy: 0.6401 - val_loss: 1.6124 - val_accuracy: 0.6168
Epoch 577/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3156 - accuracy: 0.6530 - val_loss: 1.4057 - val_accuracy: 0.6308
```

Epoch 578/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3156 - accuracy: 0.6658 - val_loss: 1.3130 - val_accuracy: 0.6589
Epoch 579/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2659 - accuracy: 0.6658 - val_loss: 1.3539 - val_accuracy: 0.6262
Epoch 580/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2513 - accuracy: 0.6555 - val_loss: 1.4011 - val_accuracy: 0.6449
Epoch 581/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2717 - accuracy: 0.6375 - val_loss: 1.2672 - val_accuracy: 0.6121
Epoch 582/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2125 - accuracy: 0.6504 - val_loss: 1.3981 - val_accuracy: 0.6308
Epoch 583/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3118 - accuracy: 0.6298 - val_loss: 1.4067 - val_accuracy: 0.6449
Epoch 584/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2403 - accuracy: 0.6504 - val_loss: 1.7869 - val_accuracy: 0.6215
Epoch 585/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2647 - accuracy: 0.6581 - val_loss: 1.5204 - val_accuracy: 0.6121
Epoch 586/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2088 - accuracy: 0.6710 - val_loss: 1.5229 - val_accuracy: 0.6262
Epoch 587/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2700 - accuracy: 0.6478 - val_loss: 1.7035 - val_accuracy: 0.6402
Epoch 588/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3616 - accuracy: 0.6889 - val_loss: 1.5230 - val_accuracy: 0.6449
Epoch 589/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2710 - accuracy: 0.6632 - val_loss: 1.4842 - val_accuracy: 0.6308
Epoch 590/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2500 - accuracy: 0.6992 - val_loss: 1.1901 - val_accuracy: 0.6402
Epoch 591/1000
4/4 [=====] - 0s 21ms/step - loss: 0.2279 - accuracy: 0.6812 - val_loss: 1.3470 - val_accuracy: 0.6402
Epoch 592/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2550 - accuracy: 0.6761 - val_loss: 1.3676 - val_accuracy: 0.6215
Epoch 593/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2148 - accuracy: 0.6787 - val_loss: 1.3347 - val_accuracy: 0.6589
Epoch 594/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2811 - accuracy: 0.6967 - val_loss: 1.2752 - val_accuracy: 0.6402
Epoch 595/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2728 - accuracy: 0.6915 - val_loss: 1.3232 - val_accuracy: 0.6495
Epoch 596/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3180 - accuracy: 0.6889 - val_loss: 1.3471 - val_accuracy: 0.6776
Epoch 597/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3370 - accuracy: 0.7378 - val_loss: 1.3288 - val_accuracy: 0.6776
Epoch 598/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2340 - accuracy: 0.6864 - val_loss: 1.2327 - val_accuracy: 0.6308
Epoch 599/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2705 - accuracy: 0.6735 - val_loss: 1.4050 - val_accuracy: 0.6729
Epoch 600/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3322 - accuracy: 0.7147 - val_loss: 1.2512 - val_accuracy: 0.6682
Epoch 601/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2622 - accuracy: 0.6992 - val_loss: 1.3045 - val_accuracy: 0.6589
Epoch 602/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2286 - accuracy: 0.6915 - val_loss: 1.2846 - val_accuracy: 0.6636
Epoch 603/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1969 - accuracy: 0.6761 - val_loss: 1.2561 - val_accuracy: 0.6542
Epoch 604/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2110 - accuracy: 0.7069 - val_loss: 1.5526 - val_accuracy: 0.6869
Epoch 605/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2022 - accuracy: 0.6889 - val_loss: 1.5293 - val_accuracy: 0.6869
Epoch 606/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2368 - accuracy: 0.6787 - val_loss: 1.6356 - val_accuracy: 0.6822
Epoch 607/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3606 - accuracy: 0.6967 - val_loss: 1.4055 - val_accuracy: 0.6967

```

accuracy: 0.6495
Epoch 608/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2255 - accuracy: 0.6967 - val_loss: 1.4894 - val_
accuracy: 0.7009
Epoch 609/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2736 - accuracy: 0.7249 - val_loss: 1.3244 - val_
accuracy: 0.6963
Epoch 610/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3181 - accuracy: 0.6889 - val_loss: 1.2476 - val_
accuracy: 0.6916
Epoch 611/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1927 - accuracy: 0.7069 - val_loss: 1.2929 - val_
accuracy: 0.7103
Epoch 612/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2134 - accuracy: 0.6889 - val_loss: 1.4009 - val_
accuracy: 0.6776
Epoch 613/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2086 - accuracy: 0.6838 - val_loss: 1.2614 - val_
accuracy: 0.6495
Epoch 614/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2270 - accuracy: 0.6864 - val_loss: 1.3244 - val_
accuracy: 0.6636
Epoch 615/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2531 - accuracy: 0.6992 - val_loss: 1.3470 - val_
accuracy: 0.6449
Epoch 616/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2748 - accuracy: 0.6504 - val_loss: 1.4505 - val_
accuracy: 0.7056
Epoch 617/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4042 - accuracy: 0.7172 - val_loss: 1.2612 - val_
accuracy: 0.6776
Epoch 618/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2769 - accuracy: 0.6864 - val_loss: 1.3132 - val_
accuracy: 0.6589
Epoch 619/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2379 - accuracy: 0.6735 - val_loss: 1.3556 - val_
accuracy: 0.6542
Epoch 620/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2261 - accuracy: 0.6735 - val_loss: 1.4023 - val_
accuracy: 0.6542
Epoch 621/1000
1/4 [====>.....] - ETA: 0s - loss: 0.6047 - accuracy: 0.7188Restoring model weights from th
e end of the best epoch: 471.
4/4 [=====] - 0s 15ms/step - loss: 0.3451 - accuracy: 0.6710 - val_loss: 1.3061 - val_
accuracy: 0.6495
Epoch 621: early stopping
2/2 [=====] - 0s 3ms/step - loss: 0.2188 - accuracy: 0.7674
[CV] END .....Dense1=100, Dense2=10; total time= 30.2s
Model: "sequential_76"

```

Layer (type)	Output Shape	Param #
dense_304 (Dense)	(None, 100)	700
batch_normalization_228 (BatchNormalization)	(None, 100)	400
activation_228 (Activation)	(None, 100)	0
dense_305 (Dense)	(None, 10)	1010
batch_normalization_229 (BatchNormalization)	(None, 10)	40
activation_229 (Activation)	(None, 10)	0
dense_306 (Dense)	(None, 10)	110
batch_normalization_230 (BatchNormalization)	(None, 10)	40
activation_230 (Activation)	(None, 10)	0
dense_307 (Dense)	(None, 2)	22

```

Total params: 2,322
Trainable params: 2,082
Non-trainable params: 240

```

```

Epoch 1/1000
4/4 [=====] - 1s 59ms/step - loss: 4.3499 - accuracy: 0.4499 - val_loss: 4.8965 - val_
accuracy: 0.6449
Epoch 2/1000
4/4 [=====] - 0s 15ms/step - loss: 2.8152 - accuracy: 0.4627 - val_loss: 3.8778 - val_
accuracy: 0.6121
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2522 - accuracy: 0.4704 - val_loss: 3.1243 - val_
accuracy: 0.5748

```

Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1354 - accuracy: 0.4602 - val_loss: 2.5863 - val_accuracy: 0.4673
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 2.2832 - accuracy: 0.4473 - val_loss: 2.4483 - val_accuracy: 0.4579
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1499 - accuracy: 0.4627 - val_loss: 2.2610 - val_accuracy: 0.4393
Epoch 7/1000
4/4 [=====] - 0s 16ms/step - loss: 2.0237 - accuracy: 0.4936 - val_loss: 2.2049 - val_accuracy: 0.4393
Epoch 8/1000
4/4 [=====] - 0s 15ms/step - loss: 1.8302 - accuracy: 0.4679 - val_loss: 2.0732 - val_accuracy: 0.4346
Epoch 9/1000
4/4 [=====] - 0s 15ms/step - loss: 1.7758 - accuracy: 0.4730 - val_loss: 2.0457 - val_accuracy: 0.4346
Epoch 10/1000
4/4 [=====] - 0s 15ms/step - loss: 1.6867 - accuracy: 0.5039 - val_loss: 2.0305 - val_accuracy: 0.4393
Epoch 11/1000
4/4 [=====] - 0s 15ms/step - loss: 1.6475 - accuracy: 0.5064 - val_loss: 2.0403 - val_accuracy: 0.4486
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7385 - accuracy: 0.4884 - val_loss: 2.0053 - val_accuracy: 0.4579
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6672 - accuracy: 0.5116 - val_loss: 1.9760 - val_accuracy: 0.4486
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5287 - accuracy: 0.4884 - val_loss: 1.8824 - val_accuracy: 0.4439
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6167 - accuracy: 0.4936 - val_loss: 1.8601 - val_accuracy: 0.4439
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5715 - accuracy: 0.4884 - val_loss: 1.8155 - val_accuracy: 0.4393
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5356 - accuracy: 0.4936 - val_loss: 1.7752 - val_accuracy: 0.4346
Epoch 18/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5330 - accuracy: 0.5270 - val_loss: 1.7591 - val_accuracy: 0.4486
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4092 - accuracy: 0.4781 - val_loss: 1.7214 - val_accuracy: 0.4579
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3524 - accuracy: 0.5193 - val_loss: 1.6992 - val_accuracy: 0.4486
Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3949 - accuracy: 0.5116 - val_loss: 1.6762 - val_accuracy: 0.4579
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3873 - accuracy: 0.5193 - val_loss: 1.6418 - val_accuracy: 0.4579
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3120 - accuracy: 0.5270 - val_loss: 1.6371 - val_accuracy: 0.4626
Epoch 24/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3407 - accuracy: 0.5244 - val_loss: 1.5991 - val_accuracy: 0.4346
Epoch 25/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3009 - accuracy: 0.5450 - val_loss: 1.5948 - val_accuracy: 0.4393
Epoch 26/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2962 - accuracy: 0.5501 - val_loss: 1.6044 - val_accuracy: 0.4393
Epoch 27/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3346 - accuracy: 0.5604 - val_loss: 1.5952 - val_accuracy: 0.4393
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2318 - accuracy: 0.5501 - val_loss: 1.5687 - val_accuracy: 0.4439
Epoch 29/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2304 - accuracy: 0.5501 - val_loss: 1.5377 - val_accuracy: 0.4579
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1785 - accuracy: 0.5373 - val_loss: 1.5032 - val_accuracy: 0.4579
Epoch 31/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2387 - accuracy: 0.5244 - val_loss: 1.4657 - val_accuracy: 0.4533
Epoch 32/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2240 - accuracy: 0.5424 - val_loss: 1.4730 - val_accuracy: 0.4439
Epoch 33/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2055 - accuracy: 0.5270 - val_loss: 1.4677 - val_accuracy: 0.4439

```
accuracy: 0.4393
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1397 - accuracy: 0.5193 - val_loss: 1.4802 - val_accuracy: 0.4439
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0769 - accuracy: 0.5116 - val_loss: 1.4598 - val_accuracy: 0.4439
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0988 - accuracy: 0.5398 - val_loss: 1.4233 - val_accuracy: 0.4346
Epoch 37/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1113 - accuracy: 0.5090 - val_loss: 1.4100 - val_accuracy: 0.4346
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0921 - accuracy: 0.5244 - val_loss: 1.3949 - val_accuracy: 0.4346
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0732 - accuracy: 0.5141 - val_loss: 1.3766 - val_accuracy: 0.4346
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0120 - accuracy: 0.5193 - val_loss: 1.3244 - val_accuracy: 0.4439
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0225 - accuracy: 0.5193 - val_loss: 1.3427 - val_accuracy: 0.4439
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0579 - accuracy: 0.4936 - val_loss: 1.3277 - val_accuracy: 0.4439
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0737 - accuracy: 0.4961 - val_loss: 1.2517 - val_accuracy: 0.4533
Epoch 44/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9983 - accuracy: 0.5064 - val_loss: 1.2402 - val_accuracy: 0.4579
Epoch 45/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0502 - accuracy: 0.5090 - val_loss: 1.2246 - val_accuracy: 0.4579
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9769 - accuracy: 0.5013 - val_loss: 1.2132 - val_accuracy: 0.4533
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9752 - accuracy: 0.5244 - val_loss: 1.2020 - val_accuracy: 0.4579
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9550 - accuracy: 0.4679 - val_loss: 1.1753 - val_accuracy: 0.4579
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9178 - accuracy: 0.4910 - val_loss: 1.1771 - val_accuracy: 0.4533
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9701 - accuracy: 0.4859 - val_loss: 1.1579 - val_accuracy: 0.4486
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8817 - accuracy: 0.5064 - val_loss: 1.1045 - val_accuracy: 0.4486
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8066 - accuracy: 0.5141 - val_loss: 1.1659 - val_accuracy: 0.4486
Epoch 53/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9130 - accuracy: 0.5141 - val_loss: 1.1788 - val_accuracy: 0.4439
Epoch 54/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8462 - accuracy: 0.5501 - val_loss: 1.1626 - val_accuracy: 0.4486
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9871 - accuracy: 0.5347 - val_loss: 1.1511 - val_accuracy: 0.4486
Epoch 56/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8884 - accuracy: 0.5193 - val_loss: 1.1422 - val_accuracy: 0.4393
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8986 - accuracy: 0.5321 - val_loss: 1.0754 - val_accuracy: 0.4486
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8301 - accuracy: 0.5398 - val_loss: 1.0267 - val_accuracy: 0.4533
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8041 - accuracy: 0.5219 - val_loss: 0.9885 - val_accuracy: 0.4579
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9980 - accuracy: 0.5424 - val_loss: 0.9741 - val_accuracy: 0.4720
Epoch 61/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8498 - accuracy: 0.5604 - val_loss: 0.9623 - val_accuracy: 0.4626
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8578 - accuracy: 0.5527 - val_loss: 0.9416 - val_accuracy: 0.4626
Epoch 63/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.8512 - accuracy: 0.5784 - val_loss: 0.9284 - val_accuracy: 0.4626
Epoch 64/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7874 - accuracy: 0.5733 - val_loss: 0.9063 - val_accuracy: 0.4626
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7923 - accuracy: 0.5553 - val_loss: 0.9006 - val_accuracy: 0.4579
Epoch 66/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8130 - accuracy: 0.5604 - val_loss: 0.8866 - val_accuracy: 0.4486
Epoch 67/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7673 - accuracy: 0.5835 - val_loss: 0.8790 - val_accuracy: 0.4486
Epoch 68/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7676 - accuracy: 0.5527 - val_loss: 0.8549 - val_accuracy: 0.4439
Epoch 69/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7329 - accuracy: 0.5758 - val_loss: 0.8498 - val_accuracy: 0.4346
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6795 - accuracy: 0.5733 - val_loss: 0.8246 - val_accuracy: 0.4346
Epoch 71/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7576 - accuracy: 0.5707 - val_loss: 0.7937 - val_accuracy: 0.4252
Epoch 72/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6924 - accuracy: 0.5296 - val_loss: 0.7952 - val_accuracy: 0.4206
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7287 - accuracy: 0.5244 - val_loss: 0.7876 - val_accuracy: 0.4393
Epoch 74/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7718 - accuracy: 0.5039 - val_loss: 0.7857 - val_accuracy: 0.4252
Epoch 75/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7235 - accuracy: 0.5141 - val_loss: 0.8160 - val_accuracy: 0.4159
Epoch 76/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6832 - accuracy: 0.5424 - val_loss: 0.7909 - val_accuracy: 0.4206
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6530 - accuracy: 0.5398 - val_loss: 0.8084 - val_accuracy: 0.4206
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6511 - accuracy: 0.5424 - val_loss: 0.8187 - val_accuracy: 0.4112
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6846 - accuracy: 0.5450 - val_loss: 0.8088 - val_accuracy: 0.4206
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5965 - accuracy: 0.5321 - val_loss: 0.7985 - val_accuracy: 0.4112
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6284 - accuracy: 0.5013 - val_loss: 0.7901 - val_accuracy: 0.4112
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6557 - accuracy: 0.5347 - val_loss: 0.7996 - val_accuracy: 0.4252
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6716 - accuracy: 0.5604 - val_loss: 0.7930 - val_accuracy: 0.4393
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7237 - accuracy: 0.5527 - val_loss: 0.7853 - val_accuracy: 0.4439
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6438 - accuracy: 0.5476 - val_loss: 0.7798 - val_accuracy: 0.4019
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6299 - accuracy: 0.5347 - val_loss: 0.7735 - val_accuracy: 0.3972
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6009 - accuracy: 0.5604 - val_loss: 0.7342 - val_accuracy: 0.4159
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5055 - accuracy: 0.5296 - val_loss: 0.7388 - val_accuracy: 0.4206
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6943 - accuracy: 0.5321 - val_loss: 0.6927 - val_accuracy: 0.3925
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4858 - accuracy: 0.5321 - val_loss: 0.6915 - val_accuracy: 0.4065
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5021 - accuracy: 0.5501 - val_loss: 0.6917 - val_accuracy: 0.3972
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4330 - accuracy: 0.5219 - val_loss: 0.6419 - val_accuracy: 0.4159
```

Epoch 93/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6143 - accuracy: 0.5424 - val_loss: 0.6292 - val_accuracy: 0.4112
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4430 - accuracy: 0.5193 - val_loss: 0.6245 - val_accuracy: 0.4159
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5533 - accuracy: 0.5707 - val_loss: 0.6461 - val_accuracy: 0.4065
Epoch 96/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4123 - accuracy: 0.5861 - val_loss: 0.6439 - val_accuracy: 0.3925
Epoch 97/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4586 - accuracy: 0.5681 - val_loss: 0.6779 - val_accuracy: 0.4065
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4072 - accuracy: 0.5887 - val_loss: 0.7190 - val_accuracy: 0.4393
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3906 - accuracy: 0.5810 - val_loss: 0.7436 - val_accuracy: 0.4159
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4953 - accuracy: 0.5681 - val_loss: 0.7576 - val_accuracy: 0.4439
Epoch 101/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4201 - accuracy: 0.5861 - val_loss: 0.7345 - val_accuracy: 0.4673
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4456 - accuracy: 0.5861 - val_loss: 0.7865 - val_accuracy: 0.4953
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4868 - accuracy: 0.5938 - val_loss: 0.7801 - val_accuracy: 0.4673
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5836 - accuracy: 0.5681 - val_loss: 0.7865 - val_accuracy: 0.4860
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4392 - accuracy: 0.5887 - val_loss: 0.7582 - val_accuracy: 0.4953
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4421 - accuracy: 0.5681 - val_loss: 0.7784 - val_accuracy: 0.4813
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4576 - accuracy: 0.5835 - val_loss: 0.7666 - val_accuracy: 0.4673
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4461 - accuracy: 0.5681 - val_loss: 0.7658 - val_accuracy: 0.4673
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4640 - accuracy: 0.5656 - val_loss: 0.7604 - val_accuracy: 0.4626
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4141 - accuracy: 0.5244 - val_loss: 0.7537 - val_accuracy: 0.4299
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4702 - accuracy: 0.5270 - val_loss: 0.7577 - val_accuracy: 0.4346
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4417 - accuracy: 0.4936 - val_loss: 0.7486 - val_accuracy: 0.4486
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4163 - accuracy: 0.5167 - val_loss: 0.7450 - val_accuracy: 0.4486
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4484 - accuracy: 0.4961 - val_loss: 0.7702 - val_accuracy: 0.5093
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4124 - accuracy: 0.5270 - val_loss: 0.7706 - val_accuracy: 0.4953
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4336 - accuracy: 0.5193 - val_loss: 0.7698 - val_accuracy: 0.4907
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4323 - accuracy: 0.5347 - val_loss: 0.7644 - val_accuracy: 0.5000
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4171 - accuracy: 0.5450 - val_loss: 0.7655 - val_accuracy: 0.4907
Epoch 119/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4034 - accuracy: 0.5296 - val_loss: 0.7670 - val_accuracy: 0.5000
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3922 - accuracy: 0.5013 - val_loss: 0.7563 - val_accuracy: 0.5607
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4015 - accuracy: 0.5733 - val_loss: 0.7522 - val_accuracy: 0.5654
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4085 - accuracy: 0.5553 - val_loss: 0.7715 - val_accuracy: 0.5553

```
accuracy: 0.5514
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3810 - accuracy: 0.5758 - val_loss: 0.7676 - val_accuracy: 0.5140
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4410 - accuracy: 0.5527 - val_loss: 0.8479 - val_accuracy: 0.5374
Epoch 125/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4645 - accuracy: 0.5604 - val_loss: 0.7426 - val_accuracy: 0.5467
Epoch 126/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4427 - accuracy: 0.5604 - val_loss: 0.6783 - val_accuracy: 0.4673
Epoch 127/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4084 - accuracy: 0.5501 - val_loss: 0.7507 - val_accuracy: 0.4579
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4328 - accuracy: 0.5707 - val_loss: 0.7526 - val_accuracy: 0.4626
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4126 - accuracy: 0.5835 - val_loss: 0.8159 - val_accuracy: 0.4299
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4111 - accuracy: 0.5604 - val_loss: 0.8363 - val_accuracy: 0.4533
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3797 - accuracy: 0.5553 - val_loss: 0.8388 - val_accuracy: 0.4533
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3810 - accuracy: 0.5810 - val_loss: 0.8439 - val_accuracy: 0.4439
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4013 - accuracy: 0.5578 - val_loss: 0.8180 - val_accuracy: 0.4533
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4152 - accuracy: 0.5578 - val_loss: 0.8194 - val_accuracy: 0.4393
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3713 - accuracy: 0.5913 - val_loss: 0.8235 - val_accuracy: 0.4720
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3496 - accuracy: 0.5835 - val_loss: 0.8259 - val_accuracy: 0.5000
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4355 - accuracy: 0.5733 - val_loss: 0.8333 - val_accuracy: 0.4626
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4454 - accuracy: 0.5630 - val_loss: 0.8351 - val_accuracy: 0.4673
Epoch 139/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4069 - accuracy: 0.5784 - val_loss: 0.8143 - val_accuracy: 0.4766
Epoch 140/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3661 - accuracy: 0.5681 - val_loss: 0.7208 - val_accuracy: 0.4907
Epoch 141/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4377 - accuracy: 0.5501 - val_loss: 0.7264 - val_accuracy: 0.5047
Epoch 142/1000
4/4 [=====] - 0s 18ms/step - loss: 0.3964 - accuracy: 0.5964 - val_loss: 0.7944 - val_accuracy: 0.5093
Epoch 143/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3791 - accuracy: 0.6272 - val_loss: 0.8028 - val_accuracy: 0.4813
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4274 - accuracy: 0.5527 - val_loss: 0.7731 - val_accuracy: 0.4813
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3537 - accuracy: 0.5784 - val_loss: 0.8526 - val_accuracy: 0.4860
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3701 - accuracy: 0.5861 - val_loss: 0.8343 - val_accuracy: 0.4766
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3764 - accuracy: 0.5681 - val_loss: 0.8203 - val_accuracy: 0.5280
Epoch 148/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3556 - accuracy: 0.5656 - val_loss: 0.8360 - val_accuracy: 0.5047
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4222 - accuracy: 0.5553 - val_loss: 0.9296 - val_accuracy: 0.5000
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3375 - accuracy: 0.5784 - val_loss: 0.9591 - val_accuracy: 0.4720
Epoch 151/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3665 - accuracy: 0.5391Restoring model weights from the end of the best epoch: 1.
4/4 [=====] - 0s 13ms/step - loss: 0.4503 - accuracy: 0.5861 - val_loss: 0.9451 - val_accuracy: 0.5000
```

```
accuracy: 0.5093
Epoch 151: early stopping
2/2 [=====] - 0s 5ms/step - loss: 4.4929 - accuracy: 0.5116
[CV] END .....Dense1=100, Dense2=10; total time= 8.6s
Model: "sequential_77"
```

Layer (type)	Output Shape	Param #
=====		
dense_308 (Dense)	(None, 100)	700
batch_normalization_231 (BatchNormalization)	(None, 100)	400
activation_231 (Activation)	(None, 100)	0
dense_309 (Dense)	(None, 10)	1010
batch_normalization_232 (BatchNormalization)	(None, 10)	40
activation_232 (Activation)	(None, 10)	0
dense_310 (Dense)	(None, 10)	110
batch_normalization_233 (BatchNormalization)	(None, 10)	40
activation_233 (Activation)	(None, 10)	0
dense_311 (Dense)	(None, 2)	22
=====		
Total params:	2,322	
Trainable params:	2,082	
Non-trainable params:	240	

```
Epoch 1/1000
4/4 [=====] - 2s 55ms/step - loss: 5.3867 - accuracy: 0.5630 - val_loss: 7.6406 - val_accuracy: 0.4579
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 4.2030 - accuracy: 0.5913 - val_loss: 7.2970 - val_accuracy: 0.4579
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 4.0199 - accuracy: 0.5964 - val_loss: 5.9477 - val_accuracy: 0.4673
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 3.6767 - accuracy: 0.6195 - val_loss: 4.4163 - val_accuracy: 0.5327
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4573 - accuracy: 0.6118 - val_loss: 3.6609 - val_accuracy: 0.5467
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 3.3147 - accuracy: 0.5990 - val_loss: 3.1056 - val_accuracy: 0.5935
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 3.2922 - accuracy: 0.6118 - val_loss: 2.7944 - val_accuracy: 0.6402
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1254 - accuracy: 0.5681 - val_loss: 2.6901 - val_accuracy: 0.6402
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9633 - accuracy: 0.5681 - val_loss: 2.5654 - val_accuracy: 0.6215
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9172 - accuracy: 0.5784 - val_loss: 2.4842 - val_accuracy: 0.6355
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6814 - accuracy: 0.5527 - val_loss: 2.3423 - val_accuracy: 0.6355
Epoch 12/1000
4/4 [=====] - 0s 15ms/step - loss: 2.7114 - accuracy: 0.5681 - val_loss: 2.1902 - val_accuracy: 0.6682
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3716 - accuracy: 0.5707 - val_loss: 2.1491 - val_accuracy: 0.6682
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4424 - accuracy: 0.5604 - val_loss: 2.0575 - val_accuracy: 0.6869
Epoch 15/1000
4/4 [=====] - 0s 15ms/step - loss: 2.2972 - accuracy: 0.5424 - val_loss: 2.0297 - val_accuracy: 0.6682
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1312 - accuracy: 0.5347 - val_loss: 2.0108 - val_accuracy: 0.6776
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0971 - accuracy: 0.5527 - val_loss: 1.9432 - val_accuracy: 0.6589
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9497 - accuracy: 0.5039 - val_loss: 1.9134 - val_accuracy: 0.6589
```

```
accuracy: 0.6589
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8560 - accuracy: 0.5116 - val_loss: 1.7863 - val_accuracy: 0.6776
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5851 - accuracy: 0.5193 - val_loss: 1.7281 - val_accuracy: 0.6776
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5150 - accuracy: 0.5090 - val_loss: 1.7218 - val_accuracy: 0.6729
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4978 - accuracy: 0.5116 - val_loss: 1.6940 - val_accuracy: 0.6682
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4058 - accuracy: 0.5013 - val_loss: 1.6737 - val_accuracy: 0.6822
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2505 - accuracy: 0.4781 - val_loss: 1.6784 - val_accuracy: 0.6542
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2167 - accuracy: 0.4807 - val_loss: 1.6421 - val_accuracy: 0.6449
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1249 - accuracy: 0.4859 - val_loss: 1.6212 - val_accuracy: 0.6402
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1833 - accuracy: 0.4679 - val_loss: 1.5997 - val_accuracy: 0.5888
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1339 - accuracy: 0.4679 - val_loss: 1.5762 - val_accuracy: 0.5888
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9969 - accuracy: 0.4961 - val_loss: 1.5664 - val_accuracy: 0.5981
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0546 - accuracy: 0.4704 - val_loss: 1.5644 - val_accuracy: 0.6121
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9188 - accuracy: 0.4859 - val_loss: 1.5241 - val_accuracy: 0.6028
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0785 - accuracy: 0.4704 - val_loss: 1.5223 - val_accuracy: 0.6075
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9714 - accuracy: 0.4961 - val_loss: 1.5057 - val_accuracy: 0.6168
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9556 - accuracy: 0.4987 - val_loss: 1.4873 - val_accuracy: 0.6028
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8980 - accuracy: 0.4859 - val_loss: 1.4662 - val_accuracy: 0.5888
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8114 - accuracy: 0.4936 - val_loss: 1.4497 - val_accuracy: 0.5981
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8538 - accuracy: 0.4679 - val_loss: 1.3938 - val_accuracy: 0.6308
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9399 - accuracy: 0.4833 - val_loss: 1.3602 - val_accuracy: 0.6028
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8941 - accuracy: 0.4730 - val_loss: 1.3973 - val_accuracy: 0.5981
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8750 - accuracy: 0.4704 - val_loss: 1.3543 - val_accuracy: 0.5841
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9019 - accuracy: 0.4422 - val_loss: 1.3227 - val_accuracy: 0.5841
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7903 - accuracy: 0.4781 - val_loss: 1.3171 - val_accuracy: 0.5701
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8575 - accuracy: 0.4473 - val_loss: 1.2817 - val_accuracy: 0.5467
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9102 - accuracy: 0.4422 - val_loss: 1.2589 - val_accuracy: 0.5654
Epoch 45/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7649 - accuracy: 0.4319 - val_loss: 1.2215 - val_accuracy: 0.5607
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8305 - accuracy: 0.4550 - val_loss: 1.2665 - val_accuracy: 0.5374
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7186 - accuracy: 0.4447 - val_loss: 1.2481 - val_accuracy: 0.5374
Epoch 48/1000
```

```
4/4 [=====] - 0s 11ms/step - loss: 0.8319 - accuracy: 0.4524 - val_loss: 1.2491 - val_accuracy: 0.5654
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7086 - accuracy: 0.4730 - val_loss: 1.2847 - val_accuracy: 0.5607
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6540 - accuracy: 0.4524 - val_loss: 1.2634 - val_accuracy: 0.5561
Epoch 51/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6896 - accuracy: 0.4576 - val_loss: 1.2506 - val_accuracy: 0.5561
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7205 - accuracy: 0.4653 - val_loss: 1.2319 - val_accuracy: 0.5561
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7268 - accuracy: 0.4627 - val_loss: 1.2330 - val_accuracy: 0.5467
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6737 - accuracy: 0.4422 - val_loss: 1.2205 - val_accuracy: 0.5374
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6747 - accuracy: 0.4679 - val_loss: 1.2016 - val_accuracy: 0.5280
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6538 - accuracy: 0.4576 - val_loss: 1.2059 - val_accuracy: 0.5140
Epoch 57/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6889 - accuracy: 0.4627 - val_loss: 1.2030 - val_accuracy: 0.5093
Epoch 58/1000
4/4 [=====] - 0s 16ms/step - loss: 0.7709 - accuracy: 0.4730 - val_loss: 1.1999 - val_accuracy: 0.5047
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7166 - accuracy: 0.4730 - val_loss: 1.1992 - val_accuracy: 0.5000
Epoch 60/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7260 - accuracy: 0.4602 - val_loss: 1.1155 - val_accuracy: 0.5093
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6137 - accuracy: 0.4602 - val_loss: 1.1288 - val_accuracy: 0.5234
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6229 - accuracy: 0.4447 - val_loss: 1.1574 - val_accuracy: 0.5234
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6944 - accuracy: 0.4267 - val_loss: 1.1491 - val_accuracy: 0.5280
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6242 - accuracy: 0.4396 - val_loss: 1.1049 - val_accuracy: 0.5140
Epoch 65/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7291 - accuracy: 0.4447 - val_loss: 1.0606 - val_accuracy: 0.4907
Epoch 66/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7248 - accuracy: 0.4370 - val_loss: 1.0562 - val_accuracy: 0.5000
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6907 - accuracy: 0.4422 - val_loss: 1.0369 - val_accuracy: 0.4907
Epoch 68/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6212 - accuracy: 0.4576 - val_loss: 1.0527 - val_accuracy: 0.5000
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6279 - accuracy: 0.4473 - val_loss: 1.0650 - val_accuracy: 0.5327
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6577 - accuracy: 0.4293 - val_loss: 1.0858 - val_accuracy: 0.5234
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6105 - accuracy: 0.4499 - val_loss: 1.0250 - val_accuracy: 0.5140
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6112 - accuracy: 0.4267 - val_loss: 0.9531 - val_accuracy: 0.5234
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6165 - accuracy: 0.4190 - val_loss: 0.9433 - val_accuracy: 0.5187
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6752 - accuracy: 0.4344 - val_loss: 0.9666 - val_accuracy: 0.5374
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6948 - accuracy: 0.4550 - val_loss: 0.9611 - val_accuracy: 0.5327
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6588 - accuracy: 0.4370 - val_loss: 0.9053 - val_accuracy: 0.5000
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6133 - accuracy: 0.4113 - val_loss: 0.9622 - val_accuracy: 0.5140
```

Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6304 - accuracy: 0.4524 - val_loss: 0.9431 - val_accuracy: 0.5140
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5629 - accuracy: 0.4447 - val_loss: 0.9044 - val_accuracy: 0.5140
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5675 - accuracy: 0.4447 - val_loss: 0.8503 - val_accuracy: 0.5234
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5825 - accuracy: 0.4165 - val_loss: 0.7880 - val_accuracy: 0.4860
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5515 - accuracy: 0.4216 - val_loss: 0.7938 - val_accuracy: 0.4860
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4502 - accuracy: 0.4165 - val_loss: 0.7912 - val_accuracy: 0.5000
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4517 - accuracy: 0.4190 - val_loss: 0.7776 - val_accuracy: 0.5000
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5415 - accuracy: 0.4139 - val_loss: 0.7698 - val_accuracy: 0.4813
Epoch 86/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4987 - accuracy: 0.4319 - val_loss: 0.7635 - val_accuracy: 0.4766
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6089 - accuracy: 0.3907 - val_loss: 0.7415 - val_accuracy: 0.4766
Epoch 88/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5723 - accuracy: 0.3985 - val_loss: 0.7501 - val_accuracy: 0.4673
Epoch 89/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5609 - accuracy: 0.4113 - val_loss: 0.7281 - val_accuracy: 0.4579
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6164 - accuracy: 0.4190 - val_loss: 0.7112 - val_accuracy: 0.4673
Epoch 91/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4748 - accuracy: 0.3933 - val_loss: 0.7093 - val_accuracy: 0.4626
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5171 - accuracy: 0.3959 - val_loss: 0.7027 - val_accuracy: 0.4533
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4554 - accuracy: 0.3985 - val_loss: 0.7210 - val_accuracy: 0.4579
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4943 - accuracy: 0.4010 - val_loss: 0.6935 - val_accuracy: 0.4579
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5629 - accuracy: 0.3933 - val_loss: 0.6799 - val_accuracy: 0.4533
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4546 - accuracy: 0.4113 - val_loss: 0.6547 - val_accuracy: 0.4486
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4709 - accuracy: 0.4087 - val_loss: 0.6483 - val_accuracy: 0.4393
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4683 - accuracy: 0.3985 - val_loss: 0.8524 - val_accuracy: 0.5000
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3757 - accuracy: 0.4370 - val_loss: 0.8644 - val_accuracy: 0.5000
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4247 - accuracy: 0.4370 - val_loss: 0.8267 - val_accuracy: 0.4860
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4843 - accuracy: 0.4422 - val_loss: 0.8158 - val_accuracy: 0.5000
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3845 - accuracy: 0.4216 - val_loss: 0.7829 - val_accuracy: 0.5000
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4500 - accuracy: 0.4319 - val_loss: 0.7956 - val_accuracy: 0.5000
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4144 - accuracy: 0.4113 - val_loss: 0.8030 - val_accuracy: 0.5093
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4088 - accuracy: 0.4190 - val_loss: 0.7768 - val_accuracy: 0.5187
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4837 - accuracy: 0.4267 - val_loss: 0.7790 - val_accuracy: 0.5234
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4291 - accuracy: 0.4396 - val_loss: 0.8262 - val_accuracy: 0.5234

```
accuracy: 0.5047
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3853 - accuracy: 0.4293 - val_loss: 0.8130 - val_
accuracy: 0.5047
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4188 - accuracy: 0.4113 - val_loss: 0.7780 - val_
accuracy: 0.4720
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4296 - accuracy: 0.4113 - val_loss: 0.9569 - val_
accuracy: 0.5000
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3909 - accuracy: 0.4344 - val_loss: 0.9362 - val_
accuracy: 0.4766
Epoch 112/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4622 - accuracy: 0.4422 - val_loss: 0.9195 - val_
accuracy: 0.4579
Epoch 113/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4172 - accuracy: 0.4165 - val_loss: 0.9076 - val_
accuracy: 0.4159
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3990 - accuracy: 0.4165 - val_loss: 0.8940 - val_
accuracy: 0.4065
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3845 - accuracy: 0.4267 - val_loss: 0.8962 - val_
accuracy: 0.4252
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3946 - accuracy: 0.4139 - val_loss: 0.9258 - val_
accuracy: 0.4299
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4320 - accuracy: 0.4087 - val_loss: 0.9183 - val_
accuracy: 0.4252
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4199 - accuracy: 0.4165 - val_loss: 0.9052 - val_
accuracy: 0.4065
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3872 - accuracy: 0.4165 - val_loss: 0.8814 - val_
accuracy: 0.4065
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3473 - accuracy: 0.4062 - val_loss: 0.8628 - val_
accuracy: 0.4346
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4015 - accuracy: 0.4319 - val_loss: 0.8330 - val_
accuracy: 0.4019
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4340 - accuracy: 0.4010 - val_loss: 0.9175 - val_
accuracy: 0.4112
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3838 - accuracy: 0.4267 - val_loss: 0.8258 - val_
accuracy: 0.3879
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4347 - accuracy: 0.4267 - val_loss: 0.8677 - val_
accuracy: 0.4252
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3790 - accuracy: 0.4602 - val_loss: 0.8837 - val_
accuracy: 0.4299
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3709 - accuracy: 0.4499 - val_loss: 0.8549 - val_
accuracy: 0.4206
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4136 - accuracy: 0.4293 - val_loss: 0.8813 - val_
accuracy: 0.4299
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4051 - accuracy: 0.4473 - val_loss: 0.8713 - val_
accuracy: 0.4486
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4362 - accuracy: 0.4396 - val_loss: 0.8518 - val_
accuracy: 0.4439
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4426 - accuracy: 0.4396 - val_loss: 0.8497 - val_
accuracy: 0.4533
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4551 - accuracy: 0.4216 - val_loss: 0.8545 - val_
accuracy: 0.4486
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4288 - accuracy: 0.4267 - val_loss: 0.8340 - val_
accuracy: 0.4393
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4234 - accuracy: 0.4062 - val_loss: 0.8157 - val_
accuracy: 0.4299
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3801 - accuracy: 0.4242 - val_loss: 0.6896 - val_
accuracy: 0.4206
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3703 - accuracy: 0.4293 - val_loss: 0.7472 - val_
accuracy: 0.4346
Epoch 136/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3317 - accuracy: 0.4396 - val_loss: 0.7899 - val_
accuracy: 0.4439
Epoch 137/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.2984 - accuracy: 0.4062 - val_loss: 0.8114 - val_accuracy: 0.4252
Epoch 138/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2905 - accuracy: 0.4216 - val_loss: 0.8312 - val_accuracy: 0.4393
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3480 - accuracy: 0.4344 - val_loss: 0.7974 - val_accuracy: 0.4065
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4125 - accuracy: 0.4293 - val_loss: 0.8805 - val_accuracy: 0.4065
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4285 - accuracy: 0.4730 - val_loss: 0.8689 - val_accuracy: 0.4065
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3940 - accuracy: 0.4139 - val_loss: 1.0408 - val_accuracy: 0.3925
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3257 - accuracy: 0.4473 - val_loss: 0.9365 - val_accuracy: 0.3972
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3950 - accuracy: 0.4679 - val_loss: 0.8545 - val_accuracy: 0.3879
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4490 - accuracy: 0.4113 - val_loss: 0.7311 - val_accuracy: 0.3972
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3561 - accuracy: 0.3907 - val_loss: 0.6736 - val_accuracy: 0.3925
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4373 - accuracy: 0.4267 - val_loss: 0.6717 - val_accuracy: 0.3785
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4310 - accuracy: 0.4267 - val_loss: 0.7007 - val_accuracy: 0.4299
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4465 - accuracy: 0.3959 - val_loss: 0.7155 - val_accuracy: 0.4065
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5277 - accuracy: 0.4216 - val_loss: 0.7237 - val_accuracy: 0.4065
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4291 - accuracy: 0.4190 - val_loss: 0.8536 - val_accuracy: 0.4112
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4423 - accuracy: 0.4216 - val_loss: 0.7759 - val_accuracy: 0.3645
Epoch 153/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3531 - accuracy: 0.4242 - val_loss: 0.8082 - val_accuracy: 0.3598
Epoch 154/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3878 - accuracy: 0.4010 - val_loss: 0.7535 - val_accuracy: 0.3645
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3522 - accuracy: 0.4216 - val_loss: 0.7349 - val_accuracy: 0.3551
Epoch 156/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3653 - accuracy: 0.4139 - val_loss: 0.7189 - val_accuracy: 0.3832
Epoch 157/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3483 - accuracy: 0.4062 - val_loss: 0.7020 - val_accuracy: 0.3645
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4362 - accuracy: 0.4165 - val_loss: 0.7171 - val_accuracy: 0.3364
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3969 - accuracy: 0.3805 - val_loss: 1.1273 - val_accuracy: 0.3364
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4682 - accuracy: 0.3933 - val_loss: 0.9693 - val_accuracy: 0.3598
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4007 - accuracy: 0.4396 - val_loss: 0.8913 - val_accuracy: 0.3832
Epoch 162/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4126 - accuracy: 0.4190 - val_loss: 0.8355 - val_accuracy: 0.4065
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3580 - accuracy: 0.4010 - val_loss: 0.8692 - val_accuracy: 0.4159
Epoch 164/1000
1/4 [====>.....] - ETA: 0s - loss: 0.4134 - accuracy: 0.4844Restoring model weights from the end of the best epoch: 14.
4/4 [=====] - 0s 14ms/step - loss: 0.3223 - accuracy: 0.4293 - val_loss: 0.8888 - val_accuracy: 0.4252
Epoch 164: early stopping
2/2 [=====] - 0s 4ms/step - loss: 1.6839 - accuracy: 0.6977
[CV] END .....Dense1=100, Dense2=10; total time= 9.2s
Model: "sequential_78"
```

Layer (type)	Output Shape	Param #
dense_312 (Dense)	(None, 100)	700
batch_normalization_234 (BatchNormalization)	(None, 100)	400
activation_234 (Activation)	(None, 100)	0
dense_313 (Dense)	(None, 10)	1010
batch_normalization_235 (BatchNormalization)	(None, 10)	40
activation_235 (Activation)	(None, 10)	0
dense_314 (Dense)	(None, 10)	110
batch_normalization_236 (BatchNormalization)	(None, 10)	40
activation_236 (Activation)	(None, 10)	0
dense_315 (Dense)	(None, 2)	22
<hr/>		
Total params: 2,322		
Trainable params: 2,082		
Non-trainable params: 240		
<hr/>		
Epoch 1/1000		
4/4 [=====] - 1s 63ms/step - loss: 5.5929 - accuracy: 0.4961 - val_loss: 5.4487 - val_accuracy: 0.5047		
Epoch 2/1000		
4/4 [=====] - 0s 13ms/step - loss: 3.9470 - accuracy: 0.5656 - val_loss: 4.6752 - val_accuracy: 0.4813		
Epoch 3/1000		
4/4 [=====] - 0s 14ms/step - loss: 3.7850 - accuracy: 0.5861 - val_loss: 3.9492 - val_accuracy: 0.4626		
Epoch 4/1000		
4/4 [=====] - 0s 13ms/step - loss: 3.6464 - accuracy: 0.5733 - val_loss: 3.7057 - val_accuracy: 0.4533		
Epoch 5/1000		
4/4 [=====] - 0s 13ms/step - loss: 3.7669 - accuracy: 0.5887 - val_loss: 3.3681 - val_accuracy: 0.4673		
Epoch 6/1000		
4/4 [=====] - 0s 14ms/step - loss: 3.7667 - accuracy: 0.5784 - val_loss: 3.1936 - val_accuracy: 0.5093		
Epoch 7/1000		
4/4 [=====] - 0s 13ms/step - loss: 3.7325 - accuracy: 0.5681 - val_loss: 2.9464 - val_accuracy: 0.5748		
Epoch 8/1000		
4/4 [=====] - 0s 13ms/step - loss: 3.5753 - accuracy: 0.5758 - val_loss: 2.8894 - val_accuracy: 0.5561		
Epoch 9/1000		
4/4 [=====] - 0s 13ms/step - loss: 3.5361 - accuracy: 0.5784 - val_loss: 2.6823 - val_accuracy: 0.5467		
Epoch 10/1000		
4/4 [=====] - 0s 13ms/step - loss: 3.5066 - accuracy: 0.5604 - val_loss: 2.4473 - val_accuracy: 0.5654		
Epoch 11/1000		
4/4 [=====] - 0s 13ms/step - loss: 3.3998 - accuracy: 0.5733 - val_loss: 2.3844 - val_accuracy: 0.5607		
Epoch 12/1000		
4/4 [=====] - 0s 13ms/step - loss: 3.3010 - accuracy: 0.5656 - val_loss: 2.3535 - val_accuracy: 0.5561		
Epoch 13/1000		
4/4 [=====] - 0s 13ms/step - loss: 3.2839 - accuracy: 0.5270 - val_loss: 2.2642 - val_accuracy: 0.5654		
Epoch 14/1000		
4/4 [=====] - 0s 14ms/step - loss: 3.4087 - accuracy: 0.5116 - val_loss: 2.2265 - val_accuracy: 0.5701		
Epoch 15/1000		
4/4 [=====] - 0s 21ms/step - loss: 3.2529 - accuracy: 0.5553 - val_loss: 2.1397 - val_accuracy: 0.5748		
Epoch 16/1000		
4/4 [=====] - 0s 16ms/step - loss: 3.2105 - accuracy: 0.5321 - val_loss: 2.1206 - val_accuracy: 0.5748		
Epoch 17/1000		
4/4 [=====] - 0s 14ms/step - loss: 3.0980 - accuracy: 0.5424 - val_loss: 2.0916 - val_accuracy: 0.5701		
Epoch 18/1000		
4/4 [=====] - 0s 15ms/step - loss: 3.1277 - accuracy: 0.5527 - val_loss: 2.0754 - val_accuracy: 0.5561		
Epoch 19/1000		
4/4 [=====] - 0s 13ms/step - loss: 2.9536 - accuracy: 0.5733 - val_loss: 1.9967 - val_accuracy: 0.4626		
Epoch 20/1000		

```
4/4 [=====] - 0s 15ms/step - loss: 2.9080 - accuracy: 0.5913 - val_loss: 1.9641 - val_accuracy: 0.4813
Epoch 21/1000
4/4 [=====] - 0s 18ms/step - loss: 2.8279 - accuracy: 0.5861 - val_loss: 1.9374 - val_accuracy: 0.4953
Epoch 22/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7669 - accuracy: 0.5887 - val_loss: 1.9230 - val_accuracy: 0.4907
Epoch 23/1000
4/4 [=====] - 0s 15ms/step - loss: 2.6839 - accuracy: 0.5810 - val_loss: 1.8885 - val_accuracy: 0.5000
Epoch 24/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4828 - accuracy: 0.5681 - val_loss: 1.8383 - val_accuracy: 0.5327
Epoch 25/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4264 - accuracy: 0.5810 - val_loss: 1.7843 - val_accuracy: 0.5140
Epoch 26/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3560 - accuracy: 0.5656 - val_loss: 1.8454 - val_accuracy: 0.5047
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1984 - accuracy: 0.5733 - val_loss: 1.8257 - val_accuracy: 0.5093
Epoch 28/1000
4/4 [=====] - 0s 15ms/step - loss: 2.0925 - accuracy: 0.5707 - val_loss: 1.8047 - val_accuracy: 0.5187
Epoch 29/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0303 - accuracy: 0.5887 - val_loss: 1.7907 - val_accuracy: 0.5187
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0707 - accuracy: 0.5964 - val_loss: 1.7450 - val_accuracy: 0.5093
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1057 - accuracy: 0.5167 - val_loss: 1.7377 - val_accuracy: 0.5140
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9738 - accuracy: 0.5501 - val_loss: 1.7364 - val_accuracy: 0.5140
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0778 - accuracy: 0.5861 - val_loss: 1.8181 - val_accuracy: 0.5140
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1053 - accuracy: 0.5321 - val_loss: 1.8338 - val_accuracy: 0.5093
Epoch 35/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9773 - accuracy: 0.5476 - val_loss: 1.8424 - val_accuracy: 0.5234
Epoch 36/1000
4/4 [=====] - 0s 15ms/step - loss: 2.0336 - accuracy: 0.5630 - val_loss: 1.8310 - val_accuracy: 0.5280
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8703 - accuracy: 0.5373 - val_loss: 1.8136 - val_accuracy: 0.5280
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8607 - accuracy: 0.5604 - val_loss: 1.8084 - val_accuracy: 0.5421
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8641 - accuracy: 0.5501 - val_loss: 1.7958 - val_accuracy: 0.5467
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8957 - accuracy: 0.5116 - val_loss: 1.7559 - val_accuracy: 0.5467
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7622 - accuracy: 0.5270 - val_loss: 1.7417 - val_accuracy: 0.5514
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7748 - accuracy: 0.5167 - val_loss: 1.7700 - val_accuracy: 0.5561
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7248 - accuracy: 0.5321 - val_loss: 1.7628 - val_accuracy: 0.5561
Epoch 44/1000
4/4 [=====] - 0s 15ms/step - loss: 1.7273 - accuracy: 0.5321 - val_loss: 1.7531 - val_accuracy: 0.5421
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7697 - accuracy: 0.5321 - val_loss: 1.7158 - val_accuracy: 0.5467
Epoch 46/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7173 - accuracy: 0.5553 - val_loss: 1.6715 - val_accuracy: 0.5467
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6971 - accuracy: 0.5398 - val_loss: 1.6664 - val_accuracy: 0.5421
Epoch 48/1000
4/4 [=====] - 0s 16ms/step - loss: 1.6732 - accuracy: 0.5296 - val_loss: 1.6971 - val_accuracy: 0.5187
Epoch 49/1000
4/4 [=====] - 0s 15ms/step - loss: 1.6620 - accuracy: 0.6221 - val_loss: 1.7006 - val_accuracy: 0.5280
```

Epoch 50/1000
4/4 [=====] - 0s 17ms/step - loss: 1.6936 - accuracy: 0.6221 - val_loss: 1.6880 - val_accuracy: 0.5187
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6382 - accuracy: 0.6221 - val_loss: 1.6795 - val_accuracy: 0.5234
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7009 - accuracy: 0.6350 - val_loss: 1.6803 - val_accuracy: 0.5421
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5577 - accuracy: 0.6170 - val_loss: 1.6339 - val_accuracy: 0.5701
Epoch 54/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5593 - accuracy: 0.6452 - val_loss: 1.6462 - val_accuracy: 0.5888
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5636 - accuracy: 0.6375 - val_loss: 1.6276 - val_accuracy: 0.5748
Epoch 56/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5256 - accuracy: 0.6581 - val_loss: 1.6322 - val_accuracy: 0.5514
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4754 - accuracy: 0.6324 - val_loss: 1.6211 - val_accuracy: 0.5514
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4852 - accuracy: 0.6401 - val_loss: 1.6025 - val_accuracy: 0.5421
Epoch 59/1000
4/4 [=====] - 0s 15ms/step - loss: 1.5201 - accuracy: 0.6607 - val_loss: 1.5198 - val_accuracy: 0.5794
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5069 - accuracy: 0.6247 - val_loss: 1.5065 - val_accuracy: 0.5841
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4231 - accuracy: 0.6555 - val_loss: 1.4865 - val_accuracy: 0.5841
Epoch 62/1000
4/4 [=====] - 0s 15ms/step - loss: 1.5119 - accuracy: 0.6735 - val_loss: 1.4567 - val_accuracy: 0.6262
Epoch 63/1000
4/4 [=====] - 0s 15ms/step - loss: 1.4211 - accuracy: 0.6530 - val_loss: 1.4619 - val_accuracy: 0.5841
Epoch 64/1000
4/4 [=====] - 0s 15ms/step - loss: 1.3693 - accuracy: 0.6272 - val_loss: 1.4377 - val_accuracy: 0.6075
Epoch 65/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3329 - accuracy: 0.6427 - val_loss: 1.4203 - val_accuracy: 0.6075
Epoch 66/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3585 - accuracy: 0.6401 - val_loss: 1.3740 - val_accuracy: 0.6355
Epoch 67/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3226 - accuracy: 0.6478 - val_loss: 1.3504 - val_accuracy: 0.6776
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3284 - accuracy: 0.6787 - val_loss: 1.3371 - val_accuracy: 0.6776
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3482 - accuracy: 0.6735 - val_loss: 1.3847 - val_accuracy: 0.6636
Epoch 70/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2536 - accuracy: 0.6504 - val_loss: 1.3730 - val_accuracy: 0.6589
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3301 - accuracy: 0.6658 - val_loss: 1.3780 - val_accuracy: 0.6495
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2726 - accuracy: 0.6324 - val_loss: 1.3591 - val_accuracy: 0.6682
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2479 - accuracy: 0.6581 - val_loss: 1.3750 - val_accuracy: 0.6916
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2050 - accuracy: 0.6761 - val_loss: 1.3622 - val_accuracy: 0.6869
Epoch 75/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2446 - accuracy: 0.6375 - val_loss: 1.3481 - val_accuracy: 0.6916
Epoch 76/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2126 - accuracy: 0.6735 - val_loss: 1.3329 - val_accuracy: 0.7103
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2336 - accuracy: 0.6427 - val_loss: 1.3410 - val_accuracy: 0.7103
Epoch 78/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1261 - accuracy: 0.6787 - val_loss: 1.3341 - val_accuracy: 0.7196
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1816 - accuracy: 0.6530 - val_loss: 1.3094 - val_accuracy: 0.7196

```
accuracy: 0.7150
Epoch 80/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2155 - accuracy: 0.6452 - val_loss: 1.2410 - val_
accuracy: 0.7243
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2031 - accuracy: 0.6375 - val_loss: 1.2485 - val_
accuracy: 0.7196
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2274 - accuracy: 0.6170 - val_loss: 1.2650 - val_
accuracy: 0.7196
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0665 - accuracy: 0.6375 - val_loss: 1.3021 - val_
accuracy: 0.7103
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2003 - accuracy: 0.6041 - val_loss: 1.3116 - val_
accuracy: 0.6776
Epoch 85/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1436 - accuracy: 0.6093 - val_loss: 1.3021 - val_
accuracy: 0.6776
Epoch 86/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1665 - accuracy: 0.5964 - val_loss: 1.2691 - val_
accuracy: 0.6682
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0767 - accuracy: 0.5707 - val_loss: 1.3205 - val_
accuracy: 0.6682
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1106 - accuracy: 0.6221 - val_loss: 1.2686 - val_
accuracy: 0.6495
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1585 - accuracy: 0.6375 - val_loss: 1.2800 - val_
accuracy: 0.6215
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0346 - accuracy: 0.6324 - val_loss: 1.2577 - val_
accuracy: 0.6402
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0768 - accuracy: 0.6427 - val_loss: 1.1930 - val_
accuracy: 0.6449
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0788 - accuracy: 0.6272 - val_loss: 1.1710 - val_
accuracy: 0.6542
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0408 - accuracy: 0.6401 - val_loss: 1.1664 - val_
accuracy: 0.6449
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0566 - accuracy: 0.6247 - val_loss: 1.1489 - val_
accuracy: 0.6495
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9847 - accuracy: 0.6170 - val_loss: 1.1103 - val_
accuracy: 0.5841
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9319 - accuracy: 0.5990 - val_loss: 1.0954 - val_
accuracy: 0.5794
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0664 - accuracy: 0.5990 - val_loss: 1.0768 - val_
accuracy: 0.5888
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9396 - accuracy: 0.6041 - val_loss: 1.0740 - val_
accuracy: 0.5841
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9241 - accuracy: 0.6118 - val_loss: 1.0745 - val_
accuracy: 0.5888
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9698 - accuracy: 0.5964 - val_loss: 1.0463 - val_
accuracy: 0.5841
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8808 - accuracy: 0.6144 - val_loss: 1.0482 - val_
accuracy: 0.5935
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9490 - accuracy: 0.6118 - val_loss: 1.0917 - val_
accuracy: 0.6028
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9034 - accuracy: 0.6093 - val_loss: 1.0906 - val_
accuracy: 0.6589
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8521 - accuracy: 0.5784 - val_loss: 1.0556 - val_
accuracy: 0.6121
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9184 - accuracy: 0.5964 - val_loss: 1.0826 - val_
accuracy: 0.6121
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8907 - accuracy: 0.6067 - val_loss: 1.1285 - val_
accuracy: 0.6168
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8491 - accuracy: 0.6041 - val_loss: 0.9865 - val_
accuracy: 0.6168
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7079 - accuracy: 0.6118 - val_loss: 1.0022 - val_
accuracy: 0.6121
Epoch 109/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.8021 - accuracy: 0.5938 - val_loss: 1.0018 - val_accuracy: 0.6168  
Epoch 110/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.7857 - accuracy: 0.6144 - val_loss: 0.9725 - val_accuracy: 0.6168  
Epoch 111/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.7143 - accuracy: 0.6221 - val_loss: 1.0575 - val_accuracy: 0.6121  
Epoch 112/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.7248 - accuracy: 0.6067 - val_loss: 1.0014 - val_accuracy: 0.6121  
Epoch 113/1000  
4/4 [=====] - 0s 11ms/step - loss: 0.7551 - accuracy: 0.6272 - val_loss: 0.9564 - val_accuracy: 0.6075  
Epoch 114/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.6777 - accuracy: 0.6350 - val_loss: 1.0026 - val_accuracy: 0.6262  
Epoch 115/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.7549 - accuracy: 0.6375 - val_loss: 1.0206 - val_accuracy: 0.6308  
Epoch 116/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.7003 - accuracy: 0.6298 - val_loss: 1.0284 - val_accuracy: 0.6168  
Epoch 117/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.6960 - accuracy: 0.6324 - val_loss: 0.9791 - val_accuracy: 0.6168  
Epoch 118/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.6879 - accuracy: 0.5964 - val_loss: 0.9706 - val_accuracy: 0.6028  
Epoch 119/1000  
4/4 [=====] - 0s 13ms/step - loss: 0.6880 - accuracy: 0.6015 - val_loss: 0.9878 - val_accuracy: 0.6168  
Epoch 120/1000  
4/4 [=====] - 0s 13ms/step - loss: 0.6895 - accuracy: 0.5964 - val_loss: 1.0527 - val_accuracy: 0.5935  
Epoch 121/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.6087 - accuracy: 0.6015 - val_loss: 1.0869 - val_accuracy: 0.6215  
Epoch 122/1000  
4/4 [=====] - 0s 13ms/step - loss: 0.6570 - accuracy: 0.5913 - val_loss: 1.0664 - val_accuracy: 0.6262  
Epoch 123/1000  
4/4 [=====] - 0s 13ms/step - loss: 0.6959 - accuracy: 0.6067 - val_loss: 1.0931 - val_accuracy: 0.6262  
Epoch 124/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.6183 - accuracy: 0.5630 - val_loss: 0.9563 - val_accuracy: 0.6168  
Epoch 125/1000  
4/4 [=====] - 0s 13ms/step - loss: 0.5828 - accuracy: 0.5733 - val_loss: 1.0718 - val_accuracy: 0.6262  
Epoch 126/1000  
4/4 [=====] - 0s 13ms/step - loss: 0.6501 - accuracy: 0.6298 - val_loss: 1.0505 - val_accuracy: 0.6449  
Epoch 127/1000  
4/4 [=====] - 0s 13ms/step - loss: 0.5720 - accuracy: 0.6067 - val_loss: 1.0518 - val_accuracy: 0.6495  
Epoch 128/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.6513 - accuracy: 0.5938 - val_loss: 1.1488 - val_accuracy: 0.6495  
Epoch 129/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.5408 - accuracy: 0.5861 - val_loss: 1.1724 - val_accuracy: 0.6495  
Epoch 130/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.6445 - accuracy: 0.5758 - val_loss: 1.1404 - val_accuracy: 0.6308  
Epoch 131/1000  
4/4 [=====] - 0s 13ms/step - loss: 0.5909 - accuracy: 0.5758 - val_loss: 1.1177 - val_accuracy: 0.6355  
Epoch 132/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.5597 - accuracy: 0.5810 - val_loss: 1.1137 - val_accuracy: 0.6449  
Epoch 133/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.5997 - accuracy: 0.5887 - val_loss: 1.1455 - val_accuracy: 0.6822  
Epoch 134/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.6209 - accuracy: 0.6015 - val_loss: 1.0175 - val_accuracy: 0.6916  
Epoch 135/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.5780 - accuracy: 0.5835 - val_loss: 0.8924 - val_accuracy: 0.6822  
Epoch 136/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.5411 - accuracy: 0.6170 - val_loss: 1.0995 - val_accuracy: 0.6636  
Epoch 137/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.5607 - accuracy: 0.5604 - val_loss: 0.8179 - val_accuracy: 0.6542  
Epoch 138/1000  
4/4 [=====] - 0s 12ms/step - loss: 0.4762 - accuracy: 0.6041 - val_loss: 0.8841 - val_accuracy: 0.6402
```

Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5974 - accuracy: 0.6221 - val_loss: 0.8617 - val_accuracy: 0.6402
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5367 - accuracy: 0.6093 - val_loss: 0.9182 - val_accuracy: 0.6262
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4995 - accuracy: 0.6221 - val_loss: 0.8812 - val_accuracy: 0.6355
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4770 - accuracy: 0.6427 - val_loss: 0.9672 - val_accuracy: 0.6308
Epoch 143/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4825 - accuracy: 0.6787 - val_loss: 0.9349 - val_accuracy: 0.6542
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5454 - accuracy: 0.6427 - val_loss: 0.9607 - val_accuracy: 0.6682
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5164 - accuracy: 0.6555 - val_loss: 0.9567 - val_accuracy: 0.6542
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4765 - accuracy: 0.6324 - val_loss: 0.9638 - val_accuracy: 0.6542
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4496 - accuracy: 0.6607 - val_loss: 0.8752 - val_accuracy: 0.6449
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4895 - accuracy: 0.6118 - val_loss: 0.8399 - val_accuracy: 0.6402
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4429 - accuracy: 0.6427 - val_loss: 0.8638 - val_accuracy: 0.6589
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4466 - accuracy: 0.6452 - val_loss: 0.8628 - val_accuracy: 0.6682
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4714 - accuracy: 0.6272 - val_loss: 0.9149 - val_accuracy: 0.6542
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4404 - accuracy: 0.6632 - val_loss: 0.9468 - val_accuracy: 0.6542
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4892 - accuracy: 0.6452 - val_loss: 0.9682 - val_accuracy: 0.6495
Epoch 154/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4996 - accuracy: 0.6170 - val_loss: 0.9810 - val_accuracy: 0.6495
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4936 - accuracy: 0.6555 - val_loss: 0.9408 - val_accuracy: 0.6636
Epoch 156/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4254 - accuracy: 0.6555 - val_loss: 0.9671 - val_accuracy: 0.6449
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4003 - accuracy: 0.6581 - val_loss: 0.9495 - val_accuracy: 0.6542
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4505 - accuracy: 0.6350 - val_loss: 0.9666 - val_accuracy: 0.6589
Epoch 159/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4755 - accuracy: 0.6452 - val_loss: 0.9637 - val_accuracy: 0.6589
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5095 - accuracy: 0.6093 - val_loss: 0.9825 - val_accuracy: 0.6636
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4792 - accuracy: 0.6324 - val_loss: 0.9524 - val_accuracy: 0.6729
Epoch 162/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4937 - accuracy: 0.6478 - val_loss: 0.9824 - val_accuracy: 0.6822
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4101 - accuracy: 0.6530 - val_loss: 1.0156 - val_accuracy: 0.6869
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4572 - accuracy: 0.6375 - val_loss: 1.0396 - val_accuracy: 0.6729
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4168 - accuracy: 0.6350 - val_loss: 1.0549 - val_accuracy: 0.6822
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3944 - accuracy: 0.6298 - val_loss: 1.1603 - val_accuracy: 0.6776
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4182 - accuracy: 0.6350 - val_loss: 1.1653 - val_accuracy: 0.6776
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4676 - accuracy: 0.6093 - val_loss: 1.1758 - val_accuracy: 0.6776

```
accuracy: 0.6869
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3286 - accuracy: 0.6530 - val_loss: 1.1469 - val_
accuracy: 0.6916
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4175 - accuracy: 0.6555 - val_loss: 1.1264 - val_
accuracy: 0.6869
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3545 - accuracy: 0.6324 - val_loss: 1.1825 - val_
accuracy: 0.6916
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3441 - accuracy: 0.6221 - val_loss: 1.2147 - val_
accuracy: 0.7009
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5321 - accuracy: 0.6761 - val_loss: 1.2484 - val_
accuracy: 0.6963
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3518 - accuracy: 0.6889 - val_loss: 1.1888 - val_
accuracy: 0.6776
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3356 - accuracy: 0.6324 - val_loss: 1.1566 - val_
accuracy: 0.6776
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3930 - accuracy: 0.6478 - val_loss: 1.2174 - val_
accuracy: 0.6682
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4099 - accuracy: 0.7018 - val_loss: 1.1761 - val_
accuracy: 0.6822
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3595 - accuracy: 0.6787 - val_loss: 1.1372 - val_
accuracy: 0.6682
Epoch 179/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3839 - accuracy: 0.6478 - val_loss: 1.0932 - val_
accuracy: 0.6776
Epoch 180/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3505 - accuracy: 0.6658 - val_loss: 1.1810 - val_
accuracy: 0.6589
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3415 - accuracy: 0.6478 - val_loss: 1.2378 - val_
accuracy: 0.6636
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4550 - accuracy: 0.6632 - val_loss: 1.1603 - val_
accuracy: 0.6589
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3926 - accuracy: 0.6684 - val_loss: 1.0258 - val_
accuracy: 0.6729
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3338 - accuracy: 0.6864 - val_loss: 1.1321 - val_
accuracy: 0.6495
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3686 - accuracy: 0.6401 - val_loss: 1.1671 - val_
accuracy: 0.6636
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3702 - accuracy: 0.6581 - val_loss: 1.1758 - val_
accuracy: 0.6589
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3337 - accuracy: 0.6272 - val_loss: 1.1155 - val_
accuracy: 0.6589
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3180 - accuracy: 0.6530 - val_loss: 1.1109 - val_
accuracy: 0.6449
Epoch 189/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3962 - accuracy: 0.6221 - val_loss: 1.1073 - val_
accuracy: 0.6449
Epoch 190/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3444 - accuracy: 0.5990 - val_loss: 1.2596 - val_
accuracy: 0.6495
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3787 - accuracy: 0.6015 - val_loss: 1.2186 - val_
accuracy: 0.6589
Epoch 192/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3004 - accuracy: 0.6093 - val_loss: 1.2480 - val_
accuracy: 0.6355
Epoch 193/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3713 - accuracy: 0.5913 - val_loss: 1.2318 - val_
accuracy: 0.6542
Epoch 194/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3670 - accuracy: 0.6093 - val_loss: 1.0454 - val_
accuracy: 0.6308
Epoch 195/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3483 - accuracy: 0.6478 - val_loss: 1.0888 - val_
accuracy: 0.5841
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3608 - accuracy: 0.5861 - val_loss: 1.0829 - val_
accuracy: 0.5981
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3986 - accuracy: 0.6067 - val_loss: 1.1089 - val_
accuracy: 0.5654
Epoch 198/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 0.5591 - accuracy: 0.5990 - val_loss: 1.2134 - val_accuracy: 0.5421
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3186 - accuracy: 0.5681 - val_loss: 1.1184 - val_accuracy: 0.6028
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3241 - accuracy: 0.5681 - val_loss: 1.0847 - val_accuracy: 0.6028
Epoch 201/1000
4/4 [=====] - 0s 17ms/step - loss: 0.3732 - accuracy: 0.5758 - val_loss: 1.1049 - val_accuracy: 0.5748
Epoch 202/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3722 - accuracy: 0.5578 - val_loss: 1.0927 - val_accuracy: 0.5935
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3754 - accuracy: 0.5733 - val_loss: 1.1523 - val_accuracy: 0.5935
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4753 - accuracy: 0.5990 - val_loss: 1.1420 - val_accuracy: 0.5841
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3495 - accuracy: 0.5938 - val_loss: 1.1397 - val_accuracy: 0.5514
Epoch 206/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3926 - accuracy: 0.5707 - val_loss: 1.1866 - val_accuracy: 0.5467
Epoch 207/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4228 - accuracy: 0.5604 - val_loss: 1.1491 - val_accuracy: 0.5748
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3281 - accuracy: 0.6093 - val_loss: 1.1506 - val_accuracy: 0.5654
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3694 - accuracy: 0.6427 - val_loss: 1.1229 - val_accuracy: 0.5981
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3515 - accuracy: 0.6761 - val_loss: 1.1196 - val_accuracy: 0.5701
Epoch 211/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3074 - accuracy: 0.6350 - val_loss: 1.1201 - val_accuracy: 0.5327
Epoch 212/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3163 - accuracy: 0.6272 - val_loss: 1.1274 - val_accuracy: 0.5374
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3426 - accuracy: 0.6118 - val_loss: 1.1178 - val_accuracy: 0.5888
Epoch 214/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3232 - accuracy: 0.6247 - val_loss: 1.2539 - val_accuracy: 0.5467
Epoch 215/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3453 - accuracy: 0.6144 - val_loss: 1.2654 - val_accuracy: 0.5514
Epoch 216/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3830 - accuracy: 0.6041 - val_loss: 1.2588 - val_accuracy: 0.5467
Epoch 217/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4288 - accuracy: 0.5810 - val_loss: 1.3142 - val_accuracy: 0.5654
Epoch 218/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2812 - accuracy: 0.6118 - val_loss: 1.2874 - val_accuracy: 0.5701
Epoch 219/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3004 - accuracy: 0.5990 - val_loss: 1.2922 - val_accuracy: 0.5467
Epoch 220/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3532 - accuracy: 0.6067 - val_loss: 1.2669 - val_accuracy: 0.5234
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3016 - accuracy: 0.5578 - val_loss: 1.2469 - val_accuracy: 0.5234
Epoch 222/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3520 - accuracy: 0.5604 - val_loss: 1.1408 - val_accuracy: 0.5421
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3748 - accuracy: 0.6093 - val_loss: 1.0331 - val_accuracy: 0.5841
Epoch 224/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3144 - accuracy: 0.6093 - val_loss: 1.0204 - val_accuracy: 0.5748
Epoch 225/1000
4/4 [=====] - 0s 19ms/step - loss: 0.3093 - accuracy: 0.5501 - val_loss: 1.0382 - val_accuracy: 0.5514
Epoch 226/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3364 - accuracy: 0.5373 - val_loss: 1.0724 - val_accuracy: 0.5561
Epoch 227/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3469 - accuracy: 0.5347 - val_loss: 1.0701 - val_accuracy: 0.5467
```

```

Epoch 228/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3632 - accuracy: 0.5604 - val_loss: 1.0958 - val_accuracy: 0.5514
Epoch 229/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3353 - accuracy: 0.5578 - val_loss: 1.0949 - val_accuracy: 0.5514
Epoch 230/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3368 - accuracy: 0.5234Restoring model weights from the end of the best epoch: 80.
4/4 [=====] - 0s 16ms/step - loss: 0.4117 - accuracy: 0.5810 - val_loss: 1.0948 - val_accuracy: 0.5654
Epoch 230: early stopping
2/2 [=====] - 0s 5ms/step - loss: 0.7395 - accuracy: 0.7907
[CV] END .....Dense1=100, Dense2=10; total time= 12.4s
Model: "sequential_79"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_316 (Dense)	(None, 100)	700
batch_normalization_237 (BatchNormalization)	(None, 100)	400
activation_237 (Activation)	(None, 100)	0
dense_317 (Dense)	(None, 25)	2525
batch_normalization_238 (BatchNormalization)	(None, 25)	100
activation_238 (Activation)	(None, 25)	0
dense_318 (Dense)	(None, 10)	260
batch_normalization_239 (BatchNormalization)	(None, 10)	40
activation_239 (Activation)	(None, 10)	0
dense_319 (Dense)	(None, 2)	22
<hr/>		

Total params: 4,047
Trainable params: 3,777
Non-trainable params: 270

```

Epoch 1/1000
4/4 [=====] - 1s 58ms/step - loss: 4.2603 - accuracy: 0.4845 - val_loss: 6.9813 - val_accuracy: 0.3972
Epoch 2/1000
4/4 [=====] - 0s 15ms/step - loss: 2.8652 - accuracy: 0.5000 - val_loss: 4.9979 - val_accuracy: 0.4159
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4254 - accuracy: 0.5077 - val_loss: 3.3806 - val_accuracy: 0.6168
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3897 - accuracy: 0.5258 - val_loss: 2.7400 - val_accuracy: 0.6916
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2784 - accuracy: 0.5438 - val_loss: 2.4525 - val_accuracy: 0.6916
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9419 - accuracy: 0.5541 - val_loss: 2.4062 - val_accuracy: 0.6963
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8872 - accuracy: 0.5412 - val_loss: 2.2469 - val_accuracy: 0.6916
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8111 - accuracy: 0.5567 - val_loss: 2.0989 - val_accuracy: 0.6869
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7325 - accuracy: 0.5644 - val_loss: 2.0850 - val_accuracy: 0.6916
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6845 - accuracy: 0.5412 - val_loss: 2.0397 - val_accuracy: 0.6916
Epoch 11/1000
4/4 [=====] - 0s 15ms/step - loss: 1.5054 - accuracy: 0.5490 - val_loss: 1.9629 - val_accuracy: 0.6963
Epoch 12/1000
4/4 [=====] - 0s 17ms/step - loss: 1.5255 - accuracy: 0.5722 - val_loss: 1.9798 - val_accuracy: 0.6869
Epoch 13/1000
4/4 [=====] - 0s 18ms/step - loss: 1.4136 - accuracy: 0.5515 - val_loss: 1.9814 - val_accuracy: 0.6822
Epoch 14/1000
4/4 [=====] - 0s 16ms/step - loss: 1.3062 - accuracy: 0.5464 - val_loss: 1.9676 - val_accuracy: 0.6822
Epoch 15/1000

```

```
4/4 [=====] - 0s 13ms/step - loss: 1.2844 - accuracy: 0.5619 - val_loss: 1.9251 - val_accuracy: 0.6869
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1846 - accuracy: 0.5515 - val_loss: 1.9029 - val_accuracy: 0.6729
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1552 - accuracy: 0.5619 - val_loss: 1.9224 - val_accuracy: 0.6495
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1043 - accuracy: 0.5567 - val_loss: 1.8940 - val_accuracy: 0.6449
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0019 - accuracy: 0.5490 - val_loss: 1.8649 - val_accuracy: 0.6402
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0125 - accuracy: 0.5696 - val_loss: 1.8386 - val_accuracy: 0.6355
Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0412 - accuracy: 0.5335 - val_loss: 1.8343 - val_accuracy: 0.6355
Epoch 22/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1202 - accuracy: 0.5387 - val_loss: 1.7813 - val_accuracy: 0.6355
Epoch 23/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0048 - accuracy: 0.5335 - val_loss: 1.8144 - val_accuracy: 0.6215
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9712 - accuracy: 0.5335 - val_loss: 1.7854 - val_accuracy: 0.6168
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9616 - accuracy: 0.5206 - val_loss: 1.7892 - val_accuracy: 0.6215
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9439 - accuracy: 0.5180 - val_loss: 1.7854 - val_accuracy: 0.6168
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9198 - accuracy: 0.5284 - val_loss: 1.7885 - val_accuracy: 0.6121
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8591 - accuracy: 0.5361 - val_loss: 1.7333 - val_accuracy: 0.6215
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7727 - accuracy: 0.5438 - val_loss: 1.7469 - val_accuracy: 0.6028
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8608 - accuracy: 0.5387 - val_loss: 1.6516 - val_accuracy: 0.5748
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7878 - accuracy: 0.5644 - val_loss: 1.6443 - val_accuracy: 0.4252
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7891 - accuracy: 0.5593 - val_loss: 1.6281 - val_accuracy: 0.4299
Epoch 33/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6984 - accuracy: 0.5644 - val_loss: 1.6521 - val_accuracy: 0.4486
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8479 - accuracy: 0.5722 - val_loss: 1.5211 - val_accuracy: 0.4626
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6958 - accuracy: 0.5567 - val_loss: 1.5026 - val_accuracy: 0.4626
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8627 - accuracy: 0.5670 - val_loss: 1.4872 - val_accuracy: 0.4673
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7038 - accuracy: 0.5696 - val_loss: 1.4519 - val_accuracy: 0.4766
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7471 - accuracy: 0.5851 - val_loss: 1.4204 - val_accuracy: 0.4673
Epoch 39/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7123 - accuracy: 0.5799 - val_loss: 1.4188 - val_accuracy: 0.4626
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6763 - accuracy: 0.5619 - val_loss: 1.4121 - val_accuracy: 0.4579
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7235 - accuracy: 0.5773 - val_loss: 1.4618 - val_accuracy: 0.4626
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6580 - accuracy: 0.5747 - val_loss: 1.4260 - val_accuracy: 0.4673
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6513 - accuracy: 0.5644 - val_loss: 1.4102 - val_accuracy: 0.4720
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6392 - accuracy: 0.5799 - val_loss: 1.3883 - val_accuracy: 0.4766
```

Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6878 - accuracy: 0.5902 - val_loss: 1.3799 - val_accuracy: 0.4626
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6229 - accuracy: 0.5722 - val_loss: 1.3695 - val_accuracy: 0.4720
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5647 - accuracy: 0.5722 - val_loss: 1.3611 - val_accuracy: 0.4813
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6605 - accuracy: 0.5670 - val_loss: 1.3431 - val_accuracy: 0.4720
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6054 - accuracy: 0.5773 - val_loss: 1.3292 - val_accuracy: 0.4626
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6428 - accuracy: 0.5799 - val_loss: 1.3234 - val_accuracy: 0.4579
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6497 - accuracy: 0.5670 - val_loss: 1.3110 - val_accuracy: 0.4673
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6303 - accuracy: 0.5851 - val_loss: 1.2787 - val_accuracy: 0.4860
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5998 - accuracy: 0.5644 - val_loss: 1.2999 - val_accuracy: 0.4813
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5161 - accuracy: 0.5619 - val_loss: 1.2710 - val_accuracy: 0.4813
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5066 - accuracy: 0.5515 - val_loss: 1.2261 - val_accuracy: 0.4813
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5571 - accuracy: 0.5515 - val_loss: 1.2055 - val_accuracy: 0.4813
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6288 - accuracy: 0.5722 - val_loss: 1.2191 - val_accuracy: 0.5000
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6117 - accuracy: 0.5799 - val_loss: 1.2331 - val_accuracy: 0.5093
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6368 - accuracy: 0.5644 - val_loss: 1.1768 - val_accuracy: 0.5093
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6246 - accuracy: 0.5696 - val_loss: 1.1818 - val_accuracy: 0.5140
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5987 - accuracy: 0.6031 - val_loss: 1.1538 - val_accuracy: 0.5000
Epoch 62/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5763 - accuracy: 0.5670 - val_loss: 1.1292 - val_accuracy: 0.5047
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6287 - accuracy: 0.5799 - val_loss: 1.0983 - val_accuracy: 0.5140
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5440 - accuracy: 0.5722 - val_loss: 1.0653 - val_accuracy: 0.5140
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6055 - accuracy: 0.5670 - val_loss: 1.0628 - val_accuracy: 0.5187
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5322 - accuracy: 0.5773 - val_loss: 1.0653 - val_accuracy: 0.5327
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5272 - accuracy: 0.5593 - val_loss: 1.0515 - val_accuracy: 0.5093
Epoch 68/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5046 - accuracy: 0.5619 - val_loss: 1.0657 - val_accuracy: 0.5234
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5068 - accuracy: 0.5619 - val_loss: 1.0322 - val_accuracy: 0.4720
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4333 - accuracy: 0.5284 - val_loss: 1.0102 - val_accuracy: 0.5140
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4223 - accuracy: 0.5773 - val_loss: 0.9765 - val_accuracy: 0.5140
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5420 - accuracy: 0.5747 - val_loss: 0.9444 - val_accuracy: 0.5187
Epoch 73/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4258 - accuracy: 0.5747 - val_loss: 0.8900 - val_accuracy: 0.5000
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4508 - accuracy: 0.5670 - val_loss: 0.8858 - val_accuracy: 0.5140

```
accuracy: 0.4953
Epoch 75/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4717 - accuracy: 0.5490 - val_loss: 0.8990 - val_accuracy: 0.5000
Epoch 76/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4654 - accuracy: 0.5747 - val_loss: 0.8931 - val_accuracy: 0.5140
Epoch 77/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4679 - accuracy: 0.5464 - val_loss: 0.8890 - val_accuracy: 0.5047
Epoch 78/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5085 - accuracy: 0.5644 - val_loss: 0.8578 - val_accuracy: 0.5047
Epoch 79/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4036 - accuracy: 0.5644 - val_loss: 0.8629 - val_accuracy: 0.5187
Epoch 80/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4750 - accuracy: 0.5464 - val_loss: 0.8312 - val_accuracy: 0.5280
Epoch 81/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5261 - accuracy: 0.5825 - val_loss: 0.8152 - val_accuracy: 0.5093
Epoch 82/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4639 - accuracy: 0.5696 - val_loss: 0.8039 - val_accuracy: 0.5327
Epoch 83/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4031 - accuracy: 0.5619 - val_loss: 0.7508 - val_accuracy: 0.5047
Epoch 84/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4153 - accuracy: 0.5670 - val_loss: 0.7400 - val_accuracy: 0.5000
Epoch 85/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5335 - accuracy: 0.5412 - val_loss: 0.7208 - val_accuracy: 0.5047
Epoch 86/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5382 - accuracy: 0.5180 - val_loss: 0.6838 - val_accuracy: 0.4953
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3888 - accuracy: 0.5361 - val_loss: 0.6844 - val_accuracy: 0.4813
Epoch 88/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4771 - accuracy: 0.5412 - val_loss: 0.6716 - val_accuracy: 0.5047
Epoch 89/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4193 - accuracy: 0.5438 - val_loss: 0.6038 - val_accuracy: 0.4907
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4451 - accuracy: 0.5515 - val_loss: 0.5943 - val_accuracy: 0.4813
Epoch 91/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4303 - accuracy: 0.5309 - val_loss: 0.5933 - val_accuracy: 0.4813
Epoch 92/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4486 - accuracy: 0.5438 - val_loss: 0.5215 - val_accuracy: 0.5140
Epoch 93/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4529 - accuracy: 0.5361 - val_loss: 0.5407 - val_accuracy: 0.5047
Epoch 94/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3938 - accuracy: 0.5593 - val_loss: 0.5525 - val_accuracy: 0.5047
Epoch 95/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4199 - accuracy: 0.5515 - val_loss: 0.5492 - val_accuracy: 0.5047
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4123 - accuracy: 0.5567 - val_loss: 0.5494 - val_accuracy: 0.5000
Epoch 97/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4380 - accuracy: 0.5438 - val_loss: 0.5450 - val_accuracy: 0.5000
Epoch 98/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4626 - accuracy: 0.5567 - val_loss: 0.5498 - val_accuracy: 0.5047
Epoch 99/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4430 - accuracy: 0.5361 - val_loss: 0.5464 - val_accuracy: 0.4860
Epoch 100/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3358 - accuracy: 0.5387 - val_loss: 0.6615 - val_accuracy: 0.4907
Epoch 101/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3386 - accuracy: 0.5567 - val_loss: 0.6256 - val_accuracy: 0.5000
Epoch 102/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4158 - accuracy: 0.5361 - val_loss: 0.6626 - val_accuracy: 0.5093
Epoch 103/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3813 - accuracy: 0.5490 - val_loss: 0.5767 - val_accuracy: 0.5561
Epoch 104/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.4153 - accuracy: 0.5490 - val_loss: 0.5720 - val_accuracy: 0.5514
Epoch 105/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3562 - accuracy: 0.5515 - val_loss: 0.6468 - val_accuracy: 0.5421
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3663 - accuracy: 0.5696 - val_loss: 0.6308 - val_accuracy: 0.5374
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4595 - accuracy: 0.5464 - val_loss: 0.6018 - val_accuracy: 0.5421
Epoch 108/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4263 - accuracy: 0.5619 - val_loss: 0.6022 - val_accuracy: 0.5327
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3938 - accuracy: 0.5670 - val_loss: 0.6711 - val_accuracy: 0.5280
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3600 - accuracy: 0.5567 - val_loss: 0.6495 - val_accuracy: 0.5280
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3885 - accuracy: 0.5619 - val_loss: 0.6074 - val_accuracy: 0.5234
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4433 - accuracy: 0.5309 - val_loss: 0.6189 - val_accuracy: 0.5234
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4066 - accuracy: 0.5309 - val_loss: 0.6718 - val_accuracy: 0.5093
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4412 - accuracy: 0.5644 - val_loss: 0.6501 - val_accuracy: 0.5140
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3780 - accuracy: 0.5515 - val_loss: 0.7056 - val_accuracy: 0.5047
Epoch 116/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3955 - accuracy: 0.5644 - val_loss: 0.7275 - val_accuracy: 0.5047
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4120 - accuracy: 0.5670 - val_loss: 0.6833 - val_accuracy: 0.5000
Epoch 118/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4448 - accuracy: 0.5541 - val_loss: 0.6319 - val_accuracy: 0.5093
Epoch 119/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4374 - accuracy: 0.5541 - val_loss: 0.6149 - val_accuracy: 0.5421
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3334 - accuracy: 0.5361 - val_loss: 0.6997 - val_accuracy: 0.5234
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3272 - accuracy: 0.5284 - val_loss: 0.7312 - val_accuracy: 0.4813
Epoch 122/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3578 - accuracy: 0.5541 - val_loss: 0.7355 - val_accuracy: 0.4907
Epoch 123/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3764 - accuracy: 0.5490 - val_loss: 0.7334 - val_accuracy: 0.4720
Epoch 124/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3601 - accuracy: 0.5696 - val_loss: 0.7007 - val_accuracy: 0.4720
Epoch 125/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3677 - accuracy: 0.5464 - val_loss: 0.6993 - val_accuracy: 0.4626
Epoch 126/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3838 - accuracy: 0.5515 - val_loss: 0.5746 - val_accuracy: 0.4953
Epoch 127/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3679 - accuracy: 0.5515 - val_loss: 0.6732 - val_accuracy: 0.4813
Epoch 128/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3839 - accuracy: 0.5438 - val_loss: 0.6399 - val_accuracy: 0.5000
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3479 - accuracy: 0.5722 - val_loss: 0.7359 - val_accuracy: 0.4907
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4907 - accuracy: 0.5670 - val_loss: 0.8100 - val_accuracy: 0.4720
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3371 - accuracy: 0.5438 - val_loss: 0.8524 - val_accuracy: 0.4766
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3878 - accuracy: 0.5541 - val_loss: 0.7410 - val_accuracy: 0.4860
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4047 - accuracy: 0.5954 - val_loss: 0.8130 - val_accuracy: 0.5000
```

Epoch 134/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3251 - accuracy: 0.5619 - val_loss: 0.9163 - val_accuracy: 0.5000
 Epoch 135/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3678 - accuracy: 0.5593 - val_loss: 0.8954 - val_accuracy: 0.4766
 Epoch 136/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3525 - accuracy: 0.5412 - val_loss: 0.9710 - val_accuracy: 0.4673
 Epoch 137/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.4888 - accuracy: 0.5515 - val_loss: 1.0635 - val_accuracy: 0.4579
 Epoch 138/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3671 - accuracy: 0.5361 - val_loss: 1.1692 - val_accuracy: 0.4439
 Epoch 139/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.5161 - accuracy: 0.5284 - val_loss: 1.3220 - val_accuracy: 0.4673
 Epoch 140/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4614 - accuracy: 0.5851 - val_loss: 1.2576 - val_accuracy: 0.4766
 Epoch 141/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3455 - accuracy: 0.5747 - val_loss: 1.1562 - val_accuracy: 0.4953
 Epoch 142/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4096 - accuracy: 0.5799 - val_loss: 1.1029 - val_accuracy: 0.4953
 Epoch 143/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3748 - accuracy: 0.5644 - val_loss: 1.2505 - val_accuracy: 0.4720
 Epoch 144/1000
 4/4 [=====] - 0s 18ms/step - loss: 0.3681 - accuracy: 0.5902 - val_loss: 1.5420 - val_accuracy: 0.4579
 Epoch 145/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.4460 - accuracy: 0.5670 - val_loss: 1.5350 - val_accuracy: 0.4393
 Epoch 146/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4034 - accuracy: 0.5928 - val_loss: 1.4693 - val_accuracy: 0.4346
 Epoch 147/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.3214 - accuracy: 0.5773 - val_loss: 1.5394 - val_accuracy: 0.4533
 Epoch 148/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3633 - accuracy: 0.5851 - val_loss: 1.5642 - val_accuracy: 0.4626
 Epoch 149/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3609 - accuracy: 0.5825 - val_loss: 1.4713 - val_accuracy: 0.4673
 Epoch 150/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3247 - accuracy: 0.5799 - val_loss: 1.5278 - val_accuracy: 0.4626
 Epoch 151/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.4038 - accuracy: 0.5696 - val_loss: 1.5364 - val_accuracy: 0.4533
 Epoch 152/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4049 - accuracy: 0.5515 - val_loss: 1.5359 - val_accuracy: 0.4346
 Epoch 153/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4017 - accuracy: 0.5567 - val_loss: 1.2821 - val_accuracy: 0.4626
 Epoch 154/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3292 - accuracy: 0.5593 - val_loss: 1.1248 - val_accuracy: 0.4766
 Epoch 155/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3948 - accuracy: 0.5928 - val_loss: 1.1211 - val_accuracy: 0.4813
 Epoch 156/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.2952 - accuracy: 0.5781 Restoring model weights from the end of the best epoch: 6.
 4/4 [=====] - 0s 14ms/step - loss: 0.3769 - accuracy: 0.5773 - val_loss: 1.1722 - val_accuracy: 0.4766
 Epoch 156: early stopping
 2/2 [=====] - 0s 3ms/step - loss: 2.6503 - accuracy: 0.6818
 [CV] END Dense1=100, Dense2=25; total time= 9.0s
 Model: "sequential_80"

Layer (type)	Output Shape	Param #
dense_320 (Dense)	(None, 100)	700
batch_normalization_240 (BatchNormalization)	(None, 100)	400
activation_240 (Activation)	(None, 100)	0
dense_321 (Dense)	(None, 25)	2525
batch_normalization_241 (BatchNormalization)	(None, 25)	100

activation_241 (Activation)	(None, 25)	0
dense_322 (Dense)	(None, 10)	260
batch_normalization_242 (BatchNormalization)	(None, 10)	40
activation_242 (Activation)	(None, 10)	0
dense_323 (Dense)	(None, 2)	22

=====

Total params: 4,047
Trainable params: 3,777
Non-trainable params: 270

Epoch 1/1000
4/4 [=====] - 1s 60ms/step - loss: 4.6024 - accuracy: 0.6005 - val_loss: 4.9327 - val_accuracy: 0.4579
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5347 - accuracy: 0.5979 - val_loss: 4.7983 - val_accuracy: 0.4533
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 3.2759 - accuracy: 0.6289 - val_loss: 4.4622 - val_accuracy: 0.4579
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 2.9519 - accuracy: 0.6366 - val_loss: 4.1605 - val_accuracy: 0.4673
Epoch 5/1000
4/4 [=====] - 0s 17ms/step - loss: 2.6820 - accuracy: 0.6778 - val_loss: 3.3416 - val_accuracy: 0.5093
Epoch 6/1000
4/4 [=====] - 0s 16ms/step - loss: 2.4811 - accuracy: 0.6701 - val_loss: 2.7080 - val_accuracy: 0.5561
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1376 - accuracy: 0.6881 - val_loss: 2.4256 - val_accuracy: 0.6495
Epoch 8/1000
4/4 [=====] - 0s 15ms/step - loss: 1.9739 - accuracy: 0.7010 - val_loss: 2.3475 - val_accuracy: 0.6589
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2750 - accuracy: 0.6804 - val_loss: 2.2876 - val_accuracy: 0.6495
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0439 - accuracy: 0.6985 - val_loss: 2.1855 - val_accuracy: 0.6916
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0629 - accuracy: 0.6933 - val_loss: 2.1246 - val_accuracy: 0.7009
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8926 - accuracy: 0.6933 - val_loss: 2.0149 - val_accuracy: 0.7150
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9477 - accuracy: 0.6856 - val_loss: 2.0003 - val_accuracy: 0.7150
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9073 - accuracy: 0.6985 - val_loss: 1.8967 - val_accuracy: 0.7056
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9966 - accuracy: 0.6753 - val_loss: 1.8917 - val_accuracy: 0.7150
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9400 - accuracy: 0.6907 - val_loss: 1.9009 - val_accuracy: 0.6916
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9149 - accuracy: 0.6778 - val_loss: 1.9301 - val_accuracy: 0.6822
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8784 - accuracy: 0.7036 - val_loss: 1.9563 - val_accuracy: 0.6869
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8918 - accuracy: 0.6830 - val_loss: 1.9660 - val_accuracy: 0.6636
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8655 - accuracy: 0.7010 - val_loss: 1.9520 - val_accuracy: 0.6542
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8922 - accuracy: 0.7010 - val_loss: 1.9439 - val_accuracy: 0.6636
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7382 - accuracy: 0.6959 - val_loss: 1.9075 - val_accuracy: 0.6776
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7206 - accuracy: 0.6881 - val_loss: 1.8874 - val_accuracy: 0.6589
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6836 - accuracy: 0.7088 - val_loss: 1.8795 - val_accuracy: 0.6636

Epoch 25/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6272 - accuracy: 0.7010 - val_loss: 1.8669 - val_accuracy: 0.6168
Epoch 26/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7758 - accuracy: 0.6933 - val_loss: 1.8561 - val_accuracy: 0.6121
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5692 - accuracy: 0.7036 - val_loss: 1.8320 - val_accuracy: 0.6075
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6232 - accuracy: 0.6830 - val_loss: 1.7961 - val_accuracy: 0.5935
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6852 - accuracy: 0.6907 - val_loss: 1.7700 - val_accuracy: 0.5841
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6325 - accuracy: 0.6985 - val_loss: 1.7479 - val_accuracy: 0.5748
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6111 - accuracy: 0.6881 - val_loss: 1.7168 - val_accuracy: 0.5794
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5297 - accuracy: 0.7088 - val_loss: 1.6703 - val_accuracy: 0.6075
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4917 - accuracy: 0.7165 - val_loss: 1.6065 - val_accuracy: 0.5888
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4458 - accuracy: 0.6881 - val_loss: 1.6373 - val_accuracy: 0.5935
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3649 - accuracy: 0.7242 - val_loss: 1.6140 - val_accuracy: 0.5935
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3464 - accuracy: 0.6856 - val_loss: 1.5847 - val_accuracy: 0.5748
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2849 - accuracy: 0.7242 - val_loss: 1.6057 - val_accuracy: 0.6121
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3602 - accuracy: 0.7242 - val_loss: 1.5852 - val_accuracy: 0.6121
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3759 - accuracy: 0.7268 - val_loss: 1.5533 - val_accuracy: 0.6308
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3697 - accuracy: 0.7294 - val_loss: 1.5110 - val_accuracy: 0.6542
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2972 - accuracy: 0.7294 - val_loss: 1.5021 - val_accuracy: 0.6542
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2892 - accuracy: 0.6985 - val_loss: 1.4868 - val_accuracy: 0.6589
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4496 - accuracy: 0.7448 - val_loss: 1.4650 - val_accuracy: 0.6542
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3184 - accuracy: 0.7242 - val_loss: 1.4409 - val_accuracy: 0.6682
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2695 - accuracy: 0.7294 - val_loss: 1.4352 - val_accuracy: 0.6308
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2778 - accuracy: 0.7191 - val_loss: 1.4254 - val_accuracy: 0.5888
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2319 - accuracy: 0.7500 - val_loss: 1.4117 - val_accuracy: 0.6355
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1460 - accuracy: 0.7113 - val_loss: 1.4055 - val_accuracy: 0.5888
Epoch 49/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1399 - accuracy: 0.7216 - val_loss: 1.3929 - val_accuracy: 0.6121
Epoch 50/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1479 - accuracy: 0.7165 - val_loss: 1.3595 - val_accuracy: 0.5935
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9945 - accuracy: 0.7320 - val_loss: 1.3376 - val_accuracy: 0.5981
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0201 - accuracy: 0.7088 - val_loss: 1.3274 - val_accuracy: 0.6028
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0132 - accuracy: 0.7371 - val_loss: 1.3117 - val_accuracy: 0.6168
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0271 - accuracy: 0.7216 - val_loss: 1.2950 - val_accuracy: 0.6168

```
accuracy: 0.6262
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0630 - accuracy: 0.7139 - val_loss: 1.2704 - val_accuracy: 0.6168
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2113 - accuracy: 0.7088 - val_loss: 1.2802 - val_accuracy: 0.6682
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1862 - accuracy: 0.6985 - val_loss: 1.3190 - val_accuracy: 0.5935
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1031 - accuracy: 0.7448 - val_loss: 1.2812 - val_accuracy: 0.6028
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0436 - accuracy: 0.7242 - val_loss: 1.2537 - val_accuracy: 0.6075
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9951 - accuracy: 0.7320 - val_loss: 1.2761 - val_accuracy: 0.6075
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0327 - accuracy: 0.7216 - val_loss: 1.2532 - val_accuracy: 0.6355
Epoch 62/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0171 - accuracy: 0.7062 - val_loss: 1.2582 - val_accuracy: 0.6355
Epoch 63/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9713 - accuracy: 0.7320 - val_loss: 1.2438 - val_accuracy: 0.6402
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9925 - accuracy: 0.6933 - val_loss: 1.2277 - val_accuracy: 0.6449
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8545 - accuracy: 0.7165 - val_loss: 1.2153 - val_accuracy: 0.6542
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9538 - accuracy: 0.7088 - val_loss: 1.1752 - val_accuracy: 0.6262
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9908 - accuracy: 0.7216 - val_loss: 1.1865 - val_accuracy: 0.6495
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9629 - accuracy: 0.6959 - val_loss: 1.1777 - val_accuracy: 0.6729
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8866 - accuracy: 0.6856 - val_loss: 1.1849 - val_accuracy: 0.6589
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8765 - accuracy: 0.6985 - val_loss: 1.2296 - val_accuracy: 0.6495
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8655 - accuracy: 0.7294 - val_loss: 1.1928 - val_accuracy: 0.6682
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8235 - accuracy: 0.7294 - val_loss: 1.1755 - val_accuracy: 0.6776
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8750 - accuracy: 0.6959 - val_loss: 1.2309 - val_accuracy: 0.6822
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8974 - accuracy: 0.6804 - val_loss: 1.2110 - val_accuracy: 0.6963
Epoch 75/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8372 - accuracy: 0.6907 - val_loss: 1.2185 - val_accuracy: 0.6729
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8176 - accuracy: 0.7448 - val_loss: 1.2117 - val_accuracy: 0.6822
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8841 - accuracy: 0.7371 - val_loss: 1.2358 - val_accuracy: 0.6822
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8080 - accuracy: 0.7216 - val_loss: 1.2246 - val_accuracy: 0.6916
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7874 - accuracy: 0.7036 - val_loss: 1.2038 - val_accuracy: 0.6916
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8249 - accuracy: 0.6804 - val_loss: 1.2440 - val_accuracy: 0.7009
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8543 - accuracy: 0.6675 - val_loss: 1.2289 - val_accuracy: 0.6916
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8347 - accuracy: 0.7191 - val_loss: 1.2181 - val_accuracy: 0.6916
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7708 - accuracy: 0.6959 - val_loss: 1.2019 - val_accuracy: 0.6776
Epoch 84/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.8489 - accuracy: 0.6959 - val_loss: 1.2057 - val_accuracy: 0.6869
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8093 - accuracy: 0.7216 - val_loss: 1.2249 - val_accuracy: 0.6916
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7749 - accuracy: 0.7242 - val_loss: 1.2331 - val_accuracy: 0.6682
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7943 - accuracy: 0.6959 - val_loss: 1.1999 - val_accuracy: 0.6869
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7856 - accuracy: 0.7139 - val_loss: 1.1897 - val_accuracy: 0.7056
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7901 - accuracy: 0.7088 - val_loss: 1.1845 - val_accuracy: 0.7103
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7144 - accuracy: 0.7423 - val_loss: 1.1742 - val_accuracy: 0.7150
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7357 - accuracy: 0.7320 - val_loss: 1.1701 - val_accuracy: 0.6963
Epoch 92/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8036 - accuracy: 0.7165 - val_loss: 1.1621 - val_accuracy: 0.7056
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7378 - accuracy: 0.7216 - val_loss: 1.2007 - val_accuracy: 0.7150
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7110 - accuracy: 0.7423 - val_loss: 1.2053 - val_accuracy: 0.7056
Epoch 95/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7451 - accuracy: 0.7036 - val_loss: 1.2285 - val_accuracy: 0.7103
Epoch 96/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7315 - accuracy: 0.7294 - val_loss: 1.1939 - val_accuracy: 0.6963
Epoch 97/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6953 - accuracy: 0.7526 - val_loss: 1.1857 - val_accuracy: 0.7056
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7184 - accuracy: 0.7345 - val_loss: 1.1860 - val_accuracy: 0.7150
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7602 - accuracy: 0.7345 - val_loss: 1.2213 - val_accuracy: 0.7243
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8056 - accuracy: 0.7655 - val_loss: 1.2652 - val_accuracy: 0.7103
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7182 - accuracy: 0.7371 - val_loss: 1.2407 - val_accuracy: 0.7009
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7682 - accuracy: 0.7423 - val_loss: 1.2190 - val_accuracy: 0.7150
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6432 - accuracy: 0.6985 - val_loss: 1.1618 - val_accuracy: 0.7290
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6127 - accuracy: 0.7036 - val_loss: 1.1859 - val_accuracy: 0.7243
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6636 - accuracy: 0.6546 - val_loss: 1.1604 - val_accuracy: 0.7103
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7365 - accuracy: 0.7010 - val_loss: 1.1355 - val_accuracy: 0.7290
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6586 - accuracy: 0.7036 - val_loss: 1.1413 - val_accuracy: 0.7243
Epoch 108/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7554 - accuracy: 0.6830 - val_loss: 1.1088 - val_accuracy: 0.7196
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6098 - accuracy: 0.7165 - val_loss: 1.1722 - val_accuracy: 0.7056
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5713 - accuracy: 0.6830 - val_loss: 1.1806 - val_accuracy: 0.7103
Epoch 111/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5458 - accuracy: 0.6778 - val_loss: 1.2093 - val_accuracy: 0.7103
Epoch 112/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6065 - accuracy: 0.6753 - val_loss: 1.1267 - val_accuracy: 0.7430
Epoch 113/1000
4/4 [=====] - 0s 18ms/step - loss: 0.4791 - accuracy: 0.6624 - val_loss: 1.0385 - val_accuracy: 0.7383
```

Epoch 114/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5417 - accuracy: 0.6418 - val_loss: 1.0602 - val_accuracy: 0.7430
Epoch 115/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5102 - accuracy: 0.6469 - val_loss: 1.1462 - val_accuracy: 0.7430
Epoch 116/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5603 - accuracy: 0.6366 - val_loss: 1.1537 - val_accuracy: 0.7336
Epoch 117/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5906 - accuracy: 0.6495 - val_loss: 1.1591 - val_accuracy: 0.7383
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5353 - accuracy: 0.6649 - val_loss: 1.1620 - val_accuracy: 0.7009
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4450 - accuracy: 0.6753 - val_loss: 1.1798 - val_accuracy: 0.6822
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4986 - accuracy: 0.6160 - val_loss: 1.1987 - val_accuracy: 0.6963
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4664 - accuracy: 0.6418 - val_loss: 1.1234 - val_accuracy: 0.7290
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4295 - accuracy: 0.6289 - val_loss: 1.1319 - val_accuracy: 0.7196
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4374 - accuracy: 0.6005 - val_loss: 1.1331 - val_accuracy: 0.7196
Epoch 124/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4438 - accuracy: 0.6495 - val_loss: 1.1762 - val_accuracy: 0.6963
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4228 - accuracy: 0.6392 - val_loss: 1.1730 - val_accuracy: 0.6963
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3598 - accuracy: 0.6340 - val_loss: 1.1341 - val_accuracy: 0.7009
Epoch 127/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3786 - accuracy: 0.6340 - val_loss: 1.1623 - val_accuracy: 0.7056
Epoch 128/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3557 - accuracy: 0.6546 - val_loss: 1.1584 - val_accuracy: 0.7150
Epoch 129/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4503 - accuracy: 0.6521 - val_loss: 1.4094 - val_accuracy: 0.6963
Epoch 130/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4208 - accuracy: 0.6572 - val_loss: 1.1417 - val_accuracy: 0.6916
Epoch 131/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4040 - accuracy: 0.6469 - val_loss: 1.2224 - val_accuracy: 0.6916
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3781 - accuracy: 0.6289 - val_loss: 1.3675 - val_accuracy: 0.6869
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3741 - accuracy: 0.6134 - val_loss: 1.2275 - val_accuracy: 0.6869
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3714 - accuracy: 0.6572 - val_loss: 1.2943 - val_accuracy: 0.6729
Epoch 135/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3987 - accuracy: 0.6392 - val_loss: 1.5281 - val_accuracy: 0.6776
Epoch 136/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5060 - accuracy: 0.6314 - val_loss: 1.3997 - val_accuracy: 0.6963
Epoch 137/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3665 - accuracy: 0.6314 - val_loss: 1.4500 - val_accuracy: 0.6822
Epoch 138/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4563 - accuracy: 0.6495 - val_loss: 1.4184 - val_accuracy: 0.6776
Epoch 139/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3729 - accuracy: 0.6701 - val_loss: 1.3890 - val_accuracy: 0.7103
Epoch 140/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4554 - accuracy: 0.6572 - val_loss: 1.4016 - val_accuracy: 0.7196
Epoch 141/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3876 - accuracy: 0.6495 - val_loss: 1.4312 - val_accuracy: 0.7290
Epoch 142/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3213 - accuracy: 0.6443 - val_loss: 1.4208 - val_accuracy: 0.7196
Epoch 143/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3264 - accuracy: 0.6727 - val_loss: 1.3134 - val_accuracy: 0.7196

```
accuracy: 0.7196
Epoch 144/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3759 - accuracy: 0.6495 - val_loss: 1.2297 - val_
accuracy: 0.7290
Epoch 145/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3836 - accuracy: 0.6572 - val_loss: 1.2341 - val_
accuracy: 0.7150
Epoch 146/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4280 - accuracy: 0.6443 - val_loss: 1.2251 - val_
accuracy: 0.7150
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2954 - accuracy: 0.6598 - val_loss: 1.2493 - val_
accuracy: 0.7383
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3514 - accuracy: 0.6649 - val_loss: 1.2838 - val_
accuracy: 0.7103
Epoch 149/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3279 - accuracy: 0.6495 - val_loss: 1.2496 - val_
accuracy: 0.7103
Epoch 150/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3367 - accuracy: 0.6701 - val_loss: 1.3074 - val_
accuracy: 0.6963
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3239 - accuracy: 0.6598 - val_loss: 1.3005 - val_
accuracy: 0.6963
Epoch 152/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3609 - accuracy: 0.6649 - val_loss: 1.3393 - val_
accuracy: 0.6869
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4178 - accuracy: 0.7062 - val_loss: 1.2735 - val_
accuracy: 0.6682
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4248 - accuracy: 0.6856 - val_loss: 1.3122 - val_
accuracy: 0.6916
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4301 - accuracy: 0.6985 - val_loss: 1.3634 - val_
accuracy: 0.6916
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3835 - accuracy: 0.6598 - val_loss: 1.3292 - val_
accuracy: 0.6636
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4231 - accuracy: 0.6701 - val_loss: 1.3496 - val_
accuracy: 0.6636
Epoch 158/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3854 - accuracy: 0.6624 - val_loss: 1.3161 - val_
accuracy: 0.6262
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3541 - accuracy: 0.6624 - val_loss: 1.2878 - val_
accuracy: 0.6542
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3080 - accuracy: 0.6366 - val_loss: 1.2633 - val_
accuracy: 0.6682
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3221 - accuracy: 0.6546 - val_loss: 1.2405 - val_
accuracy: 0.6449
Epoch 162/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2562 - accuracy: 0.6675 - val_loss: 1.1772 - val_
accuracy: 0.6682
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3125 - accuracy: 0.6675 - val_loss: 1.1202 - val_
accuracy: 0.6589
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3326 - accuracy: 0.6366 - val_loss: 1.1230 - val_
accuracy: 0.6589
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3084 - accuracy: 0.6392 - val_loss: 1.1507 - val_
accuracy: 0.6495
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2552 - accuracy: 0.6469 - val_loss: 1.3328 - val_
accuracy: 0.5981
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3313 - accuracy: 0.6134 - val_loss: 1.3883 - val_
accuracy: 0.5935
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2619 - accuracy: 0.6160 - val_loss: 1.3576 - val_
accuracy: 0.5888
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2746 - accuracy: 0.6366 - val_loss: 1.3599 - val_
accuracy: 0.6075
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3512 - accuracy: 0.6057 - val_loss: 1.4987 - val_
accuracy: 0.5935
Epoch 171/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3770 - accuracy: 0.6366 - val_loss: 1.5355 - val_
accuracy: 0.5748
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3320 - accuracy: 0.6314 - val_loss: 1.5002 - val_
accuracy: 0.5467
Epoch 173/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.3781 - accuracy: 0.6160 - val_loss: 1.4668 - val_accuracy: 0.5514
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2145 - accuracy: 0.6289 - val_loss: 1.5150 - val_accuracy: 0.5374
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3698 - accuracy: 0.6289 - val_loss: 1.4258 - val_accuracy: 0.5841
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2813 - accuracy: 0.6057 - val_loss: 1.5000 - val_accuracy: 0.5514
Epoch 177/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3605 - accuracy: 0.6314 - val_loss: 1.2937 - val_accuracy: 0.5514
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2766 - accuracy: 0.6186 - val_loss: 1.4372 - val_accuracy: 0.5701
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2942 - accuracy: 0.6289 - val_loss: 1.3686 - val_accuracy: 0.5654
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2687 - accuracy: 0.6237 - val_loss: 1.3470 - val_accuracy: 0.6121
Epoch 181/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2373 - accuracy: 0.6830 - val_loss: 1.2886 - val_accuracy: 0.5981
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2832 - accuracy: 0.6572 - val_loss: 1.2755 - val_accuracy: 0.5701
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3064 - accuracy: 0.6108 - val_loss: 1.3769 - val_accuracy: 0.5561
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2563 - accuracy: 0.6082 - val_loss: 1.3552 - val_accuracy: 0.5654
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2576 - accuracy: 0.6469 - val_loss: 1.4357 - val_accuracy: 0.5607
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2375 - accuracy: 0.6521 - val_loss: 1.4714 - val_accuracy: 0.5607
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2271 - accuracy: 0.6392 - val_loss: 1.4162 - val_accuracy: 0.5607
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2951 - accuracy: 0.6211 - val_loss: 1.4648 - val_accuracy: 0.5794
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2802 - accuracy: 0.6546 - val_loss: 1.3659 - val_accuracy: 0.5841
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2302 - accuracy: 0.6392 - val_loss: 1.5411 - val_accuracy: 0.5841
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2365 - accuracy: 0.6160 - val_loss: 1.4346 - val_accuracy: 0.5841
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3259 - accuracy: 0.6649 - val_loss: 1.4625 - val_accuracy: 0.5748
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2447 - accuracy: 0.6211 - val_loss: 1.5248 - val_accuracy: 0.5794
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2219 - accuracy: 0.6263 - val_loss: 1.4038 - val_accuracy: 0.6028
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1741 - accuracy: 0.6134 - val_loss: 1.5028 - val_accuracy: 0.5888
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2665 - accuracy: 0.6263 - val_loss: 1.4362 - val_accuracy: 0.5561
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1844 - accuracy: 0.6031 - val_loss: 1.4780 - val_accuracy: 0.5561
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2063 - accuracy: 0.6366 - val_loss: 1.6453 - val_accuracy: 0.5607
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2115 - accuracy: 0.6211 - val_loss: 1.6314 - val_accuracy: 0.5561
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2284 - accuracy: 0.6134 - val_loss: 1.5122 - val_accuracy: 0.5794
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2660 - accuracy: 0.6392 - val_loss: 1.6096 - val_accuracy: 0.5561
Epoch 202/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2313 - accuracy: 0.6160 - val_loss: 1.7752 - val_accuracy: 0.5467
```

Epoch 203/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2683 - accuracy: 0.6263 - val_loss: 1.6562 - val_accuracy: 0.5607
Epoch 204/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4306 - accuracy: 0.6263 - val_loss: 1.5120 - val_accuracy: 0.5374
Epoch 205/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2438 - accuracy: 0.6649 - val_loss: 1.4678 - val_accuracy: 0.5421
Epoch 206/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3025 - accuracy: 0.6624 - val_loss: 1.4510 - val_accuracy: 0.5421
Epoch 207/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2977 - accuracy: 0.6546 - val_loss: 1.4192 - val_accuracy: 0.6215
Epoch 208/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2411 - accuracy: 0.6572 - val_loss: 1.5201 - val_accuracy: 0.6215
Epoch 209/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2677 - accuracy: 0.6830 - val_loss: 1.4075 - val_accuracy: 0.6308
Epoch 210/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1852 - accuracy: 0.6804 - val_loss: 1.2164 - val_accuracy: 0.6589
Epoch 211/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2930 - accuracy: 0.6830 - val_loss: 1.2270 - val_accuracy: 0.6682
Epoch 212/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2264 - accuracy: 0.6082 - val_loss: 1.2190 - val_accuracy: 0.6402
Epoch 213/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2920 - accuracy: 0.6546 - val_loss: 1.1848 - val_accuracy: 0.6402
Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1770 - accuracy: 0.6624 - val_loss: 1.2953 - val_accuracy: 0.6262
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1984 - accuracy: 0.6392 - val_loss: 1.3928 - val_accuracy: 0.6215
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2256 - accuracy: 0.6186 - val_loss: 1.5784 - val_accuracy: 0.6028
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2972 - accuracy: 0.6469 - val_loss: 1.5203 - val_accuracy: 0.6262
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2995 - accuracy: 0.6340 - val_loss: 1.4622 - val_accuracy: 0.6449
Epoch 219/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2850 - accuracy: 0.5954 - val_loss: 1.5758 - val_accuracy: 0.6308
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3424 - accuracy: 0.6521 - val_loss: 1.5375 - val_accuracy: 0.6308
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3289 - accuracy: 0.6624 - val_loss: 1.4135 - val_accuracy: 0.6495
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2601 - accuracy: 0.6624 - val_loss: 1.4583 - val_accuracy: 0.6449
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2569 - accuracy: 0.6495 - val_loss: 1.4136 - val_accuracy: 0.6495
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2381 - accuracy: 0.6546 - val_loss: 1.3516 - val_accuracy: 0.6542
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3052 - accuracy: 0.6546 - val_loss: 1.3755 - val_accuracy: 0.6729
Epoch 226/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2840 - accuracy: 0.6186 - val_loss: 1.3628 - val_accuracy: 0.6729
Epoch 227/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3036 - accuracy: 0.6469 - val_loss: 1.4923 - val_accuracy: 0.6449
Epoch 228/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3208 - accuracy: 0.6521 - val_loss: 1.4285 - val_accuracy: 0.6355
Epoch 229/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2290 - accuracy: 0.6495 - val_loss: 1.4886 - val_accuracy: 0.6402
Epoch 230/1000
4/4 [=====] - 0s 10ms/step - loss: 0.2769 - accuracy: 0.6727 - val_loss: 1.4384 - val_accuracy: 0.6355
Epoch 231/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1988 - accuracy: 0.6418 - val_loss: 1.4306 - val_accuracy: 0.6495
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1656 - accuracy: 0.6598 - val_loss: 1.3805 - val_accuracy: 0.6598

```
accuracy: 0.6495
Epoch 233/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2823 - accuracy: 0.6572 - val_loss: 1.4722 - val_accuracy: 0.6215
Epoch 234/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2520 - accuracy: 0.6830 - val_loss: 1.5119 - val_accuracy: 0.5935
Epoch 235/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2571 - accuracy: 0.6624 - val_loss: 1.3090 - val_accuracy: 0.5935
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2409 - accuracy: 0.6675 - val_loss: 1.3678 - val_accuracy: 0.5748
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3747 - accuracy: 0.6263 - val_loss: 1.2427 - val_accuracy: 0.5888
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2290 - accuracy: 0.6675 - val_loss: 1.3968 - val_accuracy: 0.5514
Epoch 239/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2678 - accuracy: 0.6778 - val_loss: 1.4450 - val_accuracy: 0.5654
Epoch 240/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1719 - accuracy: 0.6546 - val_loss: 1.4425 - val_accuracy: 0.5467
Epoch 241/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2233 - accuracy: 0.6366 - val_loss: 1.4162 - val_accuracy: 0.5327
Epoch 242/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1724 - accuracy: 0.6418 - val_loss: 1.3953 - val_accuracy: 0.5374
Epoch 243/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2170 - accuracy: 0.6572 - val_loss: 1.4726 - val_accuracy: 0.5327
Epoch 244/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2646 - accuracy: 0.6418 - val_loss: 1.7298 - val_accuracy: 0.5140
Epoch 245/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1820 - accuracy: 0.6572 - val_loss: 1.5565 - val_accuracy: 0.5047
Epoch 246/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2563 - accuracy: 0.6418 - val_loss: 1.5170 - val_accuracy: 0.5187
Epoch 247/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1948 - accuracy: 0.6469 - val_loss: 1.5150 - val_accuracy: 0.5327
Epoch 248/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2173 - accuracy: 0.6624 - val_loss: 1.4598 - val_accuracy: 0.5234
Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2314 - accuracy: 0.6675 - val_loss: 1.5882 - val_accuracy: 0.5561
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2168 - accuracy: 0.6701 - val_loss: 1.6501 - val_accuracy: 0.5654
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2518 - accuracy: 0.6443 - val_loss: 1.6387 - val_accuracy: 0.5748
Epoch 252/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1914 - accuracy: 0.7113 - val_loss: 1.6522 - val_accuracy: 0.5841
Epoch 253/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2808 - accuracy: 0.6830 - val_loss: 1.5397 - val_accuracy: 0.5607
Epoch 254/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1869 - accuracy: 0.7191 - val_loss: 1.4996 - val_accuracy: 0.5935
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2334 - accuracy: 0.6985 - val_loss: 1.4944 - val_accuracy: 0.5748
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1956 - accuracy: 0.6856 - val_loss: 1.5096 - val_accuracy: 0.5607
Epoch 257/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3094 - accuracy: 0.6778 - val_loss: 1.4833 - val_accuracy: 0.5607
Epoch 258/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3281 - accuracy: 0.6804 - val_loss: 1.2861 - val_accuracy: 0.5654
Epoch 259/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1998 - accuracy: 0.6830 - val_loss: 1.3341 - val_accuracy: 0.5701
Epoch 260/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3125 - accuracy: 0.6727 - val_loss: 1.3158 - val_accuracy: 0.5841
Epoch 261/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1807 - accuracy: 0.6933 - val_loss: 1.3318 - val_accuracy: 0.5841
Epoch 262/1000
```

```

1/4 [=====>.....] - ETA: 0s - loss: 0.1240 - accuracy: 0.7500Restoring model weights from th
e end of the best epoch: 112.
4/4 [=====] - 0s 14ms/step - loss: 0.2114 - accuracy: 0.7216 - val_loss: 1.3676 - val_
accuracy: 0.5981
Epoch 262: early stopping
2/2 [=====] - 1s 3ms/step - loss: 1.6149 - accuracy: 0.7045
[CV] END .....Dense1=100, Dense2=25; total time= 14.0s
Model: "sequential_81"

```

Layer (type)	Output Shape	Param #
dense_324 (Dense)	(None, 100)	700
batch_normalization_243 (BatchNormalization)	(None, 100)	400
activation_243 (Activation)	(None, 100)	0
dense_325 (Dense)	(None, 25)	2525
batch_normalization_244 (BatchNormalization)	(None, 25)	100
activation_244 (Activation)	(None, 25)	0
dense_326 (Dense)	(None, 10)	260
batch_normalization_245 (BatchNormalization)	(None, 10)	40
activation_245 (Activation)	(None, 10)	0
dense_327 (Dense)	(None, 2)	22

```

=====
Total params: 4,047
Trainable params: 3,777
Non-trainable params: 270

```

Epoch 1/1000

```

4/4 [=====] - 1s 53ms/step - loss: 4.8951 - accuracy: 0.5116 - val_loss: 8.0333 - val_
accuracy: 0.4206
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 4.1974 - accuracy: 0.5321 - val_loss: 7.4341 - val_
accuracy: 0.4112
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 3.8843 - accuracy: 0.5373 - val_loss: 5.0728 - val_
accuracy: 0.4813
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7697 - accuracy: 0.4961 - val_loss: 3.4723 - val_
accuracy: 0.5280
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5162 - accuracy: 0.5321 - val_loss: 2.6697 - val_
accuracy: 0.4720
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3912 - accuracy: 0.5116 - val_loss: 2.2713 - val_
accuracy: 0.4673
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1969 - accuracy: 0.5347 - val_loss: 2.1948 - val_
accuracy: 0.4393
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1135 - accuracy: 0.5578 - val_loss: 2.0878 - val_
accuracy: 0.4486
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 2.9724 - accuracy: 0.5347 - val_loss: 1.9939 - val_
accuracy: 0.4486
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1041 - accuracy: 0.5321 - val_loss: 1.9254 - val_
accuracy: 0.4579
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0905 - accuracy: 0.5193 - val_loss: 1.8885 - val_
accuracy: 0.4626
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9734 - accuracy: 0.5321 - val_loss: 1.8649 - val_
accuracy: 0.3925
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8398 - accuracy: 0.5013 - val_loss: 1.8379 - val_
accuracy: 0.3738
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8723 - accuracy: 0.4884 - val_loss: 1.8091 - val_
accuracy: 0.3458
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8489 - accuracy: 0.4910 - val_loss: 1.7762 - val_
accuracy: 0.3505
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6430 - accuracy: 0.5116 - val_loss: 1.7300 - val_
accuracy: 0.3598
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7399 - accuracy: 0.4910 - val_loss: 1.7200 - val_

```

```
accuracy: 0.3411
Epoch 18/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7168 - accuracy: 0.5039 - val_loss: 1.6741 - val_
accuracy: 0.3318
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4927 - accuracy: 0.4730 - val_loss: 1.6482 - val_
accuracy: 0.3364
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4876 - accuracy: 0.4884 - val_loss: 1.6250 - val_
accuracy: 0.3224
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4419 - accuracy: 0.4936 - val_loss: 1.6066 - val_
accuracy: 0.3178
Epoch 22/1000
4/4 [=====] - 0s 11ms/step - loss: 2.3533 - accuracy: 0.4910 - val_loss: 1.5941 - val_
accuracy: 0.3224
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2360 - accuracy: 0.4679 - val_loss: 1.5696 - val_
accuracy: 0.3178
Epoch 24/1000
4/4 [=====] - 0s 11ms/step - loss: 2.1509 - accuracy: 0.4781 - val_loss: 1.5532 - val_
accuracy: 0.3178
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0347 - accuracy: 0.4781 - val_loss: 1.4850 - val_
accuracy: 0.2991
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9323 - accuracy: 0.4961 - val_loss: 1.4509 - val_
accuracy: 0.3037
Epoch 27/1000
4/4 [=====] - 0s 11ms/step - loss: 1.8082 - accuracy: 0.4833 - val_loss: 1.4069 - val_
accuracy: 0.2944
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7982 - accuracy: 0.4859 - val_loss: 1.3796 - val_
accuracy: 0.3131
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7790 - accuracy: 0.4756 - val_loss: 1.3696 - val_
accuracy: 0.2991
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7901 - accuracy: 0.4756 - val_loss: 1.3916 - val_
accuracy: 0.3037
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6316 - accuracy: 0.4781 - val_loss: 1.3718 - val_
accuracy: 0.3037
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6479 - accuracy: 0.4884 - val_loss: 1.4153 - val_
accuracy: 0.3084
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3373 - accuracy: 0.5090 - val_loss: 1.3426 - val_
accuracy: 0.2991
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3991 - accuracy: 0.5090 - val_loss: 1.3339 - val_
accuracy: 0.3084
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2901 - accuracy: 0.4910 - val_loss: 1.3240 - val_
accuracy: 0.3178
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2497 - accuracy: 0.4807 - val_loss: 1.3377 - val_
accuracy: 0.3131
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0801 - accuracy: 0.4679 - val_loss: 1.3414 - val_
accuracy: 0.3178
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0699 - accuracy: 0.4679 - val_loss: 1.3222 - val_
accuracy: 0.2991
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0671 - accuracy: 0.4884 - val_loss: 1.3100 - val_
accuracy: 0.3084
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0438 - accuracy: 0.4704 - val_loss: 1.2966 - val_
accuracy: 0.3131
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0501 - accuracy: 0.4833 - val_loss: 1.2373 - val_
accuracy: 0.3037
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8953 - accuracy: 0.4473 - val_loss: 1.2435 - val_
accuracy: 0.3458
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9808 - accuracy: 0.4807 - val_loss: 1.2282 - val_
accuracy: 0.3318
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9230 - accuracy: 0.5090 - val_loss: 1.1505 - val_
accuracy: 0.3318
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9436 - accuracy: 0.4936 - val_loss: 1.1189 - val_
accuracy: 0.3458
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8723 - accuracy: 0.4550 - val_loss: 1.1151 - val_
accuracy: 0.3458
Epoch 47/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.9318 - accuracy: 0.4859 - val_loss: 1.1070 - val_accuracy: 0.3271
Epoch 48/1000
4/4 [=====] - 0s 20ms/step - loss: 0.8627 - accuracy: 0.5116 - val_loss: 1.0976 - val_accuracy: 0.3318
Epoch 49/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7753 - accuracy: 0.5219 - val_loss: 1.0956 - val_accuracy: 0.3318
Epoch 50/1000
4/4 [=====] - 0s 16ms/step - loss: 0.7879 - accuracy: 0.4859 - val_loss: 1.0961 - val_accuracy: 0.3084
Epoch 51/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8210 - accuracy: 0.5244 - val_loss: 1.0906 - val_accuracy: 0.2897
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7907 - accuracy: 0.4807 - val_loss: 1.0899 - val_accuracy: 0.3224
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7616 - accuracy: 0.5090 - val_loss: 1.0867 - val_accuracy: 0.3224
Epoch 54/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7956 - accuracy: 0.4833 - val_loss: 1.0919 - val_accuracy: 0.3318
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7749 - accuracy: 0.5578 - val_loss: 1.0694 - val_accuracy: 0.3224
Epoch 56/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7958 - accuracy: 0.5116 - val_loss: 1.0624 - val_accuracy: 0.3224
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7651 - accuracy: 0.5219 - val_loss: 1.0621 - val_accuracy: 0.3271
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8106 - accuracy: 0.5450 - val_loss: 1.0897 - val_accuracy: 0.3224
Epoch 59/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6818 - accuracy: 0.4704 - val_loss: 0.9919 - val_accuracy: 0.3037
Epoch 60/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6726 - accuracy: 0.5141 - val_loss: 1.0145 - val_accuracy: 0.3318
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6638 - accuracy: 0.5039 - val_loss: 0.9811 - val_accuracy: 0.3178
Epoch 62/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6472 - accuracy: 0.4627 - val_loss: 1.0056 - val_accuracy: 0.3084
Epoch 63/1000
4/4 [=====] - 0s 21ms/step - loss: 0.6371 - accuracy: 0.4781 - val_loss: 1.0282 - val_accuracy: 0.3131
Epoch 64/1000
4/4 [=====] - 0s 17ms/step - loss: 0.6268 - accuracy: 0.4833 - val_loss: 1.0185 - val_accuracy: 0.3224
Epoch 65/1000
4/4 [=====] - 0s 17ms/step - loss: 0.6298 - accuracy: 0.4756 - val_loss: 0.9941 - val_accuracy: 0.3178
Epoch 66/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6841 - accuracy: 0.4627 - val_loss: 0.9880 - val_accuracy: 0.3458
Epoch 67/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6143 - accuracy: 0.4936 - val_loss: 1.0254 - val_accuracy: 0.3364
Epoch 68/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5694 - accuracy: 0.4756 - val_loss: 0.9722 - val_accuracy: 0.3178
Epoch 69/1000
4/4 [=====] - 0s 16ms/step - loss: 0.6014 - accuracy: 0.4576 - val_loss: 0.9268 - val_accuracy: 0.3224
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6972 - accuracy: 0.4704 - val_loss: 0.9348 - val_accuracy: 0.3411
Epoch 71/1000
4/4 [=====] - 0s 17ms/step - loss: 0.6626 - accuracy: 0.4602 - val_loss: 0.8329 - val_accuracy: 0.3785
Epoch 72/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6524 - accuracy: 0.4961 - val_loss: 0.8182 - val_accuracy: 0.3645
Epoch 73/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6078 - accuracy: 0.4833 - val_loss: 0.7957 - val_accuracy: 0.3598
Epoch 74/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6015 - accuracy: 0.4756 - val_loss: 0.7833 - val_accuracy: 0.3598
Epoch 75/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5857 - accuracy: 0.4859 - val_loss: 0.7772 - val_accuracy: 0.3738
Epoch 76/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5830 - accuracy: 0.4884 - val_loss: 0.7623 - val_accuracy: 0.3692
```

Epoch 77/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5445 - accuracy: 0.4679 - val_loss: 0.7513 - val_accuracy: 0.3738
Epoch 78/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5346 - accuracy: 0.5039 - val_loss: 0.7413 - val_accuracy: 0.3785
Epoch 79/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6037 - accuracy: 0.5039 - val_loss: 0.7205 - val_accuracy: 0.3879
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5610 - accuracy: 0.5141 - val_loss: 0.6874 - val_accuracy: 0.3738
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5906 - accuracy: 0.5090 - val_loss: 0.6412 - val_accuracy: 0.3738
Epoch 82/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5597 - accuracy: 0.5090 - val_loss: 0.6323 - val_accuracy: 0.3879
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6402 - accuracy: 0.5064 - val_loss: 0.6317 - val_accuracy: 0.3925
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6693 - accuracy: 0.5167 - val_loss: 0.6219 - val_accuracy: 0.4019
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6219 - accuracy: 0.5013 - val_loss: 0.6286 - val_accuracy: 0.4112
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6325 - accuracy: 0.5553 - val_loss: 0.6388 - val_accuracy: 0.4159
Epoch 87/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5581 - accuracy: 0.4679 - val_loss: 0.6372 - val_accuracy: 0.4206
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5321 - accuracy: 0.5141 - val_loss: 0.6120 - val_accuracy: 0.4252
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5714 - accuracy: 0.5424 - val_loss: 0.6107 - val_accuracy: 0.4252
Epoch 90/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5016 - accuracy: 0.5167 - val_loss: 0.6046 - val_accuracy: 0.4252
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4737 - accuracy: 0.4884 - val_loss: 0.6005 - val_accuracy: 0.4252
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5904 - accuracy: 0.5219 - val_loss: 0.5961 - val_accuracy: 0.4112
Epoch 93/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4817 - accuracy: 0.5090 - val_loss: 0.5912 - val_accuracy: 0.4346
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5233 - accuracy: 0.5141 - val_loss: 0.6167 - val_accuracy: 0.4206
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4871 - accuracy: 0.5193 - val_loss: 0.6184 - val_accuracy: 0.4159
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4715 - accuracy: 0.4730 - val_loss: 0.5895 - val_accuracy: 0.4159
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4289 - accuracy: 0.5141 - val_loss: 0.5861 - val_accuracy: 0.4112
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4385 - accuracy: 0.5270 - val_loss: 0.5834 - val_accuracy: 0.4065
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4698 - accuracy: 0.5013 - val_loss: 0.5797 - val_accuracy: 0.4065
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4613 - accuracy: 0.5039 - val_loss: 0.5696 - val_accuracy: 0.4019
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4363 - accuracy: 0.4807 - val_loss: 0.5670 - val_accuracy: 0.4019
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5128 - accuracy: 0.4653 - val_loss: 0.5627 - val_accuracy: 0.3972
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4415 - accuracy: 0.4936 - val_loss: 0.5567 - val_accuracy: 0.3972
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4365 - accuracy: 0.4936 - val_loss: 0.5649 - val_accuracy: 0.4019
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4122 - accuracy: 0.5116 - val_loss: 0.5641 - val_accuracy: 0.4019
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4547 - accuracy: 0.4756 - val_loss: 0.5594 - val_accuracy: 0.4019

```
accuracy: 0.3925
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4405 - accuracy: 0.4807 - val_loss: 0.5581 - val_
accuracy: 0.3785
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4278 - accuracy: 0.4833 - val_loss: 0.5189 - val_
accuracy: 0.3598
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4662 - accuracy: 0.4936 - val_loss: 0.5206 - val_
accuracy: 0.3411
Epoch 110/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3975 - accuracy: 0.4473 - val_loss: 0.4924 - val_
accuracy: 0.3411
Epoch 111/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4603 - accuracy: 0.4653 - val_loss: 0.4878 - val_
accuracy: 0.3598
Epoch 112/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4849 - accuracy: 0.4910 - val_loss: 0.5005 - val_
accuracy: 0.3832
Epoch 113/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3904 - accuracy: 0.4859 - val_loss: 0.4979 - val_
accuracy: 0.3972
Epoch 114/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3866 - accuracy: 0.4936 - val_loss: 0.4930 - val_
accuracy: 0.4206
Epoch 115/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3935 - accuracy: 0.4653 - val_loss: 0.4868 - val_
accuracy: 0.4159
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3868 - accuracy: 0.4756 - val_loss: 0.4829 - val_
accuracy: 0.3785
Epoch 117/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4564 - accuracy: 0.5013 - val_loss: 0.4886 - val_
accuracy: 0.3925
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4206 - accuracy: 0.4550 - val_loss: 0.5023 - val_
accuracy: 0.3972
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3909 - accuracy: 0.4602 - val_loss: 0.5395 - val_
accuracy: 0.4346
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4839 - accuracy: 0.4756 - val_loss: 0.5192 - val_
accuracy: 0.4299
Epoch 121/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4524 - accuracy: 0.4807 - val_loss: 0.5178 - val_
accuracy: 0.4112
Epoch 122/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4310 - accuracy: 0.4730 - val_loss: 0.5246 - val_
accuracy: 0.4065
Epoch 123/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3946 - accuracy: 0.4679 - val_loss: 0.5348 - val_
accuracy: 0.4346
Epoch 124/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3931 - accuracy: 0.4756 - val_loss: 0.4915 - val_
accuracy: 0.4393
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3768 - accuracy: 0.5064 - val_loss: 0.4925 - val_
accuracy: 0.4393
Epoch 126/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4575 - accuracy: 0.4833 - val_loss: 0.4911 - val_
accuracy: 0.4720
Epoch 127/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3958 - accuracy: 0.5167 - val_loss: 0.4872 - val_
accuracy: 0.4533
Epoch 128/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3743 - accuracy: 0.5167 - val_loss: 0.4865 - val_
accuracy: 0.4626
Epoch 129/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4002 - accuracy: 0.5193 - val_loss: 0.4948 - val_
accuracy: 0.4673
Epoch 130/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3878 - accuracy: 0.5193 - val_loss: 0.5318 - val_
accuracy: 0.4439
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4250 - accuracy: 0.5167 - val_loss: 0.4926 - val_
accuracy: 0.4393
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4291 - accuracy: 0.5604 - val_loss: 0.4910 - val_
accuracy: 0.4439
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3733 - accuracy: 0.5450 - val_loss: 0.4990 - val_
accuracy: 0.4626
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3550 - accuracy: 0.4987 - val_loss: 0.5202 - val_
accuracy: 0.4626
Epoch 135/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4063 - accuracy: 0.5090 - val_loss: 0.5482 - val_
accuracy: 0.4673
Epoch 136/1000
```

```

4/4 [=====] - 0s 13ms/step - loss: 0.4537 - accuracy: 0.4987 - val_loss: 0.5583 - val_accuracy: 0.4953
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3882 - accuracy: 0.5219 - val_loss: 0.5509 - val_accuracy: 0.4813
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4030 - accuracy: 0.5064 - val_loss: 0.6349 - val_accuracy: 0.4673
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3979 - accuracy: 0.5090 - val_loss: 0.5844 - val_accuracy: 0.4813
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3917 - accuracy: 0.4987 - val_loss: 0.6417 - val_accuracy: 0.5093
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4403 - accuracy: 0.4910 - val_loss: 0.5931 - val_accuracy: 0.4860
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3906 - accuracy: 0.4679 - val_loss: 0.5325 - val_accuracy: 0.4860
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3721 - accuracy: 0.4884 - val_loss: 0.5955 - val_accuracy: 0.4953
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4252 - accuracy: 0.5141 - val_loss: 0.6132 - val_accuracy: 0.5187
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4166 - accuracy: 0.4859 - val_loss: 0.5905 - val_accuracy: 0.5187
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3983 - accuracy: 0.5090 - val_loss: 0.5679 - val_accuracy: 0.5140
Epoch 147/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3671 - accuracy: 0.4627 - val_loss: 0.5722 - val_accuracy: 0.5187
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3787 - accuracy: 0.4422 - val_loss: 0.5941 - val_accuracy: 0.5140
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3481 - accuracy: 0.4447 - val_loss: 0.5519 - val_accuracy: 0.4720
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3646 - accuracy: 0.4576 - val_loss: 0.5234 - val_accuracy: 0.4720
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3450 - accuracy: 0.4447 - val_loss: 0.4698 - val_accuracy: 0.4439
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4549 - accuracy: 0.4936 - val_loss: 0.4939 - val_accuracy: 0.4346
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4068 - accuracy: 0.4987 - val_loss: 0.5320 - val_accuracy: 0.4206
Epoch 154/1000
1/4 [====>.....] - ETA: 0s - loss: 0.2381 - accuracy: 0.5391Restoring model weights from the end of the best epoch: 4.
4/4 [=====] - 0s 15ms/step - loss: 0.3879 - accuracy: 0.4833 - val_loss: 0.5369 - val_accuracy: 0.4533
Epoch 154: early stopping
2/2 [=====] - 0s 4ms/step - loss: 2.8702 - accuracy: 0.4884
[CV] END .....Dense1=100, Dense2=25; total time= 8.9s
Model: "sequential_82"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_328 (Dense)	(None, 100)	700
<hr/>		
batch_normalization_246 (BatchNormalization)	(None, 100)	400
activation_246 (Activation)	(None, 100)	0
dense_329 (Dense)	(None, 25)	2525
batch_normalization_247 (BatchNormalization)	(None, 25)	100
activation_247 (Activation)	(None, 25)	0
dense_330 (Dense)	(None, 10)	260
batch_normalization_248 (BatchNormalization)	(None, 10)	40
activation_248 (Activation)	(None, 10)	0
dense_331 (Dense)	(None, 2)	22
<hr/>		

Total params: 4,047
Trainable params: 3,777
Non-trainable params: 270

Epoch 1/1000
4/4 [=====] - 1s 57ms/step - loss: 5.1241 - accuracy: 0.4370 - val_loss: 4.8894 - val_accuracy: 0.6028
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 4.1999 - accuracy: 0.5270 - val_loss: 4.3407 - val_accuracy: 0.6028
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 4.1376 - accuracy: 0.5450 - val_loss: 3.5179 - val_accuracy: 0.6075
Epoch 4/1000
4/4 [=====] - 0s 15ms/step - loss: 3.9331 - accuracy: 0.5476 - val_loss: 3.0974 - val_accuracy: 0.6215
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9887 - accuracy: 0.5604 - val_loss: 2.9891 - val_accuracy: 0.6262
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8855 - accuracy: 0.5501 - val_loss: 3.0635 - val_accuracy: 0.6215
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7668 - accuracy: 0.5733 - val_loss: 3.1372 - val_accuracy: 0.6028
Epoch 8/1000
4/4 [=====] - 0s 12ms/step - loss: 3.6968 - accuracy: 0.5733 - val_loss: 3.3016 - val_accuracy: 0.5981
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5972 - accuracy: 0.5835 - val_loss: 3.2046 - val_accuracy: 0.6262
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 3.6741 - accuracy: 0.5938 - val_loss: 3.1922 - val_accuracy: 0.6262
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5885 - accuracy: 0.5784 - val_loss: 2.8084 - val_accuracy: 0.5561
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4724 - accuracy: 0.5887 - val_loss: 2.5102 - val_accuracy: 0.5701
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4086 - accuracy: 0.5938 - val_loss: 2.5130 - val_accuracy: 0.5654
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5413 - accuracy: 0.5861 - val_loss: 2.5648 - val_accuracy: 0.5561
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 3.3563 - accuracy: 0.6093 - val_loss: 2.4690 - val_accuracy: 0.5981
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 3.2846 - accuracy: 0.5861 - val_loss: 2.3924 - val_accuracy: 0.5841
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1493 - accuracy: 0.6041 - val_loss: 2.2048 - val_accuracy: 0.5514
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0602 - accuracy: 0.5990 - val_loss: 2.1807 - val_accuracy: 0.5654
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 3.0394 - accuracy: 0.5964 - val_loss: 2.0501 - val_accuracy: 0.5561
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0459 - accuracy: 0.5938 - val_loss: 1.9997 - val_accuracy: 0.5794
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9195 - accuracy: 0.6015 - val_loss: 1.9242 - val_accuracy: 0.5654
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7483 - accuracy: 0.6041 - val_loss: 1.8792 - val_accuracy: 0.5561
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7420 - accuracy: 0.5964 - val_loss: 1.8199 - val_accuracy: 0.5654
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6237 - accuracy: 0.5835 - val_loss: 1.7874 - val_accuracy: 0.5748
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6468 - accuracy: 0.5784 - val_loss: 1.7715 - val_accuracy: 0.5748
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7039 - accuracy: 0.5733 - val_loss: 1.7321 - val_accuracy: 0.5561
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5474 - accuracy: 0.5938 - val_loss: 1.7298 - val_accuracy: 0.5701
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4887 - accuracy: 0.6093 - val_loss: 1.6492 - val_accuracy: 0.5514
Epoch 29/1000

```
4/4 [=====] - 0s 12ms/step - loss: 2.2592 - accuracy: 0.6015 - val_loss: 1.6062 - val_accuracy: 0.5561
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2789 - accuracy: 0.5887 - val_loss: 1.5759 - val_accuracy: 0.5561
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9535 - accuracy: 0.5887 - val_loss: 1.5640 - val_accuracy: 0.5421
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0587 - accuracy: 0.5938 - val_loss: 1.6528 - val_accuracy: 0.5000
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9914 - accuracy: 0.5681 - val_loss: 1.6354 - val_accuracy: 0.4813
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0222 - accuracy: 0.5578 - val_loss: 1.6456 - val_accuracy: 0.4813
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9012 - accuracy: 0.6041 - val_loss: 1.6112 - val_accuracy: 0.4393
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7708 - accuracy: 0.5990 - val_loss: 1.5791 - val_accuracy: 0.4626
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7673 - accuracy: 0.5656 - val_loss: 1.5253 - val_accuracy: 0.4626
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8126 - accuracy: 0.5861 - val_loss: 1.5388 - val_accuracy: 0.4673
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7483 - accuracy: 0.5810 - val_loss: 1.5218 - val_accuracy: 0.4626
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5726 - accuracy: 0.5604 - val_loss: 1.4977 - val_accuracy: 0.4720
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5406 - accuracy: 0.5681 - val_loss: 1.4031 - val_accuracy: 0.4813
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4189 - accuracy: 0.5938 - val_loss: 1.3850 - val_accuracy: 0.4860
Epoch 43/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3509 - accuracy: 0.5964 - val_loss: 1.3075 - val_accuracy: 0.4813
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1974 - accuracy: 0.5527 - val_loss: 1.2874 - val_accuracy: 0.4953
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1577 - accuracy: 0.5964 - val_loss: 1.2735 - val_accuracy: 0.5187
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9493 - accuracy: 0.6041 - val_loss: 1.2579 - val_accuracy: 0.5093
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9348 - accuracy: 0.6170 - val_loss: 1.2305 - val_accuracy: 0.4720
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9036 - accuracy: 0.6015 - val_loss: 1.2105 - val_accuracy: 0.4766
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0269 - accuracy: 0.6118 - val_loss: 1.1803 - val_accuracy: 0.4766
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0037 - accuracy: 0.6221 - val_loss: 1.1704 - val_accuracy: 0.4953
Epoch 51/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8778 - accuracy: 0.6272 - val_loss: 1.1590 - val_accuracy: 0.4673
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8450 - accuracy: 0.6401 - val_loss: 1.1453 - val_accuracy: 0.4907
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8013 - accuracy: 0.6324 - val_loss: 1.1452 - val_accuracy: 0.4533
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8237 - accuracy: 0.6324 - val_loss: 1.1086 - val_accuracy: 0.4486
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7643 - accuracy: 0.6375 - val_loss: 1.0843 - val_accuracy: 0.4579
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8026 - accuracy: 0.6607 - val_loss: 1.0448 - val_accuracy: 0.4673
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6968 - accuracy: 0.6324 - val_loss: 1.0120 - val_accuracy: 0.4533
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7345 - accuracy: 0.6324 - val_loss: 0.9507 - val_accuracy: 0.5093
```

Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8138 - accuracy: 0.6375 - val_loss: 0.9273 - val_accuracy: 0.5047
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7049 - accuracy: 0.6478 - val_loss: 0.9867 - val_accuracy: 0.4533
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7040 - accuracy: 0.6478 - val_loss: 0.9552 - val_accuracy: 0.4766
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7613 - accuracy: 0.6298 - val_loss: 0.9141 - val_accuracy: 0.4953
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6382 - accuracy: 0.6144 - val_loss: 0.9149 - val_accuracy: 0.4533
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6659 - accuracy: 0.6401 - val_loss: 0.8942 - val_accuracy: 0.4626
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6696 - accuracy: 0.6478 - val_loss: 0.8731 - val_accuracy: 0.4766
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7171 - accuracy: 0.6401 - val_loss: 0.8735 - val_accuracy: 0.4720
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7605 - accuracy: 0.6298 - val_loss: 0.8680 - val_accuracy: 0.4860
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6597 - accuracy: 0.6427 - val_loss: 0.8576 - val_accuracy: 0.4860
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5806 - accuracy: 0.6452 - val_loss: 0.8169 - val_accuracy: 0.4766
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6445 - accuracy: 0.6401 - val_loss: 0.8293 - val_accuracy: 0.4720
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6204 - accuracy: 0.6298 - val_loss: 0.8233 - val_accuracy: 0.4720
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6323 - accuracy: 0.6324 - val_loss: 0.7714 - val_accuracy: 0.4953
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7123 - accuracy: 0.6504 - val_loss: 0.7578 - val_accuracy: 0.5093
Epoch 74/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6340 - accuracy: 0.6478 - val_loss: 0.7608 - val_accuracy: 0.5140
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5860 - accuracy: 0.6272 - val_loss: 0.7793 - val_accuracy: 0.5187
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5963 - accuracy: 0.6195 - val_loss: 0.7804 - val_accuracy: 0.5093
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6075 - accuracy: 0.6324 - val_loss: 0.7791 - val_accuracy: 0.5280
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6919 - accuracy: 0.6581 - val_loss: 0.7695 - val_accuracy: 0.5140
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6452 - accuracy: 0.6658 - val_loss: 0.7660 - val_accuracy: 0.5140
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6883 - accuracy: 0.6607 - val_loss: 0.7286 - val_accuracy: 0.5280
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6257 - accuracy: 0.6530 - val_loss: 0.7757 - val_accuracy: 0.5140
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6762 - accuracy: 0.6221 - val_loss: 0.7428 - val_accuracy: 0.5327
Epoch 83/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6632 - accuracy: 0.6581 - val_loss: 0.7424 - val_accuracy: 0.5234
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5784 - accuracy: 0.6170 - val_loss: 0.7661 - val_accuracy: 0.5280
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5467 - accuracy: 0.6607 - val_loss: 0.7511 - val_accuracy: 0.5327
Epoch 86/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6111 - accuracy: 0.6632 - val_loss: 0.7399 - val_accuracy: 0.5280
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6628 - accuracy: 0.6375 - val_loss: 0.7272 - val_accuracy: 0.5374
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6034 - accuracy: 0.6478 - val_loss: 0.7068 - val_accuracy: 0.5374

```
accuracy: 0.5421
Epoch 89/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5707 - accuracy: 0.6658 - val_loss: 0.6965 - val_accuracy: 0.5561
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6747 - accuracy: 0.6195 - val_loss: 0.6887 - val_accuracy: 0.5467
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5490 - accuracy: 0.6555 - val_loss: 0.6877 - val_accuracy: 0.5514
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5346 - accuracy: 0.6504 - val_loss: 0.6965 - val_accuracy: 0.5374
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5375 - accuracy: 0.6658 - val_loss: 0.7001 - val_accuracy: 0.5374
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5360 - accuracy: 0.6221 - val_loss: 0.6978 - val_accuracy: 0.5374
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5722 - accuracy: 0.6427 - val_loss: 0.7018 - val_accuracy: 0.5280
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5142 - accuracy: 0.6812 - val_loss: 0.6993 - val_accuracy: 0.5374
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6229 - accuracy: 0.6632 - val_loss: 0.7075 - val_accuracy: 0.5187
Epoch 98/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5844 - accuracy: 0.6452 - val_loss: 0.7046 - val_accuracy: 0.5374
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5462 - accuracy: 0.6581 - val_loss: 0.7058 - val_accuracy: 0.5047
Epoch 100/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5737 - accuracy: 0.6298 - val_loss: 0.7039 - val_accuracy: 0.5047
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5584 - accuracy: 0.6324 - val_loss: 0.9243 - val_accuracy: 0.5234
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5432 - accuracy: 0.6401 - val_loss: 0.9227 - val_accuracy: 0.5000
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6203 - accuracy: 0.6530 - val_loss: 0.9412 - val_accuracy: 0.5327
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5456 - accuracy: 0.6530 - val_loss: 0.9268 - val_accuracy: 0.5467
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6136 - accuracy: 0.6555 - val_loss: 0.9018 - val_accuracy: 0.5374
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6006 - accuracy: 0.6401 - val_loss: 0.9060 - val_accuracy: 0.5327
Epoch 107/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5279 - accuracy: 0.6581 - val_loss: 0.9346 - val_accuracy: 0.5421
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5539 - accuracy: 0.6555 - val_loss: 0.9293 - val_accuracy: 0.5607
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5666 - accuracy: 0.6530 - val_loss: 0.9283 - val_accuracy: 0.5561
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6316 - accuracy: 0.6607 - val_loss: 0.9606 - val_accuracy: 0.5607
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5876 - accuracy: 0.6298 - val_loss: 0.8822 - val_accuracy: 0.5607
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6391 - accuracy: 0.6504 - val_loss: 0.8839 - val_accuracy: 0.5654
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6146 - accuracy: 0.6401 - val_loss: 0.9706 - val_accuracy: 0.5561
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5823 - accuracy: 0.6375 - val_loss: 0.9740 - val_accuracy: 0.5514
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5169 - accuracy: 0.6350 - val_loss: 1.2206 - val_accuracy: 0.5514
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5379 - accuracy: 0.6401 - val_loss: 1.1924 - val_accuracy: 0.5794
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6149 - accuracy: 0.6555 - val_loss: 1.1930 - val_accuracy: 0.5561
Epoch 118/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.5455 - accuracy: 0.6658 - val_loss: 1.1193 - val_accuracy: 0.5607
Epoch 119/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5388 - accuracy: 0.6787 - val_loss: 1.1251 - val_accuracy: 0.5654
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5174 - accuracy: 0.6967 - val_loss: 1.1353 - val_accuracy: 0.5888
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5684 - accuracy: 0.6504 - val_loss: 1.1707 - val_accuracy: 0.5701
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5955 - accuracy: 0.6915 - val_loss: 1.1868 - val_accuracy: 0.5841
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4855 - accuracy: 0.7018 - val_loss: 1.1699 - val_accuracy: 0.5888
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6209 - accuracy: 0.6375 - val_loss: 1.0745 - val_accuracy: 0.5701
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5063 - accuracy: 0.6581 - val_loss: 0.9105 - val_accuracy: 0.5654
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5214 - accuracy: 0.6710 - val_loss: 0.7550 - val_accuracy: 0.5748
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5277 - accuracy: 0.6838 - val_loss: 1.0184 - val_accuracy: 0.5888
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4776 - accuracy: 0.6889 - val_loss: 1.0122 - val_accuracy: 0.6028
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5195 - accuracy: 0.6684 - val_loss: 0.9546 - val_accuracy: 0.5841
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5730 - accuracy: 0.6915 - val_loss: 1.0821 - val_accuracy: 0.5794
Epoch 131/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4916 - accuracy: 0.6941 - val_loss: 1.0790 - val_accuracy: 0.5748
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4887 - accuracy: 0.6864 - val_loss: 1.0765 - val_accuracy: 0.5701
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5006 - accuracy: 0.6812 - val_loss: 1.0727 - val_accuracy: 0.5888
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5794 - accuracy: 0.6658 - val_loss: 1.1381 - val_accuracy: 0.5794
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5098 - accuracy: 0.6684 - val_loss: 1.0247 - val_accuracy: 0.5654
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4919 - accuracy: 0.6735 - val_loss: 1.1679 - val_accuracy: 0.5607
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5190 - accuracy: 0.6735 - val_loss: 1.1704 - val_accuracy: 0.5841
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4992 - accuracy: 0.6864 - val_loss: 1.2237 - val_accuracy: 0.5935
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4896 - accuracy: 0.6761 - val_loss: 1.1917 - val_accuracy: 0.5981
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4994 - accuracy: 0.6787 - val_loss: 1.2183 - val_accuracy: 0.5888
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5448 - accuracy: 0.6967 - val_loss: 1.2485 - val_accuracy: 0.5888
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5427 - accuracy: 0.7018 - val_loss: 1.1565 - val_accuracy: 0.5888
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5228 - accuracy: 0.6812 - val_loss: 1.1874 - val_accuracy: 0.5794
Epoch 144/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5484 - accuracy: 0.6735 - val_loss: 1.2206 - val_accuracy: 0.6075
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5114 - accuracy: 0.6658 - val_loss: 1.2412 - val_accuracy: 0.5981
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5354 - accuracy: 0.6607 - val_loss: 1.2703 - val_accuracy: 0.5981
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5202 - accuracy: 0.6684 - val_loss: 1.2062 - val_accuracy: 0.6121
```

Epoch 148/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4610 - accuracy: 0.7044 - val_loss: 1.0104 - val_accuracy: 0.6028
 Epoch 149/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4545 - accuracy: 0.6864 - val_loss: 1.1256 - val_accuracy: 0.5981
 Epoch 150/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4650 - accuracy: 0.7095 - val_loss: 1.1291 - val_accuracy: 0.5888
 Epoch 151/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4627 - accuracy: 0.7069 - val_loss: 1.1356 - val_accuracy: 0.5841
 Epoch 152/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4440 - accuracy: 0.6941 - val_loss: 0.9315 - val_accuracy: 0.5794
 Epoch 153/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.5084 - accuracy: 0.6838 - val_loss: 1.0121 - val_accuracy: 0.6075
 Epoch 154/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.5096 - accuracy: 0.6812 - val_loss: 1.0301 - val_accuracy: 0.5935
 Epoch 155/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.5043 - accuracy: 0.6484 Restoring model weights from the end of the best epoch: 5.
 4/4 [=====] - 0s 13ms/step - loss: 0.5223 - accuracy: 0.6607 - val_loss: 1.0361 - val_accuracy: 0.5841
 Epoch 155: early stopping
 2/2 [=====] - 0s 3ms/step - loss: 2.5532 - accuracy: 0.6977
 [CV] END Dense1=100, Dense2=25; total time= 8.5s
 Model: "sequential_83"

Layer (type)	Output Shape	Param #
<hr/>		
dense_332 (Dense)	(None, 100)	700
batch_normalization_249 (BatchNormalization)	(None, 100)	400
activation_249 (Activation)	(None, 100)	0
dense_333 (Dense)	(None, 25)	2525
batch_normalization_250 (BatchNormalization)	(None, 25)	100
activation_250 (Activation)	(None, 25)	0
dense_334 (Dense)	(None, 10)	260
batch_normalization_251 (BatchNormalization)	(None, 10)	40
activation_251 (Activation)	(None, 10)	0
dense_335 (Dense)	(None, 2)	22
<hr/>		
Total params:	4,047	
Trainable params:	3,777	
Non-trainable params:	270	

Epoch 1/1000
 4/4 [=====] - 1s 55ms/step - loss: 4.7267 - accuracy: 0.3856 - val_loss: 4.7883 - val_accuracy: 0.5794
 Epoch 2/1000
 4/4 [=====] - 0s 15ms/step - loss: 3.4418 - accuracy: 0.4344 - val_loss: 3.8343 - val_accuracy: 0.5841
 Epoch 3/1000
 4/4 [=====] - 0s 17ms/step - loss: 3.1954 - accuracy: 0.4422 - val_loss: 3.0815 - val_accuracy: 0.5140
 Epoch 4/1000
 4/4 [=====] - 0s 14ms/step - loss: 3.0967 - accuracy: 0.4473 - val_loss: 2.7113 - val_accuracy: 0.4206
 Epoch 5/1000
 4/4 [=====] - 0s 14ms/step - loss: 3.0272 - accuracy: 0.4396 - val_loss: 2.4779 - val_accuracy: 0.3411
 Epoch 6/1000
 4/4 [=====] - 0s 14ms/step - loss: 3.0422 - accuracy: 0.4422 - val_loss: 2.3295 - val_accuracy: 0.3037
 Epoch 7/1000
 4/4 [=====] - 0s 15ms/step - loss: 2.7453 - accuracy: 0.4165 - val_loss: 2.1676 - val_accuracy: 0.3224
 Epoch 8/1000
 4/4 [=====] - 0s 15ms/step - loss: 2.7374 - accuracy: 0.3959 - val_loss: 2.1750 - val_accuracy: 0.3411
 Epoch 9/1000
 4/4 [=====] - 0s 13ms/step - loss: 2.6702 - accuracy: 0.4113 - val_loss: 2.1463 - val_accuracy: 0.3318
 Epoch 10/1000

```
4/4 [=====] - 0s 14ms/step - loss: 2.5241 - accuracy: 0.4036 - val_loss: 2.1050 - val_accuracy: 0.3785
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4095 - accuracy: 0.4242 - val_loss: 2.0927 - val_accuracy: 0.4159
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3200 - accuracy: 0.4087 - val_loss: 2.0108 - val_accuracy: 0.4439
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1959 - accuracy: 0.4422 - val_loss: 1.9734 - val_accuracy: 0.5000
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2113 - accuracy: 0.4499 - val_loss: 1.9020 - val_accuracy: 0.4766
Epoch 15/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9716 - accuracy: 0.4422 - val_loss: 1.9184 - val_accuracy: 0.4626
Epoch 16/1000
4/4 [=====] - 0s 15ms/step - loss: 2.1366 - accuracy: 0.4344 - val_loss: 1.8941 - val_accuracy: 0.4486
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9189 - accuracy: 0.4216 - val_loss: 1.7881 - val_accuracy: 0.3458
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8482 - accuracy: 0.3907 - val_loss: 1.7733 - val_accuracy: 0.2897
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8935 - accuracy: 0.4010 - val_loss: 1.7523 - val_accuracy: 0.3037
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7087 - accuracy: 0.4087 - val_loss: 1.7268 - val_accuracy: 0.2897
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6691 - accuracy: 0.4062 - val_loss: 1.6894 - val_accuracy: 0.3271
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7942 - accuracy: 0.3985 - val_loss: 1.7082 - val_accuracy: 0.3972
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7898 - accuracy: 0.4087 - val_loss: 1.7066 - val_accuracy: 0.3972
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7621 - accuracy: 0.4036 - val_loss: 1.6940 - val_accuracy: 0.4766
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7799 - accuracy: 0.3830 - val_loss: 1.7030 - val_accuracy: 0.4907
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7953 - accuracy: 0.4087 - val_loss: 1.7258 - val_accuracy: 0.5280
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8133 - accuracy: 0.3907 - val_loss: 1.7424 - val_accuracy: 0.5421
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7937 - accuracy: 0.4113 - val_loss: 1.7431 - val_accuracy: 0.5467
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6799 - accuracy: 0.3985 - val_loss: 1.7491 - val_accuracy: 0.5467
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8056 - accuracy: 0.4113 - val_loss: 1.7511 - val_accuracy: 0.5514
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6563 - accuracy: 0.4010 - val_loss: 1.7502 - val_accuracy: 0.5467
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7214 - accuracy: 0.4165 - val_loss: 1.7459 - val_accuracy: 0.5467
Epoch 33/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7346 - accuracy: 0.3985 - val_loss: 1.7406 - val_accuracy: 0.5467
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7259 - accuracy: 0.4010 - val_loss: 1.7323 - val_accuracy: 0.5467
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5961 - accuracy: 0.3933 - val_loss: 1.7275 - val_accuracy: 0.5561
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5846 - accuracy: 0.4036 - val_loss: 1.7166 - val_accuracy: 0.5514
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4327 - accuracy: 0.4010 - val_loss: 1.6975 - val_accuracy: 0.5748
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5568 - accuracy: 0.4242 - val_loss: 1.6884 - val_accuracy: 0.5654
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4554 - accuracy: 0.4139 - val_loss: 1.6788 - val_accuracy: 0.5701
```

Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3073 - accuracy: 0.4267 - val_loss: 1.6448 - val_accuracy: 0.5514
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3698 - accuracy: 0.4267 - val_loss: 1.6369 - val_accuracy: 0.5514
Epoch 42/1000
4/4 [=====] - 0s 11ms/step - loss: 1.3505 - accuracy: 0.4473 - val_loss: 1.6317 - val_accuracy: 0.5514
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2958 - accuracy: 0.4267 - val_loss: 1.6200 - val_accuracy: 0.5421
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3509 - accuracy: 0.4473 - val_loss: 1.6348 - val_accuracy: 0.5234
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2793 - accuracy: 0.4473 - val_loss: 1.6229 - val_accuracy: 0.5280
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2683 - accuracy: 0.4242 - val_loss: 1.5823 - val_accuracy: 0.5187
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2339 - accuracy: 0.4524 - val_loss: 1.5418 - val_accuracy: 0.5093
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1034 - accuracy: 0.4165 - val_loss: 1.5497 - val_accuracy: 0.4813
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1614 - accuracy: 0.4139 - val_loss: 1.5286 - val_accuracy: 0.4486
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1838 - accuracy: 0.4242 - val_loss: 1.5123 - val_accuracy: 0.4252
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0360 - accuracy: 0.4242 - val_loss: 1.5063 - val_accuracy: 0.4579
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1522 - accuracy: 0.3959 - val_loss: 1.4728 - val_accuracy: 0.4393
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0729 - accuracy: 0.4524 - val_loss: 1.4346 - val_accuracy: 0.4346
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9345 - accuracy: 0.4293 - val_loss: 1.4167 - val_accuracy: 0.4112
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0612 - accuracy: 0.4319 - val_loss: 1.3900 - val_accuracy: 0.4112
Epoch 56/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9199 - accuracy: 0.4499 - val_loss: 1.3179 - val_accuracy: 0.4206
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8560 - accuracy: 0.4370 - val_loss: 1.2405 - val_accuracy: 0.4346
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9412 - accuracy: 0.4319 - val_loss: 1.1807 - val_accuracy: 0.4252
Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8810 - accuracy: 0.4524 - val_loss: 1.1397 - val_accuracy: 0.4159
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8135 - accuracy: 0.4396 - val_loss: 1.1775 - val_accuracy: 0.3925
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8635 - accuracy: 0.4653 - val_loss: 1.1590 - val_accuracy: 0.3925
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8119 - accuracy: 0.4447 - val_loss: 1.1197 - val_accuracy: 0.3832
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7687 - accuracy: 0.4704 - val_loss: 1.1280 - val_accuracy: 0.3832
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8179 - accuracy: 0.4576 - val_loss: 1.1602 - val_accuracy: 0.3832
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8024 - accuracy: 0.4447 - val_loss: 1.0679 - val_accuracy: 0.3598
Epoch 66/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7435 - accuracy: 0.4344 - val_loss: 1.0162 - val_accuracy: 0.3598
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7300 - accuracy: 0.4422 - val_loss: 0.8323 - val_accuracy: 0.3692
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7023 - accuracy: 0.4242 - val_loss: 0.8000 - val_accuracy: 0.3879
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6031 - accuracy: 0.4396 - val_loss: 0.8057 - val_accuracy: 0.3879

```
accuracy: 0.3738
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7269 - accuracy: 0.4267 - val_loss: 0.7891 - val_accuracy: 0.3738
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6841 - accuracy: 0.4293 - val_loss: 0.8160 - val_accuracy: 0.3738
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5361 - accuracy: 0.4499 - val_loss: 0.8894 - val_accuracy: 0.3692
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6444 - accuracy: 0.4833 - val_loss: 0.9060 - val_accuracy: 0.4112
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6744 - accuracy: 0.4550 - val_loss: 0.8918 - val_accuracy: 0.4206
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5896 - accuracy: 0.4550 - val_loss: 0.8730 - val_accuracy: 0.4206
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6598 - accuracy: 0.4524 - val_loss: 0.8491 - val_accuracy: 0.4065
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6831 - accuracy: 0.4756 - val_loss: 0.8383 - val_accuracy: 0.4065
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6517 - accuracy: 0.4627 - val_loss: 0.8305 - val_accuracy: 0.3972
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5281 - accuracy: 0.4396 - val_loss: 0.8214 - val_accuracy: 0.4065
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6850 - accuracy: 0.4730 - val_loss: 0.8251 - val_accuracy: 0.4019
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5725 - accuracy: 0.4859 - val_loss: 0.7515 - val_accuracy: 0.3738
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5601 - accuracy: 0.4576 - val_loss: 0.7422 - val_accuracy: 0.3972
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5970 - accuracy: 0.4653 - val_loss: 0.7931 - val_accuracy: 0.4019
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6240 - accuracy: 0.4499 - val_loss: 0.7329 - val_accuracy: 0.4019
Epoch 85/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5590 - accuracy: 0.5090 - val_loss: 0.6910 - val_accuracy: 0.3972
Epoch 86/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6586 - accuracy: 0.4884 - val_loss: 0.6745 - val_accuracy: 0.3972
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5712 - accuracy: 0.4781 - val_loss: 0.6393 - val_accuracy: 0.3738
Epoch 88/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6226 - accuracy: 0.4807 - val_loss: 0.6325 - val_accuracy: 0.3879
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6541 - accuracy: 0.4756 - val_loss: 0.6186 - val_accuracy: 0.3925
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6860 - accuracy: 0.4936 - val_loss: 0.6019 - val_accuracy: 0.4019
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5841 - accuracy: 0.4679 - val_loss: 0.6189 - val_accuracy: 0.3972
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5829 - accuracy: 0.4679 - val_loss: 0.6601 - val_accuracy: 0.4299
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5707 - accuracy: 0.4602 - val_loss: 0.6605 - val_accuracy: 0.4346
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5148 - accuracy: 0.4936 - val_loss: 0.6660 - val_accuracy: 0.4206
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6635 - accuracy: 0.4961 - val_loss: 0.6592 - val_accuracy: 0.4346
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5426 - accuracy: 0.4781 - val_loss: 0.6515 - val_accuracy: 0.4299
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5380 - accuracy: 0.4730 - val_loss: 0.6338 - val_accuracy: 0.4159
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5254 - accuracy: 0.5013 - val_loss: 0.6434 - val_accuracy: 0.4159
Epoch 99/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.5920 - accuracy: 0.4602 - val_loss: 0.5906 - val_accuracy: 0.4206
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5858 - accuracy: 0.4884 - val_loss: 0.5765 - val_accuracy: 0.4159
Epoch 101/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4754 - accuracy: 0.4833 - val_loss: 0.5834 - val_accuracy: 0.4393
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5345 - accuracy: 0.4961 - val_loss: 0.6159 - val_accuracy: 0.4393
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6825 - accuracy: 0.5013 - val_loss: 0.5786 - val_accuracy: 0.4252
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5521 - accuracy: 0.4961 - val_loss: 0.5554 - val_accuracy: 0.4486
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5113 - accuracy: 0.4627 - val_loss: 0.5819 - val_accuracy: 0.4486
Epoch 106/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5274 - accuracy: 0.4756 - val_loss: 0.5658 - val_accuracy: 0.4626
Epoch 107/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5333 - accuracy: 0.4833 - val_loss: 0.5763 - val_accuracy: 0.4626
Epoch 108/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4619 - accuracy: 0.4704 - val_loss: 0.5689 - val_accuracy: 0.4673
Epoch 109/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4711 - accuracy: 0.4987 - val_loss: 0.5802 - val_accuracy: 0.4720
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5003 - accuracy: 0.4936 - val_loss: 0.6176 - val_accuracy: 0.4720
Epoch 111/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5289 - accuracy: 0.4859 - val_loss: 0.5896 - val_accuracy: 0.4766
Epoch 112/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4621 - accuracy: 0.4859 - val_loss: 0.6102 - val_accuracy: 0.4720
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4545 - accuracy: 0.4833 - val_loss: 0.6637 - val_accuracy: 0.4860
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4773 - accuracy: 0.4781 - val_loss: 0.7189 - val_accuracy: 0.5000
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4458 - accuracy: 0.4910 - val_loss: 0.6897 - val_accuracy: 0.5093
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4753 - accuracy: 0.5090 - val_loss: 0.6676 - val_accuracy: 0.5093
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4735 - accuracy: 0.5039 - val_loss: 0.6287 - val_accuracy: 0.5140
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4535 - accuracy: 0.4936 - val_loss: 0.6316 - val_accuracy: 0.5140
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5045 - accuracy: 0.4859 - val_loss: 0.7330 - val_accuracy: 0.5140
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4778 - accuracy: 0.5090 - val_loss: 0.6982 - val_accuracy: 0.5093
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3977 - accuracy: 0.4884 - val_loss: 0.6729 - val_accuracy: 0.4953
Epoch 122/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4728 - accuracy: 0.5013 - val_loss: 0.7692 - val_accuracy: 0.5000
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5106 - accuracy: 0.4807 - val_loss: 0.6610 - val_accuracy: 0.4813
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4601 - accuracy: 0.5013 - val_loss: 0.8070 - val_accuracy: 0.4720
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4988 - accuracy: 0.5141 - val_loss: 0.8637 - val_accuracy: 0.4720
Epoch 126/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4717 - accuracy: 0.4910 - val_loss: 0.9810 - val_accuracy: 0.4720
Epoch 127/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5241 - accuracy: 0.5116 - val_loss: 1.0152 - val_accuracy: 0.4907
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4737 - accuracy: 0.4781 - val_loss: 0.8568 - val_accuracy: 0.4673
```

Epoch 129/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4785 - accuracy: 0.4936 - val_loss: 0.8177 - val_accuracy: 0.4813
 Epoch 130/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4307 - accuracy: 0.4781 - val_loss: 0.8193 - val_accuracy: 0.4720
 Epoch 131/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4447 - accuracy: 0.4987 - val_loss: 0.8860 - val_accuracy: 0.4766
 Epoch 132/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4774 - accuracy: 0.4961 - val_loss: 0.8588 - val_accuracy: 0.4907
 Epoch 133/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4245 - accuracy: 0.4961 - val_loss: 0.7941 - val_accuracy: 0.5000
 Epoch 134/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3701 - accuracy: 0.5270 - val_loss: 0.7175 - val_accuracy: 0.4907
 Epoch 135/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3923 - accuracy: 0.5347 - val_loss: 0.7333 - val_accuracy: 0.5047
 Epoch 136/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3565 - accuracy: 0.5373 - val_loss: 0.7296 - val_accuracy: 0.4953
 Epoch 137/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4256 - accuracy: 0.5270 - val_loss: 0.7680 - val_accuracy: 0.5093
 Epoch 138/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3973 - accuracy: 0.5321 - val_loss: 0.8302 - val_accuracy: 0.4860
 Epoch 139/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3681 - accuracy: 0.5398 - val_loss: 0.8786 - val_accuracy: 0.4860
 Epoch 140/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.4219 - accuracy: 0.5244 - val_loss: 0.7453 - val_accuracy: 0.4953
 Epoch 141/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.4189 - accuracy: 0.5476 - val_loss: 0.7678 - val_accuracy: 0.4813
 Epoch 142/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.3693 - accuracy: 0.5450 - val_loss: 0.7906 - val_accuracy: 0.4953
 Epoch 143/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.4458 - accuracy: 0.5476 - val_loss: 0.7850 - val_accuracy: 0.4813
 Epoch 144/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3600 - accuracy: 0.5244 - val_loss: 0.7517 - val_accuracy: 0.4860
 Epoch 145/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.3922 - accuracy: 0.5476 - val_loss: 0.7913 - val_accuracy: 0.4720
 Epoch 146/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3706 - accuracy: 0.5398 - val_loss: 0.7579 - val_accuracy: 0.4766
 Epoch 147/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3524 - accuracy: 0.5424 - val_loss: 0.7535 - val_accuracy: 0.4673
 Epoch 148/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.3470 - accuracy: 0.5219 - val_loss: 0.7218 - val_accuracy: 0.4766
 Epoch 149/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3995 - accuracy: 0.5321 - val_loss: 0.8552 - val_accuracy: 0.4533
 Epoch 150/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3628 - accuracy: 0.5398 - val_loss: 0.8181 - val_accuracy: 0.4579
 Epoch 151/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3702 - accuracy: 0.5244 - val_loss: 0.9021 - val_accuracy: 0.4486
 Epoch 152/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.6175 - accuracy: 0.4844 Restoring model weights from the end of the best epoch: 2.
 4/4 [=====] - 0s 14ms/step - loss: 0.5188 - accuracy: 0.5347 - val_loss: 0.9802 - val_accuracy: 0.4626
 Epoch 152: early stopping
 2/2 [=====] - 0s 3ms/step - loss: 2.9622 - accuracy: 0.5349
 [CV] ENDDense1=100, Dense2=25; total time= 8.3s
 Model: "sequential_84"

Layer (type)	Output Shape	Param #
dense_336 (Dense)	(None, 100)	700
batch_normalization_252 (BatchNormalization)	(None, 100)	400
activation_252 (Activation)	(None, 100)	0
dense_337 (Dense)	(None, 25)	2525

```
batch_normalization_253 (BatchNormalization)           100
activation_253 (Activation) (None, 25)                  0
dense_338 (Dense) (None, 10)                          260
batch_normalization_254 (BatchNormalization)           40
activation_254 (Activation) (None, 10)                  0
dense_339 (Dense) (None, 2)                           22
=====
Total params: 4,047
Trainable params: 3,777
Non-trainable params: 270
-----
Epoch 1/1000
4/4 [=====] - 2s 60ms/step - loss: 4.3969 - accuracy: 0.5630 - val_loss: 2.5202 - val_accuracy: 0.3879
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 3.3977 - accuracy: 0.5296 - val_loss: 2.4046 - val_accuracy: 0.4766
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8460 - accuracy: 0.4987 - val_loss: 2.3502 - val_accuracy: 0.4860
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7108 - accuracy: 0.5347 - val_loss: 2.2220 - val_accuracy: 0.4907
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3083 - accuracy: 0.4807 - val_loss: 2.1517 - val_accuracy: 0.4953
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4137 - accuracy: 0.5141 - val_loss: 2.1266 - val_accuracy: 0.4720
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2363 - accuracy: 0.5039 - val_loss: 1.9833 - val_accuracy: 0.4019
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1780 - accuracy: 0.5244 - val_loss: 2.0263 - val_accuracy: 0.3785
Epoch 9/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9403 - accuracy: 0.5193 - val_loss: 2.0899 - val_accuracy: 0.3645
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0404 - accuracy: 0.4859 - val_loss: 2.0734 - val_accuracy: 0.4019
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8634 - accuracy: 0.4961 - val_loss: 2.0159 - val_accuracy: 0.4159
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8154 - accuracy: 0.4936 - val_loss: 2.0712 - val_accuracy: 0.4579
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6641 - accuracy: 0.4936 - val_loss: 2.0186 - val_accuracy: 0.5000
Epoch 14/1000
4/4 [=====] - 0s 15ms/step - loss: 1.5111 - accuracy: 0.4833 - val_loss: 1.9250 - val_accuracy: 0.5280
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4995 - accuracy: 0.4807 - val_loss: 1.8899 - val_accuracy: 0.5327
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5897 - accuracy: 0.4524 - val_loss: 1.7636 - val_accuracy: 0.5561
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4652 - accuracy: 0.4550 - val_loss: 1.7299 - val_accuracy: 0.5327
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3364 - accuracy: 0.4679 - val_loss: 1.7398 - val_accuracy: 0.5514
Epoch 19/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2284 - accuracy: 0.4473 - val_loss: 1.7296 - val_accuracy: 0.5467
Epoch 20/1000
4/4 [=====] - 0s 15ms/step - loss: 1.3394 - accuracy: 0.4473 - val_loss: 1.7298 - val_accuracy: 0.5654
Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4155 - accuracy: 0.4242 - val_loss: 1.7080 - val_accuracy: 0.5748
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2825 - accuracy: 0.4216 - val_loss: 1.6784 - val_accuracy: 0.5421
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2480 - accuracy: 0.4422 - val_loss: 1.6265 - val_accuracy: 0.5421
```

Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2467 - accuracy: 0.4139 - val_loss: 1.6157 - val_accuracy: 0.5421
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1366 - accuracy: 0.4139 - val_loss: 1.4958 - val_accuracy: 0.5187
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1098 - accuracy: 0.4319 - val_loss: 1.5733 - val_accuracy: 0.5280
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1007 - accuracy: 0.4113 - val_loss: 1.5708 - val_accuracy: 0.5280
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1072 - accuracy: 0.3907 - val_loss: 1.5264 - val_accuracy: 0.5327
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9287 - accuracy: 0.4190 - val_loss: 1.5634 - val_accuracy: 0.5374
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8260 - accuracy: 0.3985 - val_loss: 1.6039 - val_accuracy: 0.5561
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7787 - accuracy: 0.3907 - val_loss: 1.5644 - val_accuracy: 0.5514
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6875 - accuracy: 0.3933 - val_loss: 1.5342 - val_accuracy: 0.5467
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6605 - accuracy: 0.4062 - val_loss: 1.5046 - val_accuracy: 0.5561
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7325 - accuracy: 0.3907 - val_loss: 1.5037 - val_accuracy: 0.5561
Epoch 35/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7602 - accuracy: 0.3470 - val_loss: 1.5437 - val_accuracy: 0.5467
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6358 - accuracy: 0.4062 - val_loss: 1.5351 - val_accuracy: 0.5654
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7294 - accuracy: 0.3933 - val_loss: 1.5317 - val_accuracy: 0.5374
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6332 - accuracy: 0.3856 - val_loss: 1.5141 - val_accuracy: 0.5607
Epoch 39/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6193 - accuracy: 0.3830 - val_loss: 1.5129 - val_accuracy: 0.5514
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6771 - accuracy: 0.3805 - val_loss: 1.5155 - val_accuracy: 0.5327
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6274 - accuracy: 0.3907 - val_loss: 1.5009 - val_accuracy: 0.5327
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5695 - accuracy: 0.3830 - val_loss: 1.5155 - val_accuracy: 0.5234
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6628 - accuracy: 0.4113 - val_loss: 1.4682 - val_accuracy: 0.5047
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6163 - accuracy: 0.3676 - val_loss: 1.4862 - val_accuracy: 0.5093
Epoch 45/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5985 - accuracy: 0.3676 - val_loss: 1.4757 - val_accuracy: 0.5047
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6503 - accuracy: 0.3728 - val_loss: 1.4311 - val_accuracy: 0.5327
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5031 - accuracy: 0.3419 - val_loss: 1.4197 - val_accuracy: 0.5280
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5017 - accuracy: 0.3573 - val_loss: 1.4031 - val_accuracy: 0.5467
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4359 - accuracy: 0.3342 - val_loss: 1.4105 - val_accuracy: 0.5561
Epoch 50/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5141 - accuracy: 0.3522 - val_loss: 1.4042 - val_accuracy: 0.5374
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5657 - accuracy: 0.3676 - val_loss: 1.3657 - val_accuracy: 0.5187
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4629 - accuracy: 0.3470 - val_loss: 1.3590 - val_accuracy: 0.5093
Epoch 53/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5186 - accuracy: 0.3573 - val_loss: 1.3470 - val_accuracy: 0.5093

accuracy: 0.5093
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5432 - accuracy: 0.3625 - val_loss: 1.4055 - val_accuracy: 0.5187
Epoch 55/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5030 - accuracy: 0.3676 - val_loss: 1.3901 - val_accuracy: 0.4953
Epoch 56/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4783 - accuracy: 0.3419 - val_loss: 1.3192 - val_accuracy: 0.4720
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4916 - accuracy: 0.3419 - val_loss: 1.3021 - val_accuracy: 0.4720
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4561 - accuracy: 0.3316 - val_loss: 1.2564 - val_accuracy: 0.4813
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4725 - accuracy: 0.3496 - val_loss: 1.2376 - val_accuracy: 0.4953
Epoch 60/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4201 - accuracy: 0.3033 - val_loss: 1.2508 - val_accuracy: 0.5000
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4631 - accuracy: 0.3368 - val_loss: 1.2025 - val_accuracy: 0.4579
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4101 - accuracy: 0.3342 - val_loss: 1.2049 - val_accuracy: 0.4579
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4176 - accuracy: 0.3265 - val_loss: 1.1608 - val_accuracy: 0.4486
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3776 - accuracy: 0.3136 - val_loss: 1.1944 - val_accuracy: 0.4673
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4183 - accuracy: 0.3162 - val_loss: 1.1676 - val_accuracy: 0.4533
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4112 - accuracy: 0.3213 - val_loss: 1.1590 - val_accuracy: 0.4439
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4089 - accuracy: 0.3162 - val_loss: 1.1570 - val_accuracy: 0.4065
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4259 - accuracy: 0.3162 - val_loss: 1.1482 - val_accuracy: 0.4065
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4261 - accuracy: 0.3368 - val_loss: 1.1308 - val_accuracy: 0.3972
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4285 - accuracy: 0.3316 - val_loss: 1.0687 - val_accuracy: 0.3645
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3398 - accuracy: 0.3085 - val_loss: 1.1325 - val_accuracy: 0.4112
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3855 - accuracy: 0.3239 - val_loss: 1.0721 - val_accuracy: 0.3972
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3584 - accuracy: 0.3085 - val_loss: 1.0136 - val_accuracy: 0.3645
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3988 - accuracy: 0.3162 - val_loss: 0.9661 - val_accuracy: 0.3645
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3814 - accuracy: 0.3111 - val_loss: 0.9314 - val_accuracy: 0.3505
Epoch 76/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3665 - accuracy: 0.3316 - val_loss: 0.9359 - val_accuracy: 0.3598
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4064 - accuracy: 0.3111 - val_loss: 0.8955 - val_accuracy: 0.3551
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3531 - accuracy: 0.3188 - val_loss: 0.9211 - val_accuracy: 0.3364
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3366 - accuracy: 0.3188 - val_loss: 0.8538 - val_accuracy: 0.3037
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3375 - accuracy: 0.3111 - val_loss: 0.7889 - val_accuracy: 0.3178
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4507 - accuracy: 0.3059 - val_loss: 0.8256 - val_accuracy: 0.3037
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3721 - accuracy: 0.3008 - val_loss: 0.7974 - val_accuracy: 0.3224
Epoch 83/1000

```
4/4 [=====] - 0s 12ms/step - loss: 0.4233 - accuracy: 0.3059 - val_loss: 0.8275 - val_accuracy: 0.3084
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3363 - accuracy: 0.3162 - val_loss: 0.8742 - val_accuracy: 0.3318
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3794 - accuracy: 0.3085 - val_loss: 0.8475 - val_accuracy: 0.3224
Epoch 86/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3300 - accuracy: 0.3162 - val_loss: 0.8278 - val_accuracy: 0.3271
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3767 - accuracy: 0.3342 - val_loss: 0.8916 - val_accuracy: 0.3598
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2884 - accuracy: 0.3111 - val_loss: 0.8810 - val_accuracy: 0.3645
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3178 - accuracy: 0.3290 - val_loss: 0.8518 - val_accuracy: 0.3458
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3800 - accuracy: 0.3470 - val_loss: 0.8696 - val_accuracy: 0.3505
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2773 - accuracy: 0.3316 - val_loss: 0.8704 - val_accuracy: 0.3411
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2930 - accuracy: 0.3085 - val_loss: 0.7840 - val_accuracy: 0.3084
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3730 - accuracy: 0.3548 - val_loss: 0.7815 - val_accuracy: 0.3037
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3429 - accuracy: 0.3393 - val_loss: 0.7849 - val_accuracy: 0.3084
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2809 - accuracy: 0.3265 - val_loss: 0.7563 - val_accuracy: 0.2991
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3685 - accuracy: 0.3496 - val_loss: 0.7574 - val_accuracy: 0.3084
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3930 - accuracy: 0.3522 - val_loss: 0.7326 - val_accuracy: 0.3131
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2619 - accuracy: 0.3445 - val_loss: 0.7377 - val_accuracy: 0.2991
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3959 - accuracy: 0.3239 - val_loss: 0.6606 - val_accuracy: 0.3178
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3423 - accuracy: 0.3599 - val_loss: 0.6959 - val_accuracy: 0.2991
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3490 - accuracy: 0.3368 - val_loss: 0.6943 - val_accuracy: 0.2991
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3892 - accuracy: 0.3779 - val_loss: 0.7352 - val_accuracy: 0.3084
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4007 - accuracy: 0.3599 - val_loss: 0.7089 - val_accuracy: 0.3037
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3203 - accuracy: 0.3342 - val_loss: 0.7154 - val_accuracy: 0.2991
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4349 - accuracy: 0.3419 - val_loss: 0.6998 - val_accuracy: 0.3084
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4268 - accuracy: 0.3368 - val_loss: 0.6860 - val_accuracy: 0.2897
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2780 - accuracy: 0.3368 - val_loss: 0.6966 - val_accuracy: 0.3037
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3503 - accuracy: 0.3496 - val_loss: 0.6845 - val_accuracy: 0.3037
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3649 - accuracy: 0.3290 - val_loss: 0.7250 - val_accuracy: 0.3131
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2984 - accuracy: 0.3290 - val_loss: 0.7076 - val_accuracy: 0.3364
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3212 - accuracy: 0.3265 - val_loss: 0.6902 - val_accuracy: 0.3364
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3090 - accuracy: 0.3419 - val_loss: 0.6824 - val_accuracy: 0.3271
```

Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3066 - accuracy: 0.3342 - val_loss: 0.6870 - val_accuracy: 0.2991
Epoch 114/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2473 - accuracy: 0.3316 - val_loss: 0.5914 - val_accuracy: 0.3084
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3070 - accuracy: 0.3496 - val_loss: 0.6185 - val_accuracy: 0.3178
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3174 - accuracy: 0.3393 - val_loss: 0.6252 - val_accuracy: 0.3271
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3291 - accuracy: 0.3548 - val_loss: 0.6130 - val_accuracy: 0.3224
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3189 - accuracy: 0.3470 - val_loss: 0.6485 - val_accuracy: 0.3271
Epoch 119/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2940 - accuracy: 0.3419 - val_loss: 0.6801 - val_accuracy: 0.3318
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3885 - accuracy: 0.3625 - val_loss: 0.7394 - val_accuracy: 0.3224
Epoch 121/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2995 - accuracy: 0.3445 - val_loss: 0.7434 - val_accuracy: 0.3364
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3458 - accuracy: 0.3393 - val_loss: 0.8302 - val_accuracy: 0.3224
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3564 - accuracy: 0.3625 - val_loss: 0.7512 - val_accuracy: 0.3037
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3866 - accuracy: 0.3419 - val_loss: 0.8222 - val_accuracy: 0.3178
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3528 - accuracy: 0.3342 - val_loss: 0.7941 - val_accuracy: 0.3178
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3081 - accuracy: 0.3239 - val_loss: 0.8597 - val_accuracy: 0.3224
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2883 - accuracy: 0.3290 - val_loss: 0.7947 - val_accuracy: 0.3318
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3224 - accuracy: 0.3290 - val_loss: 0.9760 - val_accuracy: 0.3037
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3168 - accuracy: 0.3213 - val_loss: 0.9364 - val_accuracy: 0.3178
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3212 - accuracy: 0.3290 - val_loss: 1.0479 - val_accuracy: 0.3131
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2673 - accuracy: 0.3188 - val_loss: 1.0884 - val_accuracy: 0.2991
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4145 - accuracy: 0.3419 - val_loss: 1.0486 - val_accuracy: 0.2850
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2634 - accuracy: 0.3162 - val_loss: 1.1241 - val_accuracy: 0.3084
Epoch 134/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3179 - accuracy: 0.3188 - val_loss: 1.1206 - val_accuracy: 0.3037
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2756 - accuracy: 0.3290 - val_loss: 1.2111 - val_accuracy: 0.3084
Epoch 136/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2836 - accuracy: 0.3111 - val_loss: 1.2444 - val_accuracy: 0.2804
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2282 - accuracy: 0.3085 - val_loss: 1.2722 - val_accuracy: 0.3178
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3545 - accuracy: 0.3522 - val_loss: 1.0674 - val_accuracy: 0.3364
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3428 - accuracy: 0.3136 - val_loss: 1.1924 - val_accuracy: 0.3131
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2666 - accuracy: 0.3111 - val_loss: 0.9962 - val_accuracy: 0.3645
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4113 - accuracy: 0.3111 - val_loss: 1.1547 - val_accuracy: 0.3458
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3811 - accuracy: 0.2982 - val_loss: 1.3257 - val_accuracy: 0.3257

```
accuracy: 0.3131
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3018 - accuracy: 0.3239 - val_loss: 1.1284 - val_
accuracy: 0.3411
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3012 - accuracy: 0.3393 - val_loss: 1.2122 - val_
accuracy: 0.3458
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2783 - accuracy: 0.3085 - val_loss: 1.1149 - val_
accuracy: 0.3458
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2804 - accuracy: 0.3059 - val_loss: 1.2054 - val_
accuracy: 0.3411
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2766 - accuracy: 0.3290 - val_loss: 1.1664 - val_
accuracy: 0.3271
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2918 - accuracy: 0.3162 - val_loss: 1.1802 - val_
accuracy: 0.3224
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3865 - accuracy: 0.3522 - val_loss: 1.1590 - val_
accuracy: 0.3131
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3714 - accuracy: 0.3162 - val_loss: 1.0773 - val_
accuracy: 0.3178
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3480 - accuracy: 0.3008 - val_loss: 1.0417 - val_
accuracy: 0.3178
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4100 - accuracy: 0.3393 - val_loss: 1.0437 - val_
accuracy: 0.3318
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4287 - accuracy: 0.3599 - val_loss: 1.0604 - val_
accuracy: 0.3411
Epoch 154/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3199 - accuracy: 0.3290 - val_loss: 1.0229 - val_
accuracy: 0.3364
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4676 - accuracy: 0.3445 - val_loss: 0.9846 - val_
accuracy: 0.3458
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3549 - accuracy: 0.3419 - val_loss: 0.9783 - val_
accuracy: 0.3458
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3558 - accuracy: 0.3522 - val_loss: 0.9479 - val_
accuracy: 0.3598
Epoch 158/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3652 - accuracy: 0.3496 - val_loss: 0.9695 - val_
accuracy: 0.3598
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3035 - accuracy: 0.3316 - val_loss: 0.9982 - val_
accuracy: 0.3738
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3581 - accuracy: 0.3445 - val_loss: 1.0150 - val_
accuracy: 0.3458
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4315 - accuracy: 0.3213 - val_loss: 1.0106 - val_
accuracy: 0.3411
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3216 - accuracy: 0.3445 - val_loss: 1.0027 - val_
accuracy: 0.3505
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3737 - accuracy: 0.3522 - val_loss: 0.9959 - val_
accuracy: 0.3318
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3325 - accuracy: 0.3470 - val_loss: 0.9935 - val_
accuracy: 0.3692
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3073 - accuracy: 0.3419 - val_loss: 1.0541 - val_
accuracy: 0.3224
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2243 - accuracy: 0.3445 - val_loss: 1.0045 - val_
accuracy: 0.3411
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3112 - accuracy: 0.3676 - val_loss: 1.2364 - val_
accuracy: 0.3411
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3811 - accuracy: 0.3599 - val_loss: 1.2348 - val_
accuracy: 0.3364
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2376 - accuracy: 0.3445 - val_loss: 1.1604 - val_
accuracy: 0.3551
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3331 - accuracy: 0.3368 - val_loss: 1.1577 - val_
accuracy: 0.3458
Epoch 171/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3647 - accuracy: 0.3906Restoring model weights from th
e end of the best epoch: 21.
4/4 [=====] - 0s 15ms/step - loss: 0.3436 - accuracy: 0.3625 - val_loss: 1.1694 - val_
```

```
accuracy: 0.3505
Epoch 171: early stopping
2/2 [=====] - 0s 4ms/step - loss: 1.4136 - accuracy: 0.4186
[CV] END .....Dense1=100, Dense2=25; total time= 9.8s
Model: "sequential_85"
```

Layer (type)	Output Shape	Param #
<hr/>		
dense_340 (Dense)	(None, 100)	700
batch_normalization_255 (BatchNormalization)	(None, 100)	400
activation_255 (Activation)	(None, 100)	0
dense_341 (Dense)	(None, 25)	2525
batch_normalization_256 (BatchNormalization)	(None, 25)	100
activation_256 (Activation)	(None, 25)	0
dense_342 (Dense)	(None, 10)	260
batch_normalization_257 (BatchNormalization)	(None, 10)	40
activation_257 (Activation)	(None, 10)	0
dense_343 (Dense)	(None, 2)	22
<hr/>		
Total params: 4,047		
Trainable params: 3,777		
Non-trainable params: 270		

```
Epoch 1/1000
4/4 [=====] - 1s 59ms/step - loss: 4.5999 - accuracy: 0.5476 - val_loss: 7.6413 - val_accuracy: 0.4720
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9520 - accuracy: 0.6041 - val_loss: 6.2039 - val_accuracy: 0.4673
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 3.3301 - accuracy: 0.6093 - val_loss: 4.1602 - val_accuracy: 0.4766
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9936 - accuracy: 0.5141 - val_loss: 3.3515 - val_accuracy: 0.4393
Epoch 5/1000
4/4 [=====] - 0s 12ms/step - loss: 3.0683 - accuracy: 0.5219 - val_loss: 3.0698 - val_accuracy: 0.3879
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0759 - accuracy: 0.5141 - val_loss: 2.8294 - val_accuracy: 0.3645
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0170 - accuracy: 0.5244 - val_loss: 2.6699 - val_accuracy: 0.3364
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8055 - accuracy: 0.5167 - val_loss: 2.4805 - val_accuracy: 0.3645
Epoch 9/1000
4/4 [=====] - 0s 15ms/step - loss: 2.8981 - accuracy: 0.5270 - val_loss: 2.3918 - val_accuracy: 0.3645
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7572 - accuracy: 0.5244 - val_loss: 2.3287 - val_accuracy: 0.3832
Epoch 11/1000
4/4 [=====] - 0s 16ms/step - loss: 2.6284 - accuracy: 0.5553 - val_loss: 2.2336 - val_accuracy: 0.3551
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5265 - accuracy: 0.5116 - val_loss: 2.2109 - val_accuracy: 0.3598
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5838 - accuracy: 0.5193 - val_loss: 2.1092 - val_accuracy: 0.3645
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6143 - accuracy: 0.5167 - val_loss: 2.0064 - val_accuracy: 0.3645
Epoch 15/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3595 - accuracy: 0.5116 - val_loss: 1.8913 - val_accuracy: 0.3738
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3088 - accuracy: 0.5013 - val_loss: 1.8288 - val_accuracy: 0.3692
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2065 - accuracy: 0.5039 - val_loss: 1.7919 - val_accuracy: 0.3598
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2297 - accuracy: 0.4936 - val_loss: 1.7509 - val_accuracy: 0.3598
```

```
accuracy: 0.3551
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0485 - accuracy: 0.4961 - val_loss: 1.7275 - val_accuracy: 0.3551
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9648 - accuracy: 0.5090 - val_loss: 1.6731 - val_accuracy: 0.3458
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0996 - accuracy: 0.5219 - val_loss: 1.6570 - val_accuracy: 0.3411
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9053 - accuracy: 0.5476 - val_loss: 1.6047 - val_accuracy: 0.3364
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8516 - accuracy: 0.5167 - val_loss: 1.5959 - val_accuracy: 0.3271
Epoch 24/1000
4/4 [=====] - 0s 11ms/step - loss: 1.8899 - accuracy: 0.4833 - val_loss: 1.5937 - val_accuracy: 0.3178
Epoch 25/1000
4/4 [=====] - 0s 11ms/step - loss: 1.6712 - accuracy: 0.4961 - val_loss: 1.5707 - val_accuracy: 0.3271
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7147 - accuracy: 0.4884 - val_loss: 1.5536 - val_accuracy: 0.3318
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7008 - accuracy: 0.4499 - val_loss: 1.5345 - val_accuracy: 0.3271
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6718 - accuracy: 0.4602 - val_loss: 1.5138 - val_accuracy: 0.3318
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5958 - accuracy: 0.4499 - val_loss: 1.4984 - val_accuracy: 0.3318
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5832 - accuracy: 0.4756 - val_loss: 1.4748 - val_accuracy: 0.3458
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4934 - accuracy: 0.4704 - val_loss: 1.4600 - val_accuracy: 0.3318
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4347 - accuracy: 0.4653 - val_loss: 1.4377 - val_accuracy: 0.3364
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4004 - accuracy: 0.4550 - val_loss: 1.4194 - val_accuracy: 0.3271
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5038 - accuracy: 0.4627 - val_loss: 1.4006 - val_accuracy: 0.3458
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3241 - accuracy: 0.4190 - val_loss: 1.3864 - val_accuracy: 0.3458
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3536 - accuracy: 0.4216 - val_loss: 1.3654 - val_accuracy: 0.3411
Epoch 37/1000
4/4 [=====] - 0s 15ms/step - loss: 1.3169 - accuracy: 0.4293 - val_loss: 1.3418 - val_accuracy: 0.3458
Epoch 38/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2798 - accuracy: 0.4216 - val_loss: 1.3332 - val_accuracy: 0.3271
Epoch 39/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2380 - accuracy: 0.4319 - val_loss: 1.3075 - val_accuracy: 0.3411
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2315 - accuracy: 0.4267 - val_loss: 1.2837 - val_accuracy: 0.3364
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2188 - accuracy: 0.4422 - val_loss: 1.2649 - val_accuracy: 0.3364
Epoch 42/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1757 - accuracy: 0.4833 - val_loss: 1.2409 - val_accuracy: 0.3364
Epoch 43/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1041 - accuracy: 0.5013 - val_loss: 1.2300 - val_accuracy: 0.3411
Epoch 44/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1971 - accuracy: 0.4910 - val_loss: 1.2126 - val_accuracy: 0.3458
Epoch 45/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0671 - accuracy: 0.5270 - val_loss: 1.1696 - val_accuracy: 0.3318
Epoch 46/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0937 - accuracy: 0.5501 - val_loss: 1.1579 - val_accuracy: 0.3318
Epoch 47/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0610 - accuracy: 0.5630 - val_loss: 1.1526 - val_accuracy: 0.3364
Epoch 48/1000
```

```
4/4 [=====] - 0s 11ms/step - loss: 1.0337 - accuracy: 0.4987 - val_loss: 1.1373 - val_accuracy: 0.3318
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9951 - accuracy: 0.5887 - val_loss: 1.1256 - val_accuracy: 0.3318
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0477 - accuracy: 0.5784 - val_loss: 1.0876 - val_accuracy: 0.6028
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0114 - accuracy: 0.6015 - val_loss: 1.0757 - val_accuracy: 0.6075
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9717 - accuracy: 0.6041 - val_loss: 1.0620 - val_accuracy: 0.6262
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0093 - accuracy: 0.4859 - val_loss: 1.0479 - val_accuracy: 0.6168
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0211 - accuracy: 0.4730 - val_loss: 1.0370 - val_accuracy: 0.6121
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0824 - accuracy: 0.5013 - val_loss: 1.0262 - val_accuracy: 0.6121
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9519 - accuracy: 0.5733 - val_loss: 1.0410 - val_accuracy: 0.6262
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9961 - accuracy: 0.5193 - val_loss: 0.9517 - val_accuracy: 0.6215
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8791 - accuracy: 0.6093 - val_loss: 0.9710 - val_accuracy: 0.6308
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9213 - accuracy: 0.5604 - val_loss: 0.9641 - val_accuracy: 0.6215
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0088 - accuracy: 0.4987 - val_loss: 0.9575 - val_accuracy: 0.6262
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9515 - accuracy: 0.5733 - val_loss: 0.9744 - val_accuracy: 0.6355
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0200 - accuracy: 0.5193 - val_loss: 0.9905 - val_accuracy: 0.3692
Epoch 63/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9471 - accuracy: 0.4370 - val_loss: 0.9841 - val_accuracy: 0.3785
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8905 - accuracy: 0.5527 - val_loss: 0.9809 - val_accuracy: 0.3972
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9173 - accuracy: 0.5784 - val_loss: 0.9776 - val_accuracy: 0.3832
Epoch 66/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8983 - accuracy: 0.5578 - val_loss: 0.9804 - val_accuracy: 0.3785
Epoch 67/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8617 - accuracy: 0.5553 - val_loss: 0.9784 - val_accuracy: 0.3879
Epoch 68/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8870 - accuracy: 0.5861 - val_loss: 0.9736 - val_accuracy: 0.4346
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8554 - accuracy: 0.6247 - val_loss: 0.9641 - val_accuracy: 0.3972
Epoch 70/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9298 - accuracy: 0.5887 - val_loss: 0.9844 - val_accuracy: 0.3879
Epoch 71/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8875 - accuracy: 0.6375 - val_loss: 0.9845 - val_accuracy: 0.3972
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9802 - accuracy: 0.5193 - val_loss: 0.9774 - val_accuracy: 0.4299
Epoch 73/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9022 - accuracy: 0.6710 - val_loss: 0.9761 - val_accuracy: 0.4299
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8464 - accuracy: 0.6838 - val_loss: 0.9698 - val_accuracy: 0.4299
Epoch 75/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8400 - accuracy: 0.6915 - val_loss: 0.9673 - val_accuracy: 0.4393
Epoch 76/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9622 - accuracy: 0.5861 - val_loss: 0.9963 - val_accuracy: 0.4159
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9330 - accuracy: 0.5141 - val_loss: 0.9936 - val_accuracy: 0.4159
```

Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9044 - accuracy: 0.5784 - val_loss: 0.9931 - val_accuracy: 0.4206
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8450 - accuracy: 0.5373 - val_loss: 0.9851 - val_accuracy: 0.4252
Epoch 80/1000
4/4 [=====] - 0s 11ms/step - loss: 0.9037 - accuracy: 0.5064 - val_loss: 0.9881 - val_accuracy: 0.4206
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9238 - accuracy: 0.6478 - val_loss: 0.9867 - val_accuracy: 0.4206
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8741 - accuracy: 0.6067 - val_loss: 0.9285 - val_accuracy: 0.4299
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8603 - accuracy: 0.6298 - val_loss: 0.8708 - val_accuracy: 0.4346
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8002 - accuracy: 0.5141 - val_loss: 0.8659 - val_accuracy: 0.4299
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7691 - accuracy: 0.6272 - val_loss: 0.8628 - val_accuracy: 0.4393
Epoch 86/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8581 - accuracy: 0.6581 - val_loss: 0.8433 - val_accuracy: 0.4346
Epoch 87/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7799 - accuracy: 0.7044 - val_loss: 0.8570 - val_accuracy: 0.4346
Epoch 88/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8508 - accuracy: 0.6735 - val_loss: 0.8648 - val_accuracy: 0.4393
Epoch 89/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7626 - accuracy: 0.6684 - val_loss: 0.9101 - val_accuracy: 0.4393
Epoch 90/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7584 - accuracy: 0.6478 - val_loss: 0.9134 - val_accuracy: 0.4393
Epoch 91/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6909 - accuracy: 0.7095 - val_loss: 0.9393 - val_accuracy: 0.4393
Epoch 92/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7526 - accuracy: 0.6787 - val_loss: 0.9596 - val_accuracy: 0.4393
Epoch 93/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8306 - accuracy: 0.6401 - val_loss: 0.8487 - val_accuracy: 0.4439
Epoch 94/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6597 - accuracy: 0.6041 - val_loss: 0.8607 - val_accuracy: 0.4439
Epoch 95/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6511 - accuracy: 0.6375 - val_loss: 0.8583 - val_accuracy: 0.4486
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7140 - accuracy: 0.6889 - val_loss: 0.8667 - val_accuracy: 0.4486
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6649 - accuracy: 0.6401 - val_loss: 0.8521 - val_accuracy: 0.4486
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6028 - accuracy: 0.7069 - val_loss: 0.8431 - val_accuracy: 0.4533
Epoch 99/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7439 - accuracy: 0.6658 - val_loss: 0.9033 - val_accuracy: 0.4486
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6871 - accuracy: 0.6787 - val_loss: 0.9285 - val_accuracy: 0.4486
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6785 - accuracy: 0.6478 - val_loss: 0.9040 - val_accuracy: 0.4439
Epoch 102/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6106 - accuracy: 0.6170 - val_loss: 0.8996 - val_accuracy: 0.4439
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6003 - accuracy: 0.6401 - val_loss: 0.8956 - val_accuracy: 0.4486
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5952 - accuracy: 0.6658 - val_loss: 0.8986 - val_accuracy: 0.4346
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6573 - accuracy: 0.6170 - val_loss: 0.8769 - val_accuracy: 0.4346
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6112 - accuracy: 0.6350 - val_loss: 0.8665 - val_accuracy: 0.4346
Epoch 107/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5726 - accuracy: 0.6787 - val_loss: 0.8715 - val_accuracy: 0.4346

```
accuracy: 0.4579
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6879 - accuracy: 0.5835 - val_loss: 0.8649 - val_accuracy: 0.4579
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6062 - accuracy: 0.6093 - val_loss: 0.8564 - val_accuracy: 0.4533
Epoch 110/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5912 - accuracy: 0.5913 - val_loss: 0.8232 - val_accuracy: 0.4533
Epoch 111/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5865 - accuracy: 0.5810 - val_loss: 0.8250 - val_accuracy: 0.4486
Epoch 112/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6009 - accuracy: 0.6067 - val_loss: 0.8451 - val_accuracy: 0.4533
Epoch 113/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6062 - accuracy: 0.6067 - val_loss: 0.8358 - val_accuracy: 0.4486
Epoch 114/1000
4/4 [=====] - 0s 10ms/step - loss: 0.6729 - accuracy: 0.6170 - val_loss: 0.8075 - val_accuracy: 0.4486
Epoch 115/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5130 - accuracy: 0.5681 - val_loss: 0.8023 - val_accuracy: 0.4486
Epoch 116/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5715 - accuracy: 0.6247 - val_loss: 0.8151 - val_accuracy: 0.4486
Epoch 117/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6728 - accuracy: 0.6452 - val_loss: 0.8043 - val_accuracy: 0.4486
Epoch 118/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4797 - accuracy: 0.5835 - val_loss: 0.8012 - val_accuracy: 0.4533
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5407 - accuracy: 0.6581 - val_loss: 0.7980 - val_accuracy: 0.4579
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5959 - accuracy: 0.6761 - val_loss: 0.7840 - val_accuracy: 0.4579
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4450 - accuracy: 0.6915 - val_loss: 0.7883 - val_accuracy: 0.4673
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4789 - accuracy: 0.6992 - val_loss: 0.7830 - val_accuracy: 0.4626
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4743 - accuracy: 0.6889 - val_loss: 0.7764 - val_accuracy: 0.4626
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4379 - accuracy: 0.7018 - val_loss: 0.7735 - val_accuracy: 0.4673
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4280 - accuracy: 0.6941 - val_loss: 0.7892 - val_accuracy: 0.4579
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4688 - accuracy: 0.6941 - val_loss: 0.7807 - val_accuracy: 0.4626
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4762 - accuracy: 0.7069 - val_loss: 0.7816 - val_accuracy: 0.4579
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4423 - accuracy: 0.6812 - val_loss: 0.7710 - val_accuracy: 0.4579
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4422 - accuracy: 0.6889 - val_loss: 0.8035 - val_accuracy: 0.4579
Epoch 130/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4245 - accuracy: 0.6812 - val_loss: 0.8016 - val_accuracy: 0.4579
Epoch 131/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4922 - accuracy: 0.6812 - val_loss: 0.8001 - val_accuracy: 0.4626
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4282 - accuracy: 0.6710 - val_loss: 0.8510 - val_accuracy: 0.4533
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4453 - accuracy: 0.6787 - val_loss: 0.8524 - val_accuracy: 0.4626
Epoch 134/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4283 - accuracy: 0.7044 - val_loss: 0.8277 - val_accuracy: 0.4673
Epoch 135/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4487 - accuracy: 0.6992 - val_loss: 0.7902 - val_accuracy: 0.4766
Epoch 136/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4358 - accuracy: 0.6581 - val_loss: 0.7763 - val_accuracy: 0.4720
Epoch 137/1000
```

```
4/4 [=====] - 0s 11ms/step - loss: 0.3910 - accuracy: 0.6838 - val_loss: 0.7706 - val_accuracy: 0.4720
Epoch 138/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4907 - accuracy: 0.6555 - val_loss: 0.7695 - val_accuracy: 0.4766
Epoch 139/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4414 - accuracy: 0.6710 - val_loss: 0.7534 - val_accuracy: 0.4720
Epoch 140/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3908 - accuracy: 0.6710 - val_loss: 0.7480 - val_accuracy: 0.4673
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4374 - accuracy: 0.6478 - val_loss: 0.7503 - val_accuracy: 0.4766
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4988 - accuracy: 0.6530 - val_loss: 0.7111 - val_accuracy: 0.4860
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4500 - accuracy: 0.6967 - val_loss: 0.6675 - val_accuracy: 0.4860
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4791 - accuracy: 0.7044 - val_loss: 0.6687 - val_accuracy: 0.4813
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3779 - accuracy: 0.6992 - val_loss: 0.6713 - val_accuracy: 0.4673
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4052 - accuracy: 0.6375 - val_loss: 0.6778 - val_accuracy: 0.4299
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3871 - accuracy: 0.5938 - val_loss: 0.6768 - val_accuracy: 0.4252
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4097 - accuracy: 0.5630 - val_loss: 0.7124 - val_accuracy: 0.4065
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4549 - accuracy: 0.6015 - val_loss: 0.6720 - val_accuracy: 0.4393
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4267 - accuracy: 0.5990 - val_loss: 0.7319 - val_accuracy: 0.3972
Epoch 151/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4059 - accuracy: 0.5733 - val_loss: 0.7322 - val_accuracy: 0.4065
Epoch 152/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4096 - accuracy: 0.5835 - val_loss: 0.7273 - val_accuracy: 0.4159
Epoch 153/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3674 - accuracy: 0.5887 - val_loss: 0.7308 - val_accuracy: 0.4206
Epoch 154/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3328 - accuracy: 0.5887 - val_loss: 0.6999 - val_accuracy: 0.4346
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4330 - accuracy: 0.5887 - val_loss: 0.7534 - val_accuracy: 0.4206
Epoch 156/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4167 - accuracy: 0.5424 - val_loss: 0.7262 - val_accuracy: 0.4159
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4626 - accuracy: 0.5938 - val_loss: 0.7462 - val_accuracy: 0.4766
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4091 - accuracy: 0.6684 - val_loss: 0.7956 - val_accuracy: 0.4766
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4190 - accuracy: 0.6504 - val_loss: 0.8199 - val_accuracy: 0.4766
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4270 - accuracy: 0.6530 - val_loss: 0.7601 - val_accuracy: 0.4626
Epoch 161/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3948 - accuracy: 0.6478 - val_loss: 0.7589 - val_accuracy: 0.4626
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4149 - accuracy: 0.6427 - val_loss: 0.7547 - val_accuracy: 0.4533
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3671 - accuracy: 0.6247 - val_loss: 0.8038 - val_accuracy: 0.4486
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3777 - accuracy: 0.5810 - val_loss: 0.8275 - val_accuracy: 0.4486
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3989 - accuracy: 0.6144 - val_loss: 0.8207 - val_accuracy: 0.4486
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3539 - accuracy: 0.5887 - val_loss: 0.8340 - val_accuracy: 0.4486
```

Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3412 - accuracy: 0.5758 - val_loss: 0.7970 - val_accuracy: 0.4486
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4674 - accuracy: 0.5553 - val_loss: 0.8030 - val_accuracy: 0.4626
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3884 - accuracy: 0.5553 - val_loss: 0.7319 - val_accuracy: 0.4533
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3261 - accuracy: 0.5835 - val_loss: 0.7587 - val_accuracy: 0.4720
Epoch 171/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3864 - accuracy: 0.5990 - val_loss: 0.7933 - val_accuracy: 0.4766
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4333 - accuracy: 0.6170 - val_loss: 0.7725 - val_accuracy: 0.4766
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3947 - accuracy: 0.6118 - val_loss: 0.7749 - val_accuracy: 0.4766
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3073 - accuracy: 0.6067 - val_loss: 0.8099 - val_accuracy: 0.4673
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3860 - accuracy: 0.5964 - val_loss: 0.8299 - val_accuracy: 0.4907
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4129 - accuracy: 0.5913 - val_loss: 0.8359 - val_accuracy: 0.4720
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3194 - accuracy: 0.5938 - val_loss: 0.8122 - val_accuracy: 0.4813
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2966 - accuracy: 0.5656 - val_loss: 0.7721 - val_accuracy: 0.4766
Epoch 179/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4508 - accuracy: 0.5656 - val_loss: 0.8518 - val_accuracy: 0.4579
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4052 - accuracy: 0.5578 - val_loss: 0.8161 - val_accuracy: 0.4813
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3348 - accuracy: 0.5784 - val_loss: 0.8235 - val_accuracy: 0.4766
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3627 - accuracy: 0.5887 - val_loss: 0.7834 - val_accuracy: 0.4766
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3255 - accuracy: 0.5347 - val_loss: 0.7817 - val_accuracy: 0.4673
Epoch 184/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3764 - accuracy: 0.5450 - val_loss: 0.8429 - val_accuracy: 0.4673
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4090 - accuracy: 0.5450 - val_loss: 0.9649 - val_accuracy: 0.4626
Epoch 186/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4498 - accuracy: 0.5476 - val_loss: 0.8983 - val_accuracy: 0.4486
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4619 - accuracy: 0.5630 - val_loss: 0.9515 - val_accuracy: 0.4626
Epoch 188/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3069 - accuracy: 0.5321 - val_loss: 0.9489 - val_accuracy: 0.4533
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3700 - accuracy: 0.5398 - val_loss: 0.9445 - val_accuracy: 0.4393
Epoch 190/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3325 - accuracy: 0.5373 - val_loss: 0.9166 - val_accuracy: 0.4393
Epoch 191/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2913 - accuracy: 0.5373 - val_loss: 0.9194 - val_accuracy: 0.4439
Epoch 192/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3203 - accuracy: 0.5784 - val_loss: 0.8218 - val_accuracy: 0.4439
Epoch 193/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3637 - accuracy: 0.5681 - val_loss: 0.7673 - val_accuracy: 0.4439
Epoch 194/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3617 - accuracy: 0.6247 - val_loss: 0.7715 - val_accuracy: 0.4579
Epoch 195/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3555 - accuracy: 0.6375 - val_loss: 0.7791 - val_accuracy: 0.4533
Epoch 196/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3266 - accuracy: 0.5861 - val_loss: 0.8093 - val_accuracy: 0.4533

```

accuracy: 0.4533
Epoch 197/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3141 - accuracy: 0.5707 - val_loss: 0.8085 - val_
accuracy: 0.4486
Epoch 198/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3199 - accuracy: 0.5527 - val_loss: 0.7222 - val_
accuracy: 0.4533
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3281 - accuracy: 0.5656 - val_loss: 0.6728 - val_
accuracy: 0.4673
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2882 - accuracy: 0.5604 - val_loss: 0.6719 - val_
accuracy: 0.4766
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2977 - accuracy: 0.5681 - val_loss: 0.6575 - val_
accuracy: 0.4813
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2771 - accuracy: 0.5707 - val_loss: 0.6925 - val_
accuracy: 0.4813
Epoch 203/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3224 - accuracy: 0.5681 - val_loss: 0.6671 - val_
accuracy: 0.4720
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2872 - accuracy: 0.5424 - val_loss: 0.6697 - val_
accuracy: 0.4766
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3645 - accuracy: 0.5553 - val_loss: 0.6724 - val_
accuracy: 0.4766
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2698 - accuracy: 0.5758 - val_loss: 0.6725 - val_
accuracy: 0.4766
Epoch 207/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2904 - accuracy: 0.5578 - val_loss: 0.7049 - val_
accuracy: 0.4720
Epoch 208/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4181 - accuracy: 0.5578 - val_loss: 0.7062 - val_
accuracy: 0.4720
Epoch 209/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3091 - accuracy: 0.5501 - val_loss: 0.6621 - val_
accuracy: 0.4673
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3736 - accuracy: 0.5964 - val_loss: 0.7294 - val_
accuracy: 0.4673
Epoch 211/1000
1/4 [====>.....] - ETA: 0s - loss: 0.2739 - accuracy: 0.4531Restoring model weights from th
e end of the best epoch: 61.
4/4 [=====] - 0s 16ms/step - loss: 0.3038 - accuracy: 0.5398 - val_loss: 0.7290 - val_
accuracy: 0.4579
Epoch 211: early stopping
2/2 [=====] - 0s 4ms/step - loss: 0.6943 - accuracy: 0.7674
[CV] END .....Dense1=100, Dense2=25; total time= 10.9s
Model: "sequential_86"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_344 (Dense)	(None, 100)	700
batch_normalization_258 (BatchNormalization)	(None, 100)	400
activation_258 (Activation)	(None, 100)	0
dense_345 (Dense)	(None, 25)	2525
batch_normalization_259 (BatchNormalization)	(None, 25)	100
activation_259 (Activation)	(None, 25)	0
dense_346 (Dense)	(None, 10)	260
batch_normalization_260 (BatchNormalization)	(None, 10)	40
activation_260 (Activation)	(None, 10)	0
dense_347 (Dense)	(None, 2)	22
<hr/>		

Total params: 4,047
Trainable params: 3,777
Non-trainable params: 270

Epoch 1/1000
4/4 [=====] - 1s 58ms/step - loss: 4.0347 - accuracy: 0.5141 - val_loss: 5.0142 - val_
accuracy: 0.5935
Epoch 2/1000
4/4 [=====] - 0s 15ms/step - loss: 3.0385 - accuracy: 0.5270 - val_loss: 4.6759 - val_
accuracy: 0.6028

Epoch 3/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7193 - accuracy: 0.5527 - val_loss: 3.6954 - val_accuracy: 0.6028
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3339 - accuracy: 0.5887 - val_loss: 2.8970 - val_accuracy: 0.5935
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3376 - accuracy: 0.5784 - val_loss: 2.5274 - val_accuracy: 0.6168
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0757 - accuracy: 0.5656 - val_loss: 2.4250 - val_accuracy: 0.6262
Epoch 7/1000
4/4 [=====] - 0s 15ms/step - loss: 1.8794 - accuracy: 0.5964 - val_loss: 2.3113 - val_accuracy: 0.6402
Epoch 8/1000
4/4 [=====] - 0s 15ms/step - loss: 1.8196 - accuracy: 0.6041 - val_loss: 2.2333 - val_accuracy: 0.6449
Epoch 9/1000
4/4 [=====] - 0s 15ms/step - loss: 1.6451 - accuracy: 0.5990 - val_loss: 2.1484 - val_accuracy: 0.6308
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6448 - accuracy: 0.5424 - val_loss: 2.0719 - val_accuracy: 0.6355
Epoch 11/1000
4/4 [=====] - 0s 15ms/step - loss: 1.5413 - accuracy: 0.5373 - val_loss: 2.0261 - val_accuracy: 0.6075
Epoch 12/1000
4/4 [=====] - 0s 16ms/step - loss: 1.5637 - accuracy: 0.5578 - val_loss: 1.9808 - val_accuracy: 0.5701
Epoch 13/1000
4/4 [=====] - 0s 15ms/step - loss: 1.4615 - accuracy: 0.5553 - val_loss: 1.9089 - val_accuracy: 0.5514
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3725 - accuracy: 0.5681 - val_loss: 1.8511 - val_accuracy: 0.5607
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3465 - accuracy: 0.5630 - val_loss: 1.7819 - val_accuracy: 0.5607
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2425 - accuracy: 0.5630 - val_loss: 1.7202 - val_accuracy: 0.5561
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3153 - accuracy: 0.5656 - val_loss: 1.6932 - val_accuracy: 0.5000
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2541 - accuracy: 0.5578 - val_loss: 1.6411 - val_accuracy: 0.4907
Epoch 19/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1068 - accuracy: 0.5681 - val_loss: 1.6131 - val_accuracy: 0.4766
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1472 - accuracy: 0.5758 - val_loss: 1.5858 - val_accuracy: 0.4860
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1342 - accuracy: 0.5733 - val_loss: 1.5679 - val_accuracy: 0.5000
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0971 - accuracy: 0.5527 - val_loss: 1.5397 - val_accuracy: 0.4953
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0902 - accuracy: 0.5604 - val_loss: 1.5139 - val_accuracy: 0.4953
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0645 - accuracy: 0.5784 - val_loss: 1.4578 - val_accuracy: 0.4813
Epoch 25/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9363 - accuracy: 0.5964 - val_loss: 1.4456 - val_accuracy: 0.4673
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9532 - accuracy: 0.6170 - val_loss: 1.4253 - val_accuracy: 0.4579
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9020 - accuracy: 0.6067 - val_loss: 1.4025 - val_accuracy: 0.4673
Epoch 28/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8425 - accuracy: 0.5887 - val_loss: 1.3706 - val_accuracy: 0.4533
Epoch 29/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7999 - accuracy: 0.6067 - val_loss: 1.3607 - val_accuracy: 0.4439
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7957 - accuracy: 0.6221 - val_loss: 1.3369 - val_accuracy: 0.4533
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7677 - accuracy: 0.5964 - val_loss: 1.3127 - val_accuracy: 0.4673
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7923 - accuracy: 0.6067 - val_loss: 1.3003 - val_accuracy: 0.4673

```
accuracy: 0.4626
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7482 - accuracy: 0.6324 - val_loss: 1.2809 - val_accuracy: 0.4673
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7541 - accuracy: 0.6093 - val_loss: 1.2587 - val_accuracy: 0.4486
Epoch 35/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7614 - accuracy: 0.6272 - val_loss: 1.2388 - val_accuracy: 0.4720
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7319 - accuracy: 0.5810 - val_loss: 1.2272 - val_accuracy: 0.4673
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7294 - accuracy: 0.5784 - val_loss: 1.2060 - val_accuracy: 0.4813
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7882 - accuracy: 0.6093 - val_loss: 1.1989 - val_accuracy: 0.4860
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6755 - accuracy: 0.6067 - val_loss: 1.1751 - val_accuracy: 0.4907
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7423 - accuracy: 0.6041 - val_loss: 1.1607 - val_accuracy: 0.4907
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6455 - accuracy: 0.6067 - val_loss: 1.1513 - val_accuracy: 0.4579
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7041 - accuracy: 0.5887 - val_loss: 1.1407 - val_accuracy: 0.4626
Epoch 43/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6946 - accuracy: 0.6093 - val_loss: 1.1374 - val_accuracy: 0.4953
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6081 - accuracy: 0.5913 - val_loss: 1.1255 - val_accuracy: 0.5000
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6540 - accuracy: 0.5758 - val_loss: 1.0743 - val_accuracy: 0.5327
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5909 - accuracy: 0.6093 - val_loss: 1.0370 - val_accuracy: 0.5234
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5662 - accuracy: 0.6170 - val_loss: 1.0342 - val_accuracy: 0.5234
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5860 - accuracy: 0.6144 - val_loss: 1.0503 - val_accuracy: 0.5234
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5751 - accuracy: 0.6015 - val_loss: 1.0125 - val_accuracy: 0.5093
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5665 - accuracy: 0.6015 - val_loss: 1.0576 - val_accuracy: 0.5000
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5615 - accuracy: 0.6195 - val_loss: 0.9913 - val_accuracy: 0.5327
Epoch 52/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5735 - accuracy: 0.6170 - val_loss: 0.9435 - val_accuracy: 0.4907
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5445 - accuracy: 0.6093 - val_loss: 0.9289 - val_accuracy: 0.4907
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5214 - accuracy: 0.6298 - val_loss: 0.9067 - val_accuracy: 0.4953
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5329 - accuracy: 0.6170 - val_loss: 0.9016 - val_accuracy: 0.5047
Epoch 56/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4962 - accuracy: 0.6170 - val_loss: 0.8869 - val_accuracy: 0.4907
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4126 - accuracy: 0.6093 - val_loss: 0.8942 - val_accuracy: 0.5093
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4128 - accuracy: 0.6530 - val_loss: 0.9245 - val_accuracy: 0.5000
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4450 - accuracy: 0.6478 - val_loss: 0.8801 - val_accuracy: 0.5047
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3942 - accuracy: 0.6324 - val_loss: 0.9032 - val_accuracy: 0.5187
Epoch 61/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4796 - accuracy: 0.6324 - val_loss: 0.8898 - val_accuracy: 0.4953
Epoch 62/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.4259 - accuracy: 0.6478 - val_loss: 0.8643 - val_accuracy: 0.5421
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3947 - accuracy: 0.6555 - val_loss: 0.8463 - val_accuracy: 0.5280
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3494 - accuracy: 0.6530 - val_loss: 0.8127 - val_accuracy: 0.5140
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4016 - accuracy: 0.6170 - val_loss: 0.8013 - val_accuracy: 0.5187
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3853 - accuracy: 0.6427 - val_loss: 0.7958 - val_accuracy: 0.5374
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4315 - accuracy: 0.6452 - val_loss: 0.7817 - val_accuracy: 0.5467
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3643 - accuracy: 0.6144 - val_loss: 0.7716 - val_accuracy: 0.5607
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3906 - accuracy: 0.6684 - val_loss: 0.7741 - val_accuracy: 0.5607
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3661 - accuracy: 0.6401 - val_loss: 0.7752 - val_accuracy: 0.5654
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3536 - accuracy: 0.6478 - val_loss: 0.7745 - val_accuracy: 0.5561
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3956 - accuracy: 0.6684 - val_loss: 0.7856 - val_accuracy: 0.5514
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3888 - accuracy: 0.6350 - val_loss: 0.7412 - val_accuracy: 0.5280
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4640 - accuracy: 0.6324 - val_loss: 0.7298 - val_accuracy: 0.5467
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3595 - accuracy: 0.6658 - val_loss: 0.7708 - val_accuracy: 0.5280
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3939 - accuracy: 0.6530 - val_loss: 0.8111 - val_accuracy: 0.5140
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3556 - accuracy: 0.6170 - val_loss: 0.7996 - val_accuracy: 0.5093
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3509 - accuracy: 0.5990 - val_loss: 0.7665 - val_accuracy: 0.5327
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3801 - accuracy: 0.6093 - val_loss: 0.7689 - val_accuracy: 0.5374
Epoch 80/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3927 - accuracy: 0.6684 - val_loss: 0.7188 - val_accuracy: 0.5561
Epoch 81/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3169 - accuracy: 0.6427 - val_loss: 0.7377 - val_accuracy: 0.5421
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3811 - accuracy: 0.6375 - val_loss: 0.7742 - val_accuracy: 0.5561
Epoch 83/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3713 - accuracy: 0.6452 - val_loss: 0.7680 - val_accuracy: 0.5701
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3287 - accuracy: 0.6632 - val_loss: 0.7718 - val_accuracy: 0.5280
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3061 - accuracy: 0.6581 - val_loss: 0.7610 - val_accuracy: 0.5467
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4001 - accuracy: 0.6452 - val_loss: 0.7745 - val_accuracy: 0.5607
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3764 - accuracy: 0.6350 - val_loss: 0.7611 - val_accuracy: 0.5374
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3503 - accuracy: 0.6298 - val_loss: 0.7790 - val_accuracy: 0.5187
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3597 - accuracy: 0.6941 - val_loss: 0.7501 - val_accuracy: 0.5467
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2888 - accuracy: 0.6658 - val_loss: 0.7654 - val_accuracy: 0.5093
Epoch 91/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3246 - accuracy: 0.6710 - val_loss: 0.7571 - val_accuracy: 0.5561
```

Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3243 - accuracy: 0.6684 - val_loss: 0.7469 - val_accuracy: 0.5561
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3738 - accuracy: 0.6967 - val_loss: 0.7569 - val_accuracy: 0.5514
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4261 - accuracy: 0.6555 - val_loss: 0.7075 - val_accuracy: 0.5794
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3597 - accuracy: 0.6812 - val_loss: 0.7141 - val_accuracy: 0.5701
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3593 - accuracy: 0.6555 - val_loss: 0.7256 - val_accuracy: 0.5654
Epoch 97/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3762 - accuracy: 0.6401 - val_loss: 0.7412 - val_accuracy: 0.5421
Epoch 98/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3111 - accuracy: 0.6478 - val_loss: 0.7419 - val_accuracy: 0.5421
Epoch 99/1000
4/4 [=====] - 0s 17ms/step - loss: 0.3228 - accuracy: 0.6272 - val_loss: 0.7453 - val_accuracy: 0.5561
Epoch 100/1000
4/4 [=====] - 0s 18ms/step - loss: 0.3465 - accuracy: 0.6350 - val_loss: 0.7384 - val_accuracy: 0.5794
Epoch 101/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3102 - accuracy: 0.6427 - val_loss: 0.7618 - val_accuracy: 0.6028
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3082 - accuracy: 0.6684 - val_loss: 0.7733 - val_accuracy: 0.6121
Epoch 103/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3595 - accuracy: 0.6607 - val_loss: 0.8099 - val_accuracy: 0.5981
Epoch 104/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3131 - accuracy: 0.6530 - val_loss: 0.7882 - val_accuracy: 0.5888
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2918 - accuracy: 0.6452 - val_loss: 0.8128 - val_accuracy: 0.5607
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4047 - accuracy: 0.6478 - val_loss: 0.8267 - val_accuracy: 0.5935
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2960 - accuracy: 0.6555 - val_loss: 0.7903 - val_accuracy: 0.5935
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2983 - accuracy: 0.6530 - val_loss: 0.7775 - val_accuracy: 0.5935
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2801 - accuracy: 0.6530 - val_loss: 0.7656 - val_accuracy: 0.6028
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3357 - accuracy: 0.6144 - val_loss: 0.8014 - val_accuracy: 0.6028
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3848 - accuracy: 0.6632 - val_loss: 0.8218 - val_accuracy: 0.5981
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3079 - accuracy: 0.6658 - val_loss: 0.7816 - val_accuracy: 0.6215
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2871 - accuracy: 0.6787 - val_loss: 0.7455 - val_accuracy: 0.6355
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3899 - accuracy: 0.6787 - val_loss: 0.7483 - val_accuracy: 0.6168
Epoch 115/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2973 - accuracy: 0.6992 - val_loss: 0.7497 - val_accuracy: 0.6075
Epoch 116/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2949 - accuracy: 0.6530 - val_loss: 0.8048 - val_accuracy: 0.6542
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3841 - accuracy: 0.6555 - val_loss: 0.8245 - val_accuracy: 0.6355
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2989 - accuracy: 0.6735 - val_loss: 0.8016 - val_accuracy: 0.6262
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3555 - accuracy: 0.6735 - val_loss: 0.8823 - val_accuracy: 0.6121
Epoch 120/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3435 - accuracy: 0.6658 - val_loss: 0.8876 - val_accuracy: 0.6308
Epoch 121/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3320 - accuracy: 0.6992 - val_loss: 0.8749 - val_accuracy: 0.6121

accuracy: 0.6121
Epoch 122/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3242 - accuracy: 0.6684 - val_loss: 0.8573 - val_accuracy: 0.6168
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2581 - accuracy: 0.6658 - val_loss: 0.9337 - val_accuracy: 0.5794
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3157 - accuracy: 0.6427 - val_loss: 0.9075 - val_accuracy: 0.5748
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3860 - accuracy: 0.6915 - val_loss: 0.8771 - val_accuracy: 0.5467
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3456 - accuracy: 0.7018 - val_loss: 0.9231 - val_accuracy: 0.5467
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2763 - accuracy: 0.6838 - val_loss: 0.8618 - val_accuracy: 0.5421
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3554 - accuracy: 0.6581 - val_loss: 0.9682 - val_accuracy: 0.5467
Epoch 129/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3302 - accuracy: 0.6735 - val_loss: 0.8828 - val_accuracy: 0.5514
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3533 - accuracy: 0.6812 - val_loss: 0.8533 - val_accuracy: 0.5607
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2987 - accuracy: 0.6812 - val_loss: 0.9088 - val_accuracy: 0.5654
Epoch 132/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3240 - accuracy: 0.6864 - val_loss: 0.9055 - val_accuracy: 0.6168
Epoch 133/1000
4/4 [=====] - 0s 17ms/step - loss: 0.3162 - accuracy: 0.7198 - val_loss: 0.9014 - val_accuracy: 0.5935
Epoch 134/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2798 - accuracy: 0.7095 - val_loss: 0.9074 - val_accuracy: 0.6028
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3228 - accuracy: 0.7455 - val_loss: 0.8071 - val_accuracy: 0.5981
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3337 - accuracy: 0.7172 - val_loss: 0.8083 - val_accuracy: 0.6262
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3272 - accuracy: 0.7095 - val_loss: 0.8863 - val_accuracy: 0.6168
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2818 - accuracy: 0.7224 - val_loss: 0.8179 - val_accuracy: 0.5841
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2542 - accuracy: 0.7404 - val_loss: 0.8351 - val_accuracy: 0.6121
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3521 - accuracy: 0.7018 - val_loss: 0.8620 - val_accuracy: 0.6262
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2573 - accuracy: 0.6864 - val_loss: 0.8755 - val_accuracy: 0.6262
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3323 - accuracy: 0.6684 - val_loss: 0.8676 - val_accuracy: 0.6682
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2948 - accuracy: 0.6710 - val_loss: 0.8246 - val_accuracy: 0.6402
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2963 - accuracy: 0.6812 - val_loss: 0.9332 - val_accuracy: 0.6402
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3749 - accuracy: 0.6992 - val_loss: 0.8933 - val_accuracy: 0.6682
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2943 - accuracy: 0.6735 - val_loss: 0.9180 - val_accuracy: 0.6916
Epoch 147/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3456 - accuracy: 0.6864 - val_loss: 0.9481 - val_accuracy: 0.6822
Epoch 148/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2979 - accuracy: 0.6478 - val_loss: 0.9294 - val_accuracy: 0.6869
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2938 - accuracy: 0.6838 - val_loss: 0.8674 - val_accuracy: 0.6916
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2991 - accuracy: 0.6555 - val_loss: 0.8131 - val_accuracy: 0.6963
Epoch 151/1000

```
4/4 [=====] - 0s 12ms/step - loss: 0.2950 - accuracy: 0.6735 - val_loss: 0.8024 - val_accuracy: 0.6916
Epoch 152/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2627 - accuracy: 0.6787 - val_loss: 0.7863 - val_accuracy: 0.6916
Epoch 153/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4467 - accuracy: 0.6864 - val_loss: 0.8581 - val_accuracy: 0.6869
Epoch 154/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2960 - accuracy: 0.6658 - val_loss: 0.8592 - val_accuracy: 0.6776
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3174 - accuracy: 0.6812 - val_loss: 0.8314 - val_accuracy: 0.6822
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2770 - accuracy: 0.7018 - val_loss: 0.8266 - val_accuracy: 0.6729
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3208 - accuracy: 0.7275 - val_loss: 0.7888 - val_accuracy: 0.6822
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2517 - accuracy: 0.6812 - val_loss: 0.7632 - val_accuracy: 0.6495
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2732 - accuracy: 0.7044 - val_loss: 0.9268 - val_accuracy: 0.6682
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3110 - accuracy: 0.6581 - val_loss: 0.8847 - val_accuracy: 0.6589
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2461 - accuracy: 0.6812 - val_loss: 0.8905 - val_accuracy: 0.6636
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2951 - accuracy: 0.6889 - val_loss: 0.9182 - val_accuracy: 0.6542
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3185 - accuracy: 0.7044 - val_loss: 0.8907 - val_accuracy: 0.6589
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2334 - accuracy: 0.7172 - val_loss: 1.0669 - val_accuracy: 0.6589
Epoch 165/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2369 - accuracy: 0.7429 - val_loss: 1.1046 - val_accuracy: 0.6682
Epoch 166/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2684 - accuracy: 0.6915 - val_loss: 1.0035 - val_accuracy: 0.6121
Epoch 167/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2776 - accuracy: 0.6838 - val_loss: 0.8938 - val_accuracy: 0.6215
Epoch 168/1000
4/4 [=====] - 0s 22ms/step - loss: 0.2983 - accuracy: 0.7044 - val_loss: 0.9656 - val_accuracy: 0.6168
Epoch 169/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2807 - accuracy: 0.7069 - val_loss: 0.8971 - val_accuracy: 0.6075
Epoch 170/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2566 - accuracy: 0.6710 - val_loss: 1.0336 - val_accuracy: 0.6308
Epoch 171/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2673 - accuracy: 0.6632 - val_loss: 1.0137 - val_accuracy: 0.6262
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2850 - accuracy: 0.6478 - val_loss: 0.9634 - val_accuracy: 0.6075
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3009 - accuracy: 0.6992 - val_loss: 0.9866 - val_accuracy: 0.6168
Epoch 174/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2551 - accuracy: 0.6658 - val_loss: 1.0459 - val_accuracy: 0.6402
Epoch 175/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2531 - accuracy: 0.6735 - val_loss: 0.9952 - val_accuracy: 0.6402
Epoch 176/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2333 - accuracy: 0.6838 - val_loss: 0.9888 - val_accuracy: 0.6542
Epoch 177/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2762 - accuracy: 0.7069 - val_loss: 1.0433 - val_accuracy: 0.6636
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2516 - accuracy: 0.6530 - val_loss: 1.0698 - val_accuracy: 0.6308
Epoch 179/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2472 - accuracy: 0.6581 - val_loss: 1.0707 - val_accuracy: 0.6308
Epoch 180/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2747 - accuracy: 0.6710 - val_loss: 0.9900 - val_accuracy: 0.6308
```

Epoch 181/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2489 - accuracy: 0.6864 - val_loss: 0.9458 - val_accuracy: 0.6355
Epoch 182/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2979 - accuracy: 0.6967 - val_loss: 0.9244 - val_accuracy: 0.6075
Epoch 183/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2829 - accuracy: 0.6967 - val_loss: 0.8578 - val_accuracy: 0.6075
Epoch 184/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3206 - accuracy: 0.6735 - val_loss: 0.9397 - val_accuracy: 0.6355
Epoch 185/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3216 - accuracy: 0.7069 - val_loss: 0.9505 - val_accuracy: 0.6308
Epoch 186/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2387 - accuracy: 0.6658 - val_loss: 1.0118 - val_accuracy: 0.6355
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2604 - accuracy: 0.6787 - val_loss: 0.9523 - val_accuracy: 0.6355
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2998 - accuracy: 0.6375 - val_loss: 0.9971 - val_accuracy: 0.6449
Epoch 189/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2909 - accuracy: 0.6478 - val_loss: 1.0811 - val_accuracy: 0.6215
Epoch 190/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3064 - accuracy: 0.6375 - val_loss: 1.0862 - val_accuracy: 0.6308
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2585 - accuracy: 0.6272 - val_loss: 1.2236 - val_accuracy: 0.6215
Epoch 192/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3251 - accuracy: 0.6195 - val_loss: 1.0620 - val_accuracy: 0.5981
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2988 - accuracy: 0.6170 - val_loss: 1.0196 - val_accuracy: 0.5234
Epoch 194/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3224 - accuracy: 0.6401 - val_loss: 0.9843 - val_accuracy: 0.5467
Epoch 195/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3628 - accuracy: 0.6247 - val_loss: 0.9990 - val_accuracy: 0.5514
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2322 - accuracy: 0.6195 - val_loss: 1.0589 - val_accuracy: 0.5561
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2780 - accuracy: 0.6195 - val_loss: 1.0149 - val_accuracy: 0.5561
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2627 - accuracy: 0.6298 - val_loss: 1.0322 - val_accuracy: 0.5935
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2569 - accuracy: 0.6530 - val_loss: 0.9376 - val_accuracy: 0.6028
Epoch 200/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3324 - accuracy: 0.6478 - val_loss: 0.9601 - val_accuracy: 0.5701
Epoch 201/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2769 - accuracy: 0.6632 - val_loss: 0.9881 - val_accuracy: 0.5607
Epoch 202/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2390 - accuracy: 0.6504 - val_loss: 0.9828 - val_accuracy: 0.5701
Epoch 203/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2511 - accuracy: 0.6710 - val_loss: 0.9589 - val_accuracy: 0.5981
Epoch 204/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2415 - accuracy: 0.6864 - val_loss: 1.1400 - val_accuracy: 0.5748
Epoch 205/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3034 - accuracy: 0.6530 - val_loss: 1.1309 - val_accuracy: 0.5841
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2628 - accuracy: 0.6838 - val_loss: 1.1024 - val_accuracy: 0.5748
Epoch 207/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2631 - accuracy: 0.6787 - val_loss: 1.1389 - val_accuracy: 0.5748
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2543 - accuracy: 0.6761 - val_loss: 1.1327 - val_accuracy: 0.5935
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2675 - accuracy: 0.6710 - val_loss: 1.0857 - val_accuracy: 0.6028
Epoch 210/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2762 - accuracy: 0.6710 - val_loss: 1.1124 - val_accuracy: 0.6028

```
accuracy: 0.5935
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3090 - accuracy: 0.7044 - val_loss: 1.0722 - val_accuracy: 0.6168
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3023 - accuracy: 0.7147 - val_loss: 1.1466 - val_accuracy: 0.5841
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3513 - accuracy: 0.7301 - val_loss: 1.1455 - val_accuracy: 0.5701
Epoch 214/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2840 - accuracy: 0.6941 - val_loss: 1.1472 - val_accuracy: 0.5654
Epoch 215/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2640 - accuracy: 0.6915 - val_loss: 1.0998 - val_accuracy: 0.5701
Epoch 216/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2301 - accuracy: 0.6889 - val_loss: 1.0144 - val_accuracy: 0.5374
Epoch 217/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3237 - accuracy: 0.6941 - val_loss: 1.1250 - val_accuracy: 0.5841
Epoch 218/1000
4/4 [=====] - 0s 19ms/step - loss: 0.2605 - accuracy: 0.6864 - val_loss: 1.1034 - val_accuracy: 0.5981
Epoch 219/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1908 - accuracy: 0.6787 - val_loss: 1.2181 - val_accuracy: 0.6262
Epoch 220/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2434 - accuracy: 0.6864 - val_loss: 1.1834 - val_accuracy: 0.6262
Epoch 221/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3724 - accuracy: 0.6992 - val_loss: 1.1742 - val_accuracy: 0.6308
Epoch 222/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2711 - accuracy: 0.6735 - val_loss: 1.1758 - val_accuracy: 0.6168
Epoch 223/1000
4/4 [=====] - 0s 30ms/step - loss: 0.2305 - accuracy: 0.6761 - val_loss: 1.1169 - val_accuracy: 0.6168
Epoch 224/1000
4/4 [=====] - 0s 28ms/step - loss: 0.2698 - accuracy: 0.7018 - val_loss: 1.0448 - val_accuracy: 0.6262
Epoch 225/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3333 - accuracy: 0.6787 - val_loss: 1.0254 - val_accuracy: 0.5935
Epoch 226/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2731 - accuracy: 0.6838 - val_loss: 0.9996 - val_accuracy: 0.6402
Epoch 227/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2745 - accuracy: 0.6427 - val_loss: 0.9699 - val_accuracy: 0.6355
Epoch 228/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2635 - accuracy: 0.6761 - val_loss: 0.9235 - val_accuracy: 0.6121
Epoch 229/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2066 - accuracy: 0.6812 - val_loss: 0.8914 - val_accuracy: 0.6168
Epoch 230/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2624 - accuracy: 0.6915 - val_loss: 0.9805 - val_accuracy: 0.6075
Epoch 231/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2919 - accuracy: 0.7069 - val_loss: 0.9937 - val_accuracy: 0.6168
Epoch 232/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3604 - accuracy: 0.6967 - val_loss: 1.1313 - val_accuracy: 0.6449
Epoch 233/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2785 - accuracy: 0.6812 - val_loss: 1.1015 - val_accuracy: 0.6355
Epoch 234/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2529 - accuracy: 0.6992 - val_loss: 0.9415 - val_accuracy: 0.6822
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3024 - accuracy: 0.7018 - val_loss: 0.8979 - val_accuracy: 0.6682
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2713 - accuracy: 0.6915 - val_loss: 0.9427 - val_accuracy: 0.6589
Epoch 237/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2229 - accuracy: 0.7069 - val_loss: 0.9426 - val_accuracy: 0.6682
Epoch 238/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2642 - accuracy: 0.7532 - val_loss: 0.9211 - val_accuracy: 0.6916
Epoch 239/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2388 - accuracy: 0.7455 - val_loss: 1.0030 - val_accuracy: 0.6869
Epoch 240/1000
```

```
4/4 [=====] - 0s 15ms/step - loss: 0.2439 - accuracy: 0.7121 - val_loss: 1.0410 - val_accuracy: 0.7103
Epoch 241/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3448 - accuracy: 0.7044 - val_loss: 1.1744 - val_accuracy: 0.7150
Epoch 242/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2684 - accuracy: 0.7249 - val_loss: 1.3674 - val_accuracy: 0.7103
Epoch 243/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3239 - accuracy: 0.7044 - val_loss: 1.3348 - val_accuracy: 0.7009
Epoch 244/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2571 - accuracy: 0.7069 - val_loss: 1.2619 - val_accuracy: 0.7009
Epoch 245/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3636 - accuracy: 0.7121 - val_loss: 1.1702 - val_accuracy: 0.6822
Epoch 246/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2793 - accuracy: 0.7069 - val_loss: 1.2499 - val_accuracy: 0.7009
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1920 - accuracy: 0.7044 - val_loss: 1.3476 - val_accuracy: 0.7056
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2343 - accuracy: 0.7275 - val_loss: 1.3508 - val_accuracy: 0.7103
Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2742 - accuracy: 0.7249 - val_loss: 1.3251 - val_accuracy: 0.7056
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2188 - accuracy: 0.7326 - val_loss: 1.3474 - val_accuracy: 0.6916
Epoch 251/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2909 - accuracy: 0.7224 - val_loss: 1.1896 - val_accuracy: 0.6963
Epoch 252/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2183 - accuracy: 0.7326 - val_loss: 1.2071 - val_accuracy: 0.7523
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3028 - accuracy: 0.6864 - val_loss: 1.2186 - val_accuracy: 0.7196
Epoch 254/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2709 - accuracy: 0.7249 - val_loss: 1.4534 - val_accuracy: 0.7523
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2259 - accuracy: 0.7147 - val_loss: 1.5419 - val_accuracy: 0.7523
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2383 - accuracy: 0.7609 - val_loss: 1.4626 - val_accuracy: 0.7336
Epoch 257/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1876 - accuracy: 0.7481 - val_loss: 1.4103 - val_accuracy: 0.7336
Epoch 258/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2094 - accuracy: 0.7455 - val_loss: 1.4326 - val_accuracy: 0.7196
Epoch 259/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1908 - accuracy: 0.7429 - val_loss: 1.4124 - val_accuracy: 0.7196
Epoch 260/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2068 - accuracy: 0.7198 - val_loss: 1.4110 - val_accuracy: 0.6822
Epoch 261/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2358 - accuracy: 0.7224 - val_loss: 1.3065 - val_accuracy: 0.7056
Epoch 262/1000
4/4 [=====] - 0s 18ms/step - loss: 0.2669 - accuracy: 0.7301 - val_loss: 1.3380 - val_accuracy: 0.7150
Epoch 263/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2358 - accuracy: 0.7455 - val_loss: 1.2100 - val_accuracy: 0.7056
Epoch 264/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1863 - accuracy: 0.7326 - val_loss: 1.2427 - val_accuracy: 0.6963
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2801 - accuracy: 0.7455 - val_loss: 1.2326 - val_accuracy: 0.6495
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2225 - accuracy: 0.7506 - val_loss: 1.3186 - val_accuracy: 0.6776
Epoch 267/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2039 - accuracy: 0.7609 - val_loss: 1.2872 - val_accuracy: 0.6776
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2512 - accuracy: 0.7275 - val_loss: 1.2732 - val_accuracy: 0.6682
Epoch 269/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2210 - accuracy: 0.7249 - val_loss: 1.2437 - val_accuracy: 0.6916
```

Epoch 270/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2429 - accuracy: 0.7584 - val_loss: 1.3046 - val_accuracy: 0.6869
Epoch 271/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4041 - accuracy: 0.7249 - val_loss: 1.2794 - val_accuracy: 0.6963
Epoch 272/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3115 - accuracy: 0.7661 - val_loss: 1.3826 - val_accuracy: 0.6682
Epoch 273/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2756 - accuracy: 0.6889 - val_loss: 1.3606 - val_accuracy: 0.6776
Epoch 274/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2152 - accuracy: 0.7018 - val_loss: 1.2637 - val_accuracy: 0.6729
Epoch 275/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2192 - accuracy: 0.7095 - val_loss: 1.1938 - val_accuracy: 0.6542
Epoch 276/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1981 - accuracy: 0.7609 - val_loss: 1.2297 - val_accuracy: 0.6729
Epoch 277/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2285 - accuracy: 0.7686 - val_loss: 1.1811 - val_accuracy: 0.6636
Epoch 278/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2480 - accuracy: 0.7378 - val_loss: 1.1812 - val_accuracy: 0.6262
Epoch 279/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2387 - accuracy: 0.7712 - val_loss: 1.2539 - val_accuracy: 0.6495
Epoch 280/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2059 - accuracy: 0.7481 - val_loss: 1.2033 - val_accuracy: 0.6682
Epoch 281/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2643 - accuracy: 0.7326 - val_loss: 1.3327 - val_accuracy: 0.7290
Epoch 282/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2213 - accuracy: 0.7198 - val_loss: 1.4284 - val_accuracy: 0.7430
Epoch 283/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2867 - accuracy: 0.7224 - val_loss: 1.4301 - val_accuracy: 0.7477
Epoch 284/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2191 - accuracy: 0.7044 - val_loss: 1.5249 - val_accuracy: 0.7430
Epoch 285/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2957 - accuracy: 0.7044 - val_loss: 1.3956 - val_accuracy: 0.7570
Epoch 286/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2145 - accuracy: 0.6992 - val_loss: 1.4137 - val_accuracy: 0.7383
Epoch 287/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2372 - accuracy: 0.7455 - val_loss: 1.3893 - val_accuracy: 0.7430
Epoch 288/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1836 - accuracy: 0.6941 - val_loss: 1.4214 - val_accuracy: 0.7430
Epoch 289/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2529 - accuracy: 0.6992 - val_loss: 1.4081 - val_accuracy: 0.7383
Epoch 290/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1863 - accuracy: 0.7378 - val_loss: 1.4069 - val_accuracy: 0.7383
Epoch 291/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1873 - accuracy: 0.6941 - val_loss: 1.3149 - val_accuracy: 0.7336
Epoch 292/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3958 - accuracy: 0.7506 - val_loss: 1.3484 - val_accuracy: 0.7336
Epoch 293/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2230 - accuracy: 0.7198 - val_loss: 1.4023 - val_accuracy: 0.7336
Epoch 294/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1932 - accuracy: 0.7198 - val_loss: 1.4577 - val_accuracy: 0.7243
Epoch 295/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1790 - accuracy: 0.6915 - val_loss: 1.6316 - val_accuracy: 0.7430
Epoch 296/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2109 - accuracy: 0.7095 - val_loss: 1.3472 - val_accuracy: 0.7290
Epoch 297/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2133 - accuracy: 0.7378 - val_loss: 1.5753 - val_accuracy: 0.7523
Epoch 298/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2577 - accuracy: 0.7224 - val_loss: 1.5204 - val_accuracy: 0.7383
Epoch 299/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1976 - accuracy: 0.6658 - val_loss: 1.5397 - val_accuracy: 0.6869

```
accuracy: 0.7430
Epoch 300/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1884 - accuracy: 0.7069 - val_loss: 1.5254 - val_
accuracy: 0.7570
Epoch 301/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2708 - accuracy: 0.7249 - val_loss: 1.4951 - val_
accuracy: 0.7336
Epoch 302/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2606 - accuracy: 0.7172 - val_loss: 1.4405 - val_
accuracy: 0.7383
Epoch 303/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2579 - accuracy: 0.7506 - val_loss: 1.4389 - val_
accuracy: 0.7150
Epoch 304/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2156 - accuracy: 0.7532 - val_loss: 1.4453 - val_
accuracy: 0.7196
Epoch 305/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2170 - accuracy: 0.7532 - val_loss: 1.4123 - val_
accuracy: 0.7150
Epoch 306/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1907 - accuracy: 0.7455 - val_loss: 1.3555 - val_
accuracy: 0.7383
Epoch 307/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2296 - accuracy: 0.7506 - val_loss: 1.3062 - val_
accuracy: 0.7336
Epoch 308/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2021 - accuracy: 0.7429 - val_loss: 1.2802 - val_
accuracy: 0.6916
Epoch 309/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1866 - accuracy: 0.7455 - val_loss: 1.3527 - val_
accuracy: 0.6869
Epoch 310/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2585 - accuracy: 0.7326 - val_loss: 1.4707 - val_
accuracy: 0.7103
Epoch 311/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1848 - accuracy: 0.7918 - val_loss: 1.5175 - val_
accuracy: 0.7150
Epoch 312/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2239 - accuracy: 0.7969 - val_loss: 1.4374 - val_
accuracy: 0.7243
Epoch 313/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2475 - accuracy: 0.7738 - val_loss: 1.5089 - val_
accuracy: 0.7150
Epoch 314/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2486 - accuracy: 0.7661 - val_loss: 1.5004 - val_
accuracy: 0.6963
Epoch 315/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2466 - accuracy: 0.7789 - val_loss: 1.3941 - val_
accuracy: 0.7196
Epoch 316/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2544 - accuracy: 0.7789 - val_loss: 1.5012 - val_
accuracy: 0.7103
Epoch 317/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2157 - accuracy: 0.7686 - val_loss: 1.4605 - val_
accuracy: 0.7383
Epoch 318/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2288 - accuracy: 0.7815 - val_loss: 1.4834 - val_
accuracy: 0.7383
Epoch 319/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2337 - accuracy: 0.7943 - val_loss: 1.3292 - val_
accuracy: 0.7290
Epoch 320/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2371 - accuracy: 0.7841 - val_loss: 1.4419 - val_
accuracy: 0.7196
Epoch 321/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2151 - accuracy: 0.7892 - val_loss: 1.3396 - val_
accuracy: 0.7196
Epoch 322/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1934 - accuracy: 0.7866 - val_loss: 1.4881 - val_
accuracy: 0.7150
Epoch 323/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2689 - accuracy: 0.7686 - val_loss: 1.5614 - val_
accuracy: 0.6963
Epoch 324/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2194 - accuracy: 0.7763 - val_loss: 1.5477 - val_
accuracy: 0.7103
Epoch 325/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2332 - accuracy: 0.7661 - val_loss: 1.5478 - val_
accuracy: 0.7056
Epoch 326/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2699 - accuracy: 0.7841 - val_loss: 1.5377 - val_
accuracy: 0.7009
Epoch 327/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3027 - accuracy: 0.7738 - val_loss: 1.4673 - val_
accuracy: 0.6869
Epoch 328/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2064 - accuracy: 0.7506 - val_loss: 1.4995 - val_
accuracy: 0.7009
Epoch 329/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.2410 - accuracy: 0.7558 - val_loss: 1.5716 - val_accuracy: 0.7196
Epoch 330/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2935 - accuracy: 0.7686 - val_loss: 1.5690 - val_accuracy: 0.7430
Epoch 331/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2057 - accuracy: 0.7763 - val_loss: 1.5352 - val_accuracy: 0.7243
Epoch 332/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2546 - accuracy: 0.7789 - val_loss: 1.4809 - val_accuracy: 0.7383
Epoch 333/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2362 - accuracy: 0.7841 - val_loss: 1.4692 - val_accuracy: 0.7103
Epoch 334/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1765 - accuracy: 0.7532 - val_loss: 1.4885 - val_accuracy: 0.7243
Epoch 335/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1645 - accuracy: 0.7506 - val_loss: 1.6338 - val_accuracy: 0.7243
Epoch 336/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2243 - accuracy: 0.7249 - val_loss: 1.4936 - val_accuracy: 0.7150
Epoch 337/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2578 - accuracy: 0.7738 - val_loss: 1.4553 - val_accuracy: 0.6869
Epoch 338/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2001 - accuracy: 0.7532 - val_loss: 1.4801 - val_accuracy: 0.6822
Epoch 339/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1910 - accuracy: 0.7455 - val_loss: 1.4759 - val_accuracy: 0.6963
Epoch 340/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3800 - accuracy: 0.7326 - val_loss: 1.4509 - val_accuracy: 0.7009
Epoch 341/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2619 - accuracy: 0.7506 - val_loss: 1.4540 - val_accuracy: 0.7009
Epoch 342/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2329 - accuracy: 0.7018 - val_loss: 1.4200 - val_accuracy: 0.7056
Epoch 343/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2147 - accuracy: 0.6915 - val_loss: 1.4213 - val_accuracy: 0.7196
Epoch 344/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2497 - accuracy: 0.6992 - val_loss: 1.4398 - val_accuracy: 0.6822
Epoch 345/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2538 - accuracy: 0.7147 - val_loss: 1.4129 - val_accuracy: 0.6729
Epoch 346/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2397 - accuracy: 0.6967 - val_loss: 1.4514 - val_accuracy: 0.6916
Epoch 347/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2382 - accuracy: 0.6787 - val_loss: 1.4408 - val_accuracy: 0.6916
Epoch 348/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2096 - accuracy: 0.6761 - val_loss: 1.4611 - val_accuracy: 0.6729
Epoch 349/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2351 - accuracy: 0.6581 - val_loss: 1.4524 - val_accuracy: 0.6729
Epoch 350/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1952 - accuracy: 0.6607 - val_loss: 1.4139 - val_accuracy: 0.7009
Epoch 351/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2186 - accuracy: 0.6761 - val_loss: 1.4842 - val_accuracy: 0.7009
Epoch 352/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2320 - accuracy: 0.6889 - val_loss: 1.5771 - val_accuracy: 0.7103
Epoch 353/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3403 - accuracy: 0.6632 - val_loss: 1.6109 - val_accuracy: 0.7196
Epoch 354/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2272 - accuracy: 0.6941 - val_loss: 1.4651 - val_accuracy: 0.7056
Epoch 355/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1890 - accuracy: 0.6915 - val_loss: 1.6161 - val_accuracy: 0.7056
Epoch 356/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1673 - accuracy: 0.6838 - val_loss: 1.5500 - val_accuracy: 0.7243
Epoch 357/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2385 - accuracy: 0.6967 - val_loss: 1.6573 - val_accuracy: 0.7056
Epoch 358/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2490 - accuracy: 0.6735 - val_loss: 1.6799 - val_accuracy: 0.6963
```

Epoch 359/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3249 - accuracy: 0.6684 - val_loss: 1.6502 - val_accuracy: 0.6776
Epoch 360/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1901 - accuracy: 0.6787 - val_loss: 1.5463 - val_accuracy: 0.7056
Epoch 361/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1726 - accuracy: 0.7198 - val_loss: 1.5527 - val_accuracy: 0.7009
Epoch 362/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1800 - accuracy: 0.6992 - val_loss: 1.5995 - val_accuracy: 0.7383
Epoch 363/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2543 - accuracy: 0.7044 - val_loss: 1.5186 - val_accuracy: 0.7336
Epoch 364/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2964 - accuracy: 0.7326 - val_loss: 1.6037 - val_accuracy: 0.7150
Epoch 365/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3143 - accuracy: 0.6992 - val_loss: 1.6377 - val_accuracy: 0.7336
Epoch 366/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2018 - accuracy: 0.7069 - val_loss: 1.7033 - val_accuracy: 0.7430
Epoch 367/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3066 - accuracy: 0.6967 - val_loss: 1.6545 - val_accuracy: 0.7664
Epoch 368/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2861 - accuracy: 0.7018 - val_loss: 1.6624 - val_accuracy: 0.7617
Epoch 369/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1847 - accuracy: 0.6889 - val_loss: 1.8255 - val_accuracy: 0.7617
Epoch 370/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2723 - accuracy: 0.7121 - val_loss: 1.7347 - val_accuracy: 0.7336
Epoch 371/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3083 - accuracy: 0.7095 - val_loss: 1.8059 - val_accuracy: 0.7664
Epoch 372/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2831 - accuracy: 0.6812 - val_loss: 1.6482 - val_accuracy: 0.7430
Epoch 373/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2336 - accuracy: 0.6967 - val_loss: 1.6501 - val_accuracy: 0.7336
Epoch 374/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2219 - accuracy: 0.7147 - val_loss: 1.5201 - val_accuracy: 0.7103
Epoch 375/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2984 - accuracy: 0.7069 - val_loss: 1.4083 - val_accuracy: 0.7290
Epoch 376/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2640 - accuracy: 0.7275 - val_loss: 1.4057 - val_accuracy: 0.7243
Epoch 377/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2043 - accuracy: 0.7404 - val_loss: 1.4879 - val_accuracy: 0.7430
Epoch 378/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2092 - accuracy: 0.7712 - val_loss: 1.5541 - val_accuracy: 0.7570
Epoch 379/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2973 - accuracy: 0.7481 - val_loss: 1.5651 - val_accuracy: 0.7710
Epoch 380/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1633 - accuracy: 0.7995 - val_loss: 1.5920 - val_accuracy: 0.7710
Epoch 381/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2210 - accuracy: 0.7506 - val_loss: 1.5686 - val_accuracy: 0.7617
Epoch 382/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1558 - accuracy: 0.7841 - val_loss: 1.5312 - val_accuracy: 0.7196
Epoch 383/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2119 - accuracy: 0.7686 - val_loss: 1.5329 - val_accuracy: 0.7383
Epoch 384/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2191 - accuracy: 0.7815 - val_loss: 1.5277 - val_accuracy: 0.7523
Epoch 385/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1541 - accuracy: 0.7789 - val_loss: 1.5754 - val_accuracy: 0.7430
Epoch 386/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1641 - accuracy: 0.7789 - val_loss: 1.5620 - val_accuracy: 0.7103
Epoch 387/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1747 - accuracy: 0.7789 - val_loss: 1.6069 - val_accuracy: 0.6916
Epoch 388/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2142 - accuracy: 0.7738 - val_loss: 1.6516 - val_accuracy: 0.7103

```
accuracy: 0.6636
Epoch 389/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1872 - accuracy: 0.7712 - val_loss: 1.6266 - val_accuracy: 0.6636
Epoch 390/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2007 - accuracy: 0.7506 - val_loss: 1.5471 - val_accuracy: 0.6682
Epoch 391/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2111 - accuracy: 0.7661 - val_loss: 1.6907 - val_accuracy: 0.6869
Epoch 392/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2060 - accuracy: 0.7635 - val_loss: 1.7163 - val_accuracy: 0.7009
Epoch 393/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2147 - accuracy: 0.7943 - val_loss: 1.8357 - val_accuracy: 0.7009
Epoch 394/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1585 - accuracy: 0.7969 - val_loss: 1.8504 - val_accuracy: 0.7103
Epoch 395/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2376 - accuracy: 0.7841 - val_loss: 1.8672 - val_accuracy: 0.7150
Epoch 396/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1521 - accuracy: 0.7995 - val_loss: 1.8649 - val_accuracy: 0.6963
Epoch 397/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1921 - accuracy: 0.8226 - val_loss: 1.8558 - val_accuracy: 0.6963
Epoch 398/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2426 - accuracy: 0.7609 - val_loss: 1.8684 - val_accuracy: 0.7150
Epoch 399/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1906 - accuracy: 0.7995 - val_loss: 1.8173 - val_accuracy: 0.7103
Epoch 400/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2312 - accuracy: 0.7789 - val_loss: 1.7322 - val_accuracy: 0.7056
Epoch 401/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2020 - accuracy: 0.7918 - val_loss: 1.7699 - val_accuracy: 0.7196
Epoch 402/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2229 - accuracy: 0.8175 - val_loss: 1.7652 - val_accuracy: 0.7196
Epoch 403/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2115 - accuracy: 0.7995 - val_loss: 1.6883 - val_accuracy: 0.7243
Epoch 404/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2203 - accuracy: 0.7969 - val_loss: 1.7200 - val_accuracy: 0.7523
Epoch 405/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2402 - accuracy: 0.8072 - val_loss: 1.7051 - val_accuracy: 0.7243
Epoch 406/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1889 - accuracy: 0.8252 - val_loss: 1.7373 - val_accuracy: 0.7290
Epoch 407/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2622 - accuracy: 0.8098 - val_loss: 1.7244 - val_accuracy: 0.7336
Epoch 408/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2431 - accuracy: 0.8175 - val_loss: 1.6497 - val_accuracy: 0.7243
Epoch 409/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2151 - accuracy: 0.8278 - val_loss: 1.7688 - val_accuracy: 0.7196
Epoch 410/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1737 - accuracy: 0.7995 - val_loss: 1.8187 - val_accuracy: 0.7290
Epoch 411/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1818 - accuracy: 0.8046 - val_loss: 1.8147 - val_accuracy: 0.7336
Epoch 412/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1997 - accuracy: 0.8021 - val_loss: 1.8061 - val_accuracy: 0.7523
Epoch 413/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3382 - accuracy: 0.7866 - val_loss: 1.8754 - val_accuracy: 0.7664
Epoch 414/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2979 - accuracy: 0.8072 - val_loss: 1.9184 - val_accuracy: 0.7617
Epoch 415/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2259 - accuracy: 0.8046 - val_loss: 1.8342 - val_accuracy: 0.7617
Epoch 416/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1598 - accuracy: 0.8123 - val_loss: 1.8048 - val_accuracy: 0.7617
Epoch 417/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2343 - accuracy: 0.8123 - val_loss: 1.8319 - val_accuracy: 0.7383
Epoch 418/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 0.1602 - accuracy: 0.8278 - val_loss: 1.7679 - val_accuracy: 0.7150
Epoch 419/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2421 - accuracy: 0.8123 - val_loss: 1.7710 - val_accuracy: 0.7009
Epoch 420/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1946 - accuracy: 0.8329 - val_loss: 1.8582 - val_accuracy: 0.7430
Epoch 421/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1650 - accuracy: 0.8201 - val_loss: 1.7477 - val_accuracy: 0.7383
Epoch 422/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2472 - accuracy: 0.8201 - val_loss: 1.5973 - val_accuracy: 0.7196
Epoch 423/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2045 - accuracy: 0.7892 - val_loss: 1.7662 - val_accuracy: 0.7103
Epoch 424/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2014 - accuracy: 0.8098 - val_loss: 1.6275 - val_accuracy: 0.7150
Epoch 425/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2581 - accuracy: 0.7995 - val_loss: 1.6457 - val_accuracy: 0.7243
Epoch 426/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3345 - accuracy: 0.8149 - val_loss: 1.7668 - val_accuracy: 0.7523
Epoch 427/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1744 - accuracy: 0.8303 - val_loss: 1.6942 - val_accuracy: 0.7336
Epoch 428/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2558 - accuracy: 0.8278 - val_loss: 1.6537 - val_accuracy: 0.7383
Epoch 429/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2345 - accuracy: 0.8149 - val_loss: 1.5517 - val_accuracy: 0.7383
Epoch 430/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2128 - accuracy: 0.8046 - val_loss: 1.5590 - val_accuracy: 0.7430
Epoch 431/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3338 - accuracy: 0.8046 - val_loss: 1.5114 - val_accuracy: 0.7523
Epoch 432/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2155 - accuracy: 0.8252 - val_loss: 1.5701 - val_accuracy: 0.7523
Epoch 433/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2178 - accuracy: 0.8175 - val_loss: 1.5859 - val_accuracy: 0.7430
Epoch 434/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2618 - accuracy: 0.7866 - val_loss: 1.6807 - val_accuracy: 0.7617
Epoch 435/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1612 - accuracy: 0.8123 - val_loss: 1.6575 - val_accuracy: 0.7523
Epoch 436/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2029 - accuracy: 0.8278 - val_loss: 1.6837 - val_accuracy: 0.7523
Epoch 437/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1710 - accuracy: 0.7892 - val_loss: 1.6606 - val_accuracy: 0.7570
Epoch 438/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1900 - accuracy: 0.8098 - val_loss: 1.6260 - val_accuracy: 0.7617
Epoch 439/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2203 - accuracy: 0.7892 - val_loss: 1.6587 - val_accuracy: 0.7664
Epoch 440/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2799 - accuracy: 0.7609 - val_loss: 1.7784 - val_accuracy: 0.7664
Epoch 441/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1717 - accuracy: 0.8072 - val_loss: 1.7917 - val_accuracy: 0.7617
Epoch 442/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2244 - accuracy: 0.8098 - val_loss: 1.7653 - val_accuracy: 0.7710
Epoch 443/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1725 - accuracy: 0.7943 - val_loss: 1.7315 - val_accuracy: 0.7430
Epoch 444/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1958 - accuracy: 0.7789 - val_loss: 1.7286 - val_accuracy: 0.7570
Epoch 445/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2343 - accuracy: 0.7918 - val_loss: 1.6933 - val_accuracy: 0.7477
Epoch 446/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1535 - accuracy: 0.8201 - val_loss: 1.6736 - val_accuracy: 0.7617
Epoch 447/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1736 - accuracy: 0.7995 - val_loss: 1.6787 - val_accuracy: 0.7570
```

Epoch 448/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2171 - accuracy: 0.8201 - val_loss: 1.6891 - val_accuracy: 0.7430
Epoch 449/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1988 - accuracy: 0.8072 - val_loss: 1.7731 - val_accuracy: 0.7757
Epoch 450/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1695 - accuracy: 0.7892 - val_loss: 1.6834 - val_accuracy: 0.7570
Epoch 451/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2646 - accuracy: 0.8149 - val_loss: 1.6589 - val_accuracy: 0.7336
Epoch 452/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2692 - accuracy: 0.7866 - val_loss: 1.6300 - val_accuracy: 0.7710
Epoch 453/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2395 - accuracy: 0.7866 - val_loss: 1.5525 - val_accuracy: 0.7383
Epoch 454/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1428 - accuracy: 0.8072 - val_loss: 1.6002 - val_accuracy: 0.7430
Epoch 455/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2454 - accuracy: 0.7969 - val_loss: 1.6328 - val_accuracy: 0.7150
Epoch 456/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1908 - accuracy: 0.7918 - val_loss: 1.6041 - val_accuracy: 0.7056
Epoch 457/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1721 - accuracy: 0.7918 - val_loss: 1.7167 - val_accuracy: 0.7336
Epoch 458/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2956 - accuracy: 0.7609 - val_loss: 1.6919 - val_accuracy: 0.7243
Epoch 459/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2259 - accuracy: 0.7429 - val_loss: 1.9221 - val_accuracy: 0.7477
Epoch 460/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2234 - accuracy: 0.8021 - val_loss: 1.7986 - val_accuracy: 0.7617
Epoch 461/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3439 - accuracy: 0.7892 - val_loss: 1.7461 - val_accuracy: 0.7150
Epoch 462/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2218 - accuracy: 0.7789 - val_loss: 1.8550 - val_accuracy: 0.7523
Epoch 463/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2441 - accuracy: 0.7892 - val_loss: 1.8206 - val_accuracy: 0.7430
Epoch 464/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2127 - accuracy: 0.7815 - val_loss: 1.7687 - val_accuracy: 0.7617
Epoch 465/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2103 - accuracy: 0.7763 - val_loss: 1.9162 - val_accuracy: 0.7710
Epoch 466/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2456 - accuracy: 0.8046 - val_loss: 1.6934 - val_accuracy: 0.7523
Epoch 467/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1719 - accuracy: 0.8046 - val_loss: 1.7877 - val_accuracy: 0.7290
Epoch 468/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2123 - accuracy: 0.8123 - val_loss: 1.6043 - val_accuracy: 0.7290
Epoch 469/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1576 - accuracy: 0.8098 - val_loss: 1.5671 - val_accuracy: 0.7290
Epoch 470/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1419 - accuracy: 0.8098 - val_loss: 1.6618 - val_accuracy: 0.7430
Epoch 471/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1520 - accuracy: 0.7943 - val_loss: 1.6196 - val_accuracy: 0.7383
Epoch 472/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1610 - accuracy: 0.8355 - val_loss: 1.6628 - val_accuracy: 0.7336
Epoch 473/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3028 - accuracy: 0.7943 - val_loss: 1.6211 - val_accuracy: 0.7477
Epoch 474/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3217 - accuracy: 0.7841 - val_loss: 1.5575 - val_accuracy: 0.7523
Epoch 475/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2618 - accuracy: 0.8175 - val_loss: 1.8351 - val_accuracy: 0.7617
Epoch 476/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2378 - accuracy: 0.7815 - val_loss: 1.7578 - val_accuracy: 0.7570
Epoch 477/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2775 - accuracy: 0.7943 - val_loss: 1.7212 - val_accuracy: 0.7617

```
accuracy: 0.7710
Epoch 478/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2117 - accuracy: 0.8046 - val_loss: 1.6499 - val_
accuracy: 0.7617
Epoch 479/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3025 - accuracy: 0.7943 - val_loss: 1.6052 - val_
accuracy: 0.7664
Epoch 480/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1787 - accuracy: 0.7995 - val_loss: 1.6920 - val_
accuracy: 0.7570
Epoch 481/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1366 - accuracy: 0.7789 - val_loss: 1.6832 - val_
accuracy: 0.7570
Epoch 482/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2624 - accuracy: 0.7584 - val_loss: 1.8014 - val_
accuracy: 0.7430
Epoch 483/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2449 - accuracy: 0.8175 - val_loss: 1.6603 - val_
accuracy: 0.7523
Epoch 484/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2480 - accuracy: 0.8329 - val_loss: 1.8210 - val_
accuracy: 0.7710
Epoch 485/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2839 - accuracy: 0.7892 - val_loss: 1.7677 - val_
accuracy: 0.7477
Epoch 486/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1733 - accuracy: 0.8021 - val_loss: 1.7117 - val_
accuracy: 0.7523
Epoch 487/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1773 - accuracy: 0.7969 - val_loss: 1.7036 - val_
accuracy: 0.7430
Epoch 488/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2686 - accuracy: 0.8149 - val_loss: 1.7605 - val_
accuracy: 0.7617
Epoch 489/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2067 - accuracy: 0.8175 - val_loss: 1.5319 - val_
accuracy: 0.7477
Epoch 490/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1594 - accuracy: 0.8046 - val_loss: 1.7398 - val_
accuracy: 0.7243
Epoch 491/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2322 - accuracy: 0.7763 - val_loss: 1.6530 - val_
accuracy: 0.7570
Epoch 492/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2620 - accuracy: 0.8303 - val_loss: 1.7503 - val_
accuracy: 0.7617
Epoch 493/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1584 - accuracy: 0.8149 - val_loss: 1.7982 - val_
accuracy: 0.7757
Epoch 494/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3124 - accuracy: 0.8072 - val_loss: 1.9084 - val_
accuracy: 0.7850
Epoch 495/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2171 - accuracy: 0.8278 - val_loss: 1.8327 - val_
accuracy: 0.7710
Epoch 496/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2102 - accuracy: 0.8226 - val_loss: 1.9093 - val_
accuracy: 0.7383
Epoch 497/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2321 - accuracy: 0.7841 - val_loss: 1.8459 - val_
accuracy: 0.7523
Epoch 498/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1631 - accuracy: 0.7892 - val_loss: 1.8413 - val_
accuracy: 0.7757
Epoch 499/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2125 - accuracy: 0.8072 - val_loss: 1.8096 - val_
accuracy: 0.7477
Epoch 500/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1842 - accuracy: 0.8303 - val_loss: 1.8010 - val_
accuracy: 0.7664
Epoch 501/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2957 - accuracy: 0.7943 - val_loss: 1.8620 - val_
accuracy: 0.7664
Epoch 502/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2591 - accuracy: 0.7815 - val_loss: 1.7463 - val_
accuracy: 0.7477
Epoch 503/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1537 - accuracy: 0.7918 - val_loss: 1.8179 - val_
accuracy: 0.7523
Epoch 504/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2361 - accuracy: 0.7969 - val_loss: 1.7191 - val_
accuracy: 0.7243
Epoch 505/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2201 - accuracy: 0.8303 - val_loss: 1.7076 - val_
accuracy: 0.7430
Epoch 506/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2281 - accuracy: 0.8226 - val_loss: 1.8546 - val_
accuracy: 0.7477
Epoch 507/1000
```

```
4/4 [=====] - 0s 11ms/step - loss: 0.1623 - accuracy: 0.8021 - val_loss: 1.7953 - val_accuracy: 0.7336
Epoch 508/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1919 - accuracy: 0.7866 - val_loss: 1.9264 - val_accuracy: 0.7243
Epoch 509/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2130 - accuracy: 0.7892 - val_loss: 1.9499 - val_accuracy: 0.7290
Epoch 510/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1670 - accuracy: 0.8123 - val_loss: 2.0346 - val_accuracy: 0.7617
Epoch 511/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2384 - accuracy: 0.8252 - val_loss: 1.8384 - val_accuracy: 0.7056
Epoch 512/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1971 - accuracy: 0.8072 - val_loss: 1.8469 - val_accuracy: 0.7103
Epoch 513/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1650 - accuracy: 0.8252 - val_loss: 1.8481 - val_accuracy: 0.7243
Epoch 514/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2113 - accuracy: 0.8226 - val_loss: 1.8356 - val_accuracy: 0.7196
Epoch 515/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2179 - accuracy: 0.8201 - val_loss: 1.8146 - val_accuracy: 0.7196
Epoch 516/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1717 - accuracy: 0.8612 - val_loss: 1.8406 - val_accuracy: 0.7336
Epoch 517/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1750 - accuracy: 0.8303 - val_loss: 1.8921 - val_accuracy: 0.7477
Epoch 518/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2253 - accuracy: 0.8483 - val_loss: 1.8601 - val_accuracy: 0.7336
Epoch 519/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1942 - accuracy: 0.8046 - val_loss: 1.8844 - val_accuracy: 0.7477
Epoch 520/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1908 - accuracy: 0.8252 - val_loss: 1.8998 - val_accuracy: 0.7290
Epoch 521/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1420 - accuracy: 0.8329 - val_loss: 1.9499 - val_accuracy: 0.7383
Epoch 522/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1645 - accuracy: 0.8175 - val_loss: 1.9678 - val_accuracy: 0.7430
Epoch 523/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1965 - accuracy: 0.8458 - val_loss: 1.9061 - val_accuracy: 0.7430
Epoch 524/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1631 - accuracy: 0.8380 - val_loss: 1.9339 - val_accuracy: 0.7290
Epoch 525/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2291 - accuracy: 0.8406 - val_loss: 1.9328 - val_accuracy: 0.7383
Epoch 526/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1628 - accuracy: 0.8586 - val_loss: 1.8572 - val_accuracy: 0.7383
Epoch 527/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2363 - accuracy: 0.8560 - val_loss: 1.7884 - val_accuracy: 0.7383
Epoch 528/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1647 - accuracy: 0.8046 - val_loss: 1.7999 - val_accuracy: 0.7196
Epoch 529/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2124 - accuracy: 0.8406 - val_loss: 1.7877 - val_accuracy: 0.7570
Epoch 530/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2513 - accuracy: 0.8252 - val_loss: 1.8130 - val_accuracy: 0.7430
Epoch 531/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1369 - accuracy: 0.8509 - val_loss: 1.6644 - val_accuracy: 0.7477
Epoch 532/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1436 - accuracy: 0.8458 - val_loss: 1.7144 - val_accuracy: 0.7664
Epoch 533/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1923 - accuracy: 0.8278 - val_loss: 1.7499 - val_accuracy: 0.7757
Epoch 534/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1431 - accuracy: 0.8458 - val_loss: 1.8477 - val_accuracy: 0.7664
Epoch 535/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3134 - accuracy: 0.8201 - val_loss: 1.6596 - val_accuracy: 0.7477
Epoch 536/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1310 - accuracy: 0.8252 - val_loss: 1.6781 - val_accuracy: 0.7430
```

Epoch 537/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2239 - accuracy: 0.8175 - val_loss: 1.6061 - val_accuracy: 0.7056
Epoch 538/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1784 - accuracy: 0.8406 - val_loss: 1.6626 - val_accuracy: 0.7196
Epoch 539/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1776 - accuracy: 0.8483 - val_loss: 1.7034 - val_accuracy: 0.7383
Epoch 540/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1581 - accuracy: 0.8560 - val_loss: 1.6978 - val_accuracy: 0.7523
Epoch 541/1000
4/4 [=====] - 0s 17ms/step - loss: 0.1254 - accuracy: 0.8792 - val_loss: 1.7045 - val_accuracy: 0.7056
Epoch 542/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2064 - accuracy: 0.8355 - val_loss: 1.6851 - val_accuracy: 0.7290
Epoch 543/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1445 - accuracy: 0.8432 - val_loss: 1.8774 - val_accuracy: 0.7757
Epoch 544/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2018 - accuracy: 0.8355 - val_loss: 1.8812 - val_accuracy: 0.7570
Epoch 545/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2095 - accuracy: 0.8638 - val_loss: 1.7960 - val_accuracy: 0.7383
Epoch 546/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2471 - accuracy: 0.8252 - val_loss: 1.6518 - val_accuracy: 0.7150
Epoch 547/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2154 - accuracy: 0.8278 - val_loss: 1.6766 - val_accuracy: 0.7103
Epoch 548/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1510 - accuracy: 0.8226 - val_loss: 1.6570 - val_accuracy: 0.7150
Epoch 549/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1817 - accuracy: 0.8021 - val_loss: 1.7420 - val_accuracy: 0.7056
Epoch 550/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1672 - accuracy: 0.8149 - val_loss: 1.6754 - val_accuracy: 0.6589
Epoch 551/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1838 - accuracy: 0.8252 - val_loss: 2.0186 - val_accuracy: 0.7477
Epoch 552/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2322 - accuracy: 0.8303 - val_loss: 2.0507 - val_accuracy: 0.7477
Epoch 553/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2251 - accuracy: 0.8252 - val_loss: 1.9999 - val_accuracy: 0.7523
Epoch 554/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1862 - accuracy: 0.8303 - val_loss: 1.6587 - val_accuracy: 0.7150
Epoch 555/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2053 - accuracy: 0.8072 - val_loss: 1.6049 - val_accuracy: 0.6869
Epoch 556/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1707 - accuracy: 0.8046 - val_loss: 1.7255 - val_accuracy: 0.7290
Epoch 557/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2502 - accuracy: 0.8098 - val_loss: 1.7449 - val_accuracy: 0.7430
Epoch 558/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1223 - accuracy: 0.8226 - val_loss: 1.7707 - val_accuracy: 0.7430
Epoch 559/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1983 - accuracy: 0.7866 - val_loss: 1.7407 - val_accuracy: 0.7617
Epoch 560/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1625 - accuracy: 0.8303 - val_loss: 1.6098 - val_accuracy: 0.7336
Epoch 561/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1818 - accuracy: 0.8175 - val_loss: 1.6668 - val_accuracy: 0.7103
Epoch 562/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2567 - accuracy: 0.8201 - val_loss: 1.6606 - val_accuracy: 0.7570
Epoch 563/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1659 - accuracy: 0.8355 - val_loss: 1.6868 - val_accuracy: 0.7523
Epoch 564/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2404 - accuracy: 0.7866 - val_loss: 1.6759 - val_accuracy: 0.7897
Epoch 565/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2706 - accuracy: 0.8226 - val_loss: 1.6638 - val_accuracy: 0.7710
Epoch 566/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1682 - accuracy: 0.8278 - val_loss: 1.9268 - val_accuracy: 0.7710

```
accuracy: 0.7710
Epoch 567/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2696 - accuracy: 0.8458 - val_loss: 1.8720 - val_
accuracy: 0.7570
Epoch 568/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2201 - accuracy: 0.8406 - val_loss: 1.8498 - val_
accuracy: 0.7477
Epoch 569/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1693 - accuracy: 0.8355 - val_loss: 1.8135 - val_
accuracy: 0.7710
Epoch 570/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2277 - accuracy: 0.7738 - val_loss: 1.8536 - val_
accuracy: 0.7477
Epoch 571/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1284 - accuracy: 0.8226 - val_loss: 1.7842 - val_
accuracy: 0.7383
Epoch 572/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1946 - accuracy: 0.8098 - val_loss: 1.7197 - val_
accuracy: 0.7290
Epoch 573/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1352 - accuracy: 0.8149 - val_loss: 1.7045 - val_
accuracy: 0.7196
Epoch 574/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1445 - accuracy: 0.8201 - val_loss: 1.6599 - val_
accuracy: 0.7243
Epoch 575/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1820 - accuracy: 0.8175 - val_loss: 1.7191 - val_
accuracy: 0.7150
Epoch 576/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1567 - accuracy: 0.8278 - val_loss: 1.8256 - val_
accuracy: 0.7477
Epoch 577/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2062 - accuracy: 0.8226 - val_loss: 1.6946 - val_
accuracy: 0.7336
Epoch 578/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1287 - accuracy: 0.8612 - val_loss: 1.6745 - val_
accuracy: 0.7523
Epoch 579/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1872 - accuracy: 0.8355 - val_loss: 1.8154 - val_
accuracy: 0.7804
Epoch 580/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1834 - accuracy: 0.8149 - val_loss: 1.8499 - val_
accuracy: 0.7757
Epoch 581/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1261 - accuracy: 0.8355 - val_loss: 1.8046 - val_
accuracy: 0.7383
Epoch 582/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1392 - accuracy: 0.8586 - val_loss: 1.8306 - val_
accuracy: 0.7897
Epoch 583/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1310 - accuracy: 0.8380 - val_loss: 1.7154 - val_
accuracy: 0.7430
Epoch 584/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2468 - accuracy: 0.8638 - val_loss: 1.8911 - val_
accuracy: 0.7664
Epoch 585/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1902 - accuracy: 0.8355 - val_loss: 1.6636 - val_
accuracy: 0.7243
Epoch 586/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1812 - accuracy: 0.7815 - val_loss: 1.6067 - val_
accuracy: 0.7290
Epoch 587/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2292 - accuracy: 0.8175 - val_loss: 1.6242 - val_
accuracy: 0.7150
Epoch 588/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2004 - accuracy: 0.7969 - val_loss: 1.5706 - val_
accuracy: 0.7103
Epoch 589/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2209 - accuracy: 0.7738 - val_loss: 1.5930 - val_
accuracy: 0.6822
Epoch 590/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1695 - accuracy: 0.7892 - val_loss: 1.7336 - val_
accuracy: 0.6682
Epoch 591/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2222 - accuracy: 0.7815 - val_loss: 1.7038 - val_
accuracy: 0.6822
Epoch 592/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2189 - accuracy: 0.7584 - val_loss: 1.7052 - val_
accuracy: 0.6963
Epoch 593/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1862 - accuracy: 0.7892 - val_loss: 1.7366 - val_
accuracy: 0.7290
Epoch 594/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2309 - accuracy: 0.7995 - val_loss: 1.6528 - val_
accuracy: 0.7009
Epoch 595/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2059 - accuracy: 0.8046 - val_loss: 1.6959 - val_
accuracy: 0.6963
Epoch 596/1000
```

```
4/4 [=====] - 0s 11ms/step - loss: 0.1394 - accuracy: 0.7995 - val_loss: 1.6881 - val_accuracy: 0.7056
Epoch 597/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1844 - accuracy: 0.7841 - val_loss: 1.5814 - val_accuracy: 0.6869
Epoch 598/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1276 - accuracy: 0.7712 - val_loss: 1.9004 - val_accuracy: 0.7150
Epoch 599/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2317 - accuracy: 0.7866 - val_loss: 2.0044 - val_accuracy: 0.7056
Epoch 600/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2677 - accuracy: 0.8098 - val_loss: 1.8379 - val_accuracy: 0.6869
Epoch 601/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3114 - accuracy: 0.7918 - val_loss: 1.6306 - val_accuracy: 0.6542
Epoch 602/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1555 - accuracy: 0.8046 - val_loss: 1.6596 - val_accuracy: 0.6542
Epoch 603/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1205 - accuracy: 0.7866 - val_loss: 1.6494 - val_accuracy: 0.6776
Epoch 604/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1536 - accuracy: 0.8046 - val_loss: 1.9055 - val_accuracy: 0.7009
Epoch 605/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1562 - accuracy: 0.7763 - val_loss: 1.6588 - val_accuracy: 0.6963
Epoch 606/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1626 - accuracy: 0.7686 - val_loss: 1.7391 - val_accuracy: 0.7150
Epoch 607/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1151 - accuracy: 0.7738 - val_loss: 1.8242 - val_accuracy: 0.7103
Epoch 608/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2699 - accuracy: 0.7661 - val_loss: 1.6781 - val_accuracy: 0.6869
Epoch 609/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1544 - accuracy: 0.8021 - val_loss: 1.7274 - val_accuracy: 0.6916
Epoch 610/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1676 - accuracy: 0.8072 - val_loss: 1.7233 - val_accuracy: 0.6869
Epoch 611/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1298 - accuracy: 0.7943 - val_loss: 1.7545 - val_accuracy: 0.7150
Epoch 612/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1200 - accuracy: 0.7686 - val_loss: 1.6685 - val_accuracy: 0.7009
Epoch 613/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1095 - accuracy: 0.7789 - val_loss: 1.6678 - val_accuracy: 0.7009
Epoch 614/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0951 - accuracy: 0.7892 - val_loss: 1.6943 - val_accuracy: 0.7103
Epoch 615/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2604 - accuracy: 0.7712 - val_loss: 1.7124 - val_accuracy: 0.6776
Epoch 616/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1401 - accuracy: 0.7609 - val_loss: 1.7092 - val_accuracy: 0.7009
Epoch 617/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2310 - accuracy: 0.7609 - val_loss: 1.8881 - val_accuracy: 0.7103
Epoch 618/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1628 - accuracy: 0.7918 - val_loss: 1.6873 - val_accuracy: 0.6495
Epoch 619/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1459 - accuracy: 0.8072 - val_loss: 1.7219 - val_accuracy: 0.6542
Epoch 620/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1232 - accuracy: 0.8046 - val_loss: 1.5808 - val_accuracy: 0.6449
Epoch 621/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3440 - accuracy: 0.7866 - val_loss: 1.6911 - val_accuracy: 0.6215
Epoch 622/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1927 - accuracy: 0.7661 - val_loss: 1.8066 - val_accuracy: 0.6168
Epoch 623/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2153 - accuracy: 0.7609 - val_loss: 1.7722 - val_accuracy: 0.6168
Epoch 624/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3320 - accuracy: 0.7686 - val_loss: 1.8525 - val_accuracy: 0.6308
Epoch 625/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3276 - accuracy: 0.7712 - val_loss: 1.9005 - val_accuracy: 0.6308
```

Epoch 626/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2356 - accuracy: 0.7661 - val_loss: 1.9456 - val_accuracy: 0.6449
Epoch 627/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1460 - accuracy: 0.7943 - val_loss: 1.9367 - val_accuracy: 0.6542
Epoch 628/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2812 - accuracy: 0.7686 - val_loss: 1.9826 - val_accuracy: 0.6822
Epoch 629/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1711 - accuracy: 0.7455 - val_loss: 1.9084 - val_accuracy: 0.6869
Epoch 630/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1735 - accuracy: 0.7686 - val_loss: 1.8734 - val_accuracy: 0.7056
Epoch 631/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1676 - accuracy: 0.7815 - val_loss: 1.9256 - val_accuracy: 0.7150
Epoch 632/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3275 - accuracy: 0.7712 - val_loss: 1.9867 - val_accuracy: 0.7103
Epoch 633/1000
4/4 [=====] - 0s 18ms/step - loss: 0.2393 - accuracy: 0.7558 - val_loss: 2.0316 - val_accuracy: 0.6869
Epoch 634/1000
4/4 [=====] - 0s 17ms/step - loss: 0.2522 - accuracy: 0.7532 - val_loss: 2.0625 - val_accuracy: 0.6916
Epoch 635/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1670 - accuracy: 0.7738 - val_loss: 1.9251 - val_accuracy: 0.6729
Epoch 636/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1926 - accuracy: 0.8123 - val_loss: 2.0396 - val_accuracy: 0.6589
Epoch 637/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1262 - accuracy: 0.8021 - val_loss: 1.9836 - val_accuracy: 0.6963
Epoch 638/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2209 - accuracy: 0.8072 - val_loss: 1.8708 - val_accuracy: 0.6869
Epoch 639/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1947 - accuracy: 0.7841 - val_loss: 1.8592 - val_accuracy: 0.7150
Epoch 640/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1640 - accuracy: 0.8098 - val_loss: 1.8736 - val_accuracy: 0.7243
Epoch 641/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3142 - accuracy: 0.7532 - val_loss: 2.0446 - val_accuracy: 0.7150
Epoch 642/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1687 - accuracy: 0.7686 - val_loss: 1.9961 - val_accuracy: 0.6869
Epoch 643/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1564 - accuracy: 0.7969 - val_loss: 2.0202 - val_accuracy: 0.6449
Epoch 644/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1626 - accuracy: 0.7969 - val_loss: 2.0304 - val_accuracy: 0.6542
Epoch 645/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1306 - accuracy: 0.7866 - val_loss: 2.0091 - val_accuracy: 0.6542
Epoch 646/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1416 - accuracy: 0.7712 - val_loss: 2.0519 - val_accuracy: 0.6355
Epoch 647/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1340 - accuracy: 0.7892 - val_loss: 2.1234 - val_accuracy: 0.6542
Epoch 648/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1580 - accuracy: 0.7892 - val_loss: 1.9342 - val_accuracy: 0.6449
Epoch 649/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2896 - accuracy: 0.7686 - val_loss: 1.9592 - val_accuracy: 0.6355
Epoch 650/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1602 - accuracy: 0.7738 - val_loss: 1.9326 - val_accuracy: 0.6589
Epoch 651/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1605 - accuracy: 0.7609 - val_loss: 2.0794 - val_accuracy: 0.6542
Epoch 652/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3450 - accuracy: 0.7584 - val_loss: 2.0675 - val_accuracy: 0.6776
Epoch 653/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1713 - accuracy: 0.7918 - val_loss: 2.0755 - val_accuracy: 0.6542
Epoch 654/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2344 - accuracy: 0.7686 - val_loss: 2.0106 - val_accuracy: 0.6636
Epoch 655/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1843 - accuracy: 0.7943 - val_loss: 1.9806 - val_accuracy: 0.6542

```
accuracy: 0.6589
Epoch 656/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1078 - accuracy: 0.7892 - val_loss: 1.9884 - val_
accuracy: 0.6729
Epoch 657/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1582 - accuracy: 0.7943 - val_loss: 1.8697 - val_
accuracy: 0.6262
Epoch 658/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2331 - accuracy: 0.7789 - val_loss: 1.9017 - val_
accuracy: 0.6729
Epoch 659/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2489 - accuracy: 0.7635 - val_loss: 2.0838 - val_
accuracy: 0.7103
Epoch 660/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3333 - accuracy: 0.7712 - val_loss: 2.0955 - val_
accuracy: 0.7056
Epoch 661/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1493 - accuracy: 0.8072 - val_loss: 2.1116 - val_
accuracy: 0.7056
Epoch 662/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2042 - accuracy: 0.7943 - val_loss: 2.0656 - val_
accuracy: 0.7009
Epoch 663/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1986 - accuracy: 0.7918 - val_loss: 1.8971 - val_
accuracy: 0.7196
Epoch 664/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2008 - accuracy: 0.7995 - val_loss: 2.1789 - val_
accuracy: 0.7430
Epoch 665/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1813 - accuracy: 0.7892 - val_loss: 1.9241 - val_
accuracy: 0.7056
Epoch 666/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1632 - accuracy: 0.7738 - val_loss: 1.9360 - val_
accuracy: 0.7103
Epoch 667/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1521 - accuracy: 0.8201 - val_loss: 1.8901 - val_
accuracy: 0.7056
Epoch 668/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1636 - accuracy: 0.8021 - val_loss: 1.9107 - val_
accuracy: 0.6963
Epoch 669/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1602 - accuracy: 0.7841 - val_loss: 1.9180 - val_
accuracy: 0.7056
Epoch 670/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2696 - accuracy: 0.8252 - val_loss: 1.9497 - val_
accuracy: 0.7103
Epoch 671/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2266 - accuracy: 0.7738 - val_loss: 1.9948 - val_
accuracy: 0.7103
Epoch 672/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1917 - accuracy: 0.7763 - val_loss: 1.9822 - val_
accuracy: 0.7150
Epoch 673/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1626 - accuracy: 0.8149 - val_loss: 2.0016 - val_
accuracy: 0.6729
Epoch 674/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1689 - accuracy: 0.7532 - val_loss: 1.9779 - val_
accuracy: 0.7150
Epoch 675/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1738 - accuracy: 0.7815 - val_loss: 1.9974 - val_
accuracy: 0.7103
Epoch 676/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1566 - accuracy: 0.8021 - val_loss: 1.9901 - val_
accuracy: 0.6869
Epoch 677/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1718 - accuracy: 0.8046 - val_loss: 2.0142 - val_
accuracy: 0.7150
Epoch 678/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1482 - accuracy: 0.7892 - val_loss: 2.1336 - val_
accuracy: 0.6963
Epoch 679/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2349 - accuracy: 0.7789 - val_loss: 2.1133 - val_
accuracy: 0.7009
Epoch 680/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1492 - accuracy: 0.7841 - val_loss: 2.3059 - val_
accuracy: 0.6963
Epoch 681/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1086 - accuracy: 0.7558 - val_loss: 2.2540 - val_
accuracy: 0.6916
Epoch 682/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1319 - accuracy: 0.7943 - val_loss: 2.0827 - val_
accuracy: 0.6402
Epoch 683/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1617 - accuracy: 0.7635 - val_loss: 1.9975 - val_
accuracy: 0.6028
Epoch 684/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1966 - accuracy: 0.7635 - val_loss: 1.9841 - val_
accuracy: 0.6215
Epoch 685/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.1549 - accuracy: 0.7866 - val_loss: 1.9860 - val_accuracy: 0.6028
Epoch 686/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1135 - accuracy: 0.7763 - val_loss: 1.9833 - val_accuracy: 0.6262
Epoch 687/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1884 - accuracy: 0.7789 - val_loss: 2.0432 - val_accuracy: 0.6262
Epoch 688/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1455 - accuracy: 0.7841 - val_loss: 2.0750 - val_accuracy: 0.6636
Epoch 689/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2965 - accuracy: 0.7789 - val_loss: 2.1146 - val_accuracy: 0.6589
Epoch 690/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2322 - accuracy: 0.7789 - val_loss: 2.0640 - val_accuracy: 0.6495
Epoch 691/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1152 - accuracy: 0.8021 - val_loss: 2.3096 - val_accuracy: 0.7243
Epoch 692/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2692 - accuracy: 0.8226 - val_loss: 2.3263 - val_accuracy: 0.6963
Epoch 693/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1691 - accuracy: 0.8201 - val_loss: 2.2960 - val_accuracy: 0.6869
Epoch 694/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1351 - accuracy: 0.8123 - val_loss: 2.3988 - val_accuracy: 0.6916
Epoch 695/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1084 - accuracy: 0.7969 - val_loss: 2.1480 - val_accuracy: 0.6589
Epoch 696/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1841 - accuracy: 0.8021 - val_loss: 2.1849 - val_accuracy: 0.6729
Epoch 697/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1252 - accuracy: 0.7815 - val_loss: 2.1515 - val_accuracy: 0.6916
Epoch 698/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1281 - accuracy: 0.8201 - val_loss: 2.1008 - val_accuracy: 0.6869
Epoch 699/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2140 - accuracy: 0.7918 - val_loss: 2.0957 - val_accuracy: 0.7009
Epoch 700/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2272 - accuracy: 0.7892 - val_loss: 2.2684 - val_accuracy: 0.7150
Epoch 701/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2052 - accuracy: 0.8329 - val_loss: 2.5027 - val_accuracy: 0.7196
Epoch 702/1000
4/4 [=====] - 0s 11ms/step - loss: 0.0971 - accuracy: 0.8278 - val_loss: 2.4812 - val_accuracy: 0.7290
Epoch 703/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3154 - accuracy: 0.8175 - val_loss: 2.5292 - val_accuracy: 0.7664
Epoch 704/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1564 - accuracy: 0.8123 - val_loss: 2.5144 - val_accuracy: 0.7664
Epoch 705/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1991 - accuracy: 0.7969 - val_loss: 2.5467 - val_accuracy: 0.7523
Epoch 706/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3245 - accuracy: 0.8098 - val_loss: 2.4801 - val_accuracy: 0.7383
Epoch 707/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1558 - accuracy: 0.8432 - val_loss: 2.2854 - val_accuracy: 0.7664
Epoch 708/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1560 - accuracy: 0.8226 - val_loss: 2.4562 - val_accuracy: 0.7944
Epoch 709/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1230 - accuracy: 0.8612 - val_loss: 2.4349 - val_accuracy: 0.7804
Epoch 710/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1039 - accuracy: 0.8098 - val_loss: 2.2923 - val_accuracy: 0.7850
Epoch 711/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1781 - accuracy: 0.8201 - val_loss: 2.4586 - val_accuracy: 0.7850
Epoch 712/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1510 - accuracy: 0.8149 - val_loss: 2.2024 - val_accuracy: 0.7991
Epoch 713/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1353 - accuracy: 0.8226 - val_loss: 2.2861 - val_accuracy: 0.7944
Epoch 714/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2701 - accuracy: 0.8535 - val_loss: 2.2401 - val_accuracy: 0.8037
```

Epoch 715/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1658 - accuracy: 0.8406 - val_loss: 2.1873 - val_accuracy: 0.7897
Epoch 716/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2200 - accuracy: 0.8303 - val_loss: 2.1154 - val_accuracy: 0.7664
Epoch 717/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1427 - accuracy: 0.8175 - val_loss: 2.1904 - val_accuracy: 0.7710
Epoch 718/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1022 - accuracy: 0.8252 - val_loss: 2.2819 - val_accuracy: 0.7757
Epoch 719/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1111 - accuracy: 0.7918 - val_loss: 2.3608 - val_accuracy: 0.7804
Epoch 720/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1653 - accuracy: 0.7943 - val_loss: 2.4318 - val_accuracy: 0.7897
Epoch 721/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2099 - accuracy: 0.7789 - val_loss: 2.2975 - val_accuracy: 0.7523
Epoch 722/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1346 - accuracy: 0.8046 - val_loss: 2.4042 - val_accuracy: 0.7570
Epoch 723/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1196 - accuracy: 0.7866 - val_loss: 2.3375 - val_accuracy: 0.7430
Epoch 724/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1763 - accuracy: 0.8201 - val_loss: 2.2542 - val_accuracy: 0.7617
Epoch 725/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1366 - accuracy: 0.7918 - val_loss: 2.2906 - val_accuracy: 0.7710
Epoch 726/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2204 - accuracy: 0.8021 - val_loss: 2.1179 - val_accuracy: 0.7804
Epoch 727/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2320 - accuracy: 0.8072 - val_loss: 2.2063 - val_accuracy: 0.7757
Epoch 728/1000
4/4 [=====] - 0s 11ms/step - loss: 0.0995 - accuracy: 0.8226 - val_loss: 2.1701 - val_accuracy: 0.7570
Epoch 729/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1913 - accuracy: 0.8226 - val_loss: 2.1736 - val_accuracy: 0.7196
Epoch 730/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1135 - accuracy: 0.7892 - val_loss: 2.2105 - val_accuracy: 0.7009
Epoch 731/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1955 - accuracy: 0.8072 - val_loss: 1.9897 - val_accuracy: 0.7243
Epoch 732/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1975 - accuracy: 0.8046 - val_loss: 2.0956 - val_accuracy: 0.7150
Epoch 733/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1571 - accuracy: 0.8123 - val_loss: 2.2785 - val_accuracy: 0.7290
Epoch 734/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1127 - accuracy: 0.8175 - val_loss: 1.9350 - val_accuracy: 0.6869
Epoch 735/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1471 - accuracy: 0.8380 - val_loss: 1.9386 - val_accuracy: 0.7056
Epoch 736/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1441 - accuracy: 0.8355 - val_loss: 2.0629 - val_accuracy: 0.7243
Epoch 737/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1278 - accuracy: 0.8252 - val_loss: 2.1537 - val_accuracy: 0.7056
Epoch 738/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1345 - accuracy: 0.8406 - val_loss: 2.0977 - val_accuracy: 0.7710
Epoch 739/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2264 - accuracy: 0.8123 - val_loss: 2.1283 - val_accuracy: 0.7290
Epoch 740/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1246 - accuracy: 0.8483 - val_loss: 2.1318 - val_accuracy: 0.7150
Epoch 741/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1972 - accuracy: 0.8278 - val_loss: 2.2065 - val_accuracy: 0.7290
Epoch 742/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1728 - accuracy: 0.7892 - val_loss: 2.1937 - val_accuracy: 0.7243
Epoch 743/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2817 - accuracy: 0.8123 - val_loss: 2.0778 - val_accuracy: 0.7290
Epoch 744/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1439 - accuracy: 0.8123 - val_loss: 1.9295 - val_accuracy: 0.7290

```
accuracy: 0.7196
Epoch 745/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1291 - accuracy: 0.8355 - val_loss: 2.1039 - val_
accuracy: 0.7196
Epoch 746/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1927 - accuracy: 0.8175 - val_loss: 1.9931 - val_
accuracy: 0.7944
Epoch 747/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2285 - accuracy: 0.7712 - val_loss: 1.9765 - val_
accuracy: 0.7804
Epoch 748/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1990 - accuracy: 0.8046 - val_loss: 1.8576 - val_
accuracy: 0.7664
Epoch 749/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1257 - accuracy: 0.8175 - val_loss: 1.9487 - val_
accuracy: 0.7523
Epoch 750/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3005 - accuracy: 0.7815 - val_loss: 1.7646 - val_
accuracy: 0.7290
Epoch 751/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1978 - accuracy: 0.8303 - val_loss: 1.8648 - val_
accuracy: 0.7290
Epoch 752/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1959 - accuracy: 0.8303 - val_loss: 1.9058 - val_
accuracy: 0.7710
Epoch 753/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2345 - accuracy: 0.8252 - val_loss: 1.9298 - val_
accuracy: 0.7757
Epoch 754/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2926 - accuracy: 0.8201 - val_loss: 1.9327 - val_
accuracy: 0.7664
Epoch 755/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2341 - accuracy: 0.8380 - val_loss: 1.9752 - val_
accuracy: 0.7477
Epoch 756/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1174 - accuracy: 0.8663 - val_loss: 1.9945 - val_
accuracy: 0.7850
Epoch 757/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1156 - accuracy: 0.8638 - val_loss: 1.9392 - val_
accuracy: 0.7944
Epoch 758/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1640 - accuracy: 0.8509 - val_loss: 1.9909 - val_
accuracy: 0.7804
Epoch 759/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1418 - accuracy: 0.8586 - val_loss: 1.9774 - val_
accuracy: 0.7710
Epoch 760/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1424 - accuracy: 0.8406 - val_loss: 2.0001 - val_
accuracy: 0.7664
Epoch 761/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1513 - accuracy: 0.8715 - val_loss: 2.0492 - val_
accuracy: 0.7664
Epoch 762/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2010 - accuracy: 0.8329 - val_loss: 2.0154 - val_
accuracy: 0.7757
Epoch 763/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2196 - accuracy: 0.8638 - val_loss: 1.9641 - val_
accuracy: 0.7664
Epoch 764/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2101 - accuracy: 0.8432 - val_loss: 1.8998 - val_
accuracy: 0.7664
Epoch 765/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1057 - accuracy: 0.8869 - val_loss: 1.8947 - val_
accuracy: 0.7804
Epoch 766/1000
4/4 [=====] - 0s 14ms/step - loss: 0.0874 - accuracy: 0.8638 - val_loss: 1.8613 - val_
accuracy: 0.7757
Epoch 767/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1793 - accuracy: 0.8612 - val_loss: 1.9404 - val_
accuracy: 0.7897
Epoch 768/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2156 - accuracy: 0.8509 - val_loss: 2.0650 - val_
accuracy: 0.7944
Epoch 769/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1186 - accuracy: 0.8612 - val_loss: 2.0152 - val_
accuracy: 0.7944
Epoch 770/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2009 - accuracy: 0.8483 - val_loss: 2.0717 - val_
accuracy: 0.7850
Epoch 771/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2267 - accuracy: 0.8689 - val_loss: 2.0465 - val_
accuracy: 0.7897
Epoch 772/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1976 - accuracy: 0.8792 - val_loss: 2.0731 - val_
accuracy: 0.7850
Epoch 773/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2082 - accuracy: 0.8560 - val_loss: 2.0866 - val_
accuracy: 0.7897
Epoch 774/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.1787 - accuracy: 0.8586 - val_loss: 2.1251 - val_accuracy: 0.7897
Epoch 775/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1775 - accuracy: 0.8946 - val_loss: 2.0810 - val_accuracy: 0.7897
Epoch 776/1000
4/4 [=====] - 0s 12ms/step - loss: 0.0744 - accuracy: 0.8766 - val_loss: 2.0511 - val_accuracy: 0.7850
Epoch 777/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3054 - accuracy: 0.8612 - val_loss: 2.0941 - val_accuracy: 0.8178
Epoch 778/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2661 - accuracy: 0.8997 - val_loss: 1.8999 - val_accuracy: 0.7944
Epoch 779/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2781 - accuracy: 0.8638 - val_loss: 2.1593 - val_accuracy: 0.8037
Epoch 780/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1659 - accuracy: 0.8586 - val_loss: 2.0515 - val_accuracy: 0.8084
Epoch 781/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2465 - accuracy: 0.8586 - val_loss: 2.0292 - val_accuracy: 0.7804
Epoch 782/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2106 - accuracy: 0.8792 - val_loss: 1.9973 - val_accuracy: 0.7944
Epoch 783/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1213 - accuracy: 0.8817 - val_loss: 2.3008 - val_accuracy: 0.8271
Epoch 784/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1827 - accuracy: 0.8303 - val_loss: 2.2434 - val_accuracy: 0.8131
Epoch 785/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1444 - accuracy: 0.8586 - val_loss: 2.0401 - val_accuracy: 0.8131
Epoch 786/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0999 - accuracy: 0.8586 - val_loss: 2.0721 - val_accuracy: 0.8178
Epoch 787/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1582 - accuracy: 0.8458 - val_loss: 2.0235 - val_accuracy: 0.8271
Epoch 788/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1895 - accuracy: 0.8535 - val_loss: 2.0196 - val_accuracy: 0.8411
Epoch 789/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1767 - accuracy: 0.8715 - val_loss: 2.0704 - val_accuracy: 0.8271
Epoch 790/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1950 - accuracy: 0.8458 - val_loss: 2.0318 - val_accuracy: 0.8271
Epoch 791/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1294 - accuracy: 0.8432 - val_loss: 2.1926 - val_accuracy: 0.8178
Epoch 792/1000
4/4 [=====] - 0s 11ms/step - loss: 0.0976 - accuracy: 0.8560 - val_loss: 2.1624 - val_accuracy: 0.8084
Epoch 793/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2561 - accuracy: 0.8560 - val_loss: 2.4156 - val_accuracy: 0.8084
Epoch 794/1000
4/4 [=====] - 0s 11ms/step - loss: 0.0974 - accuracy: 0.8715 - val_loss: 2.2855 - val_accuracy: 0.8178
Epoch 795/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2017 - accuracy: 0.8483 - val_loss: 2.2495 - val_accuracy: 0.7991
Epoch 796/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1595 - accuracy: 0.8638 - val_loss: 2.3860 - val_accuracy: 0.7804
Epoch 797/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2593 - accuracy: 0.8380 - val_loss: 2.2436 - val_accuracy: 0.7804
Epoch 798/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1380 - accuracy: 0.8792 - val_loss: 2.1295 - val_accuracy: 0.7710
Epoch 799/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1556 - accuracy: 0.8278 - val_loss: 2.4531 - val_accuracy: 0.7897
Epoch 800/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1983 - accuracy: 0.8766 - val_loss: 2.4306 - val_accuracy: 0.7944
Epoch 801/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1379 - accuracy: 0.8612 - val_loss: 2.2331 - val_accuracy: 0.7897
Epoch 802/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1220 - accuracy: 0.8432 - val_loss: 2.1823 - val_accuracy: 0.7991
Epoch 803/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1003 - accuracy: 0.8740 - val_loss: 2.2219 - val_accuracy: 0.7664
```

Epoch 804/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1281 - accuracy: 0.8586 - val_loss: 2.3078 - val_accuracy: 0.7804
Epoch 805/1000
4/4 [=====] - 0s 12ms/step - loss: 0.0640 - accuracy: 0.8560 - val_loss: 2.4083 - val_accuracy: 0.7944
Epoch 806/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1491 - accuracy: 0.8612 - val_loss: 2.4550 - val_accuracy: 0.7944
Epoch 807/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0640 - accuracy: 0.8458 - val_loss: 2.4106 - val_accuracy: 0.7477
Epoch 808/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1233 - accuracy: 0.8895 - val_loss: 2.3866 - val_accuracy: 0.7617
Epoch 809/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1278 - accuracy: 0.8509 - val_loss: 2.3976 - val_accuracy: 0.7757
Epoch 810/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1141 - accuracy: 0.8997 - val_loss: 2.4192 - val_accuracy: 0.7710
Epoch 811/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1668 - accuracy: 0.8483 - val_loss: 2.2796 - val_accuracy: 0.7804
Epoch 812/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1392 - accuracy: 0.8766 - val_loss: 2.3292 - val_accuracy: 0.7710
Epoch 813/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1108 - accuracy: 0.8869 - val_loss: 2.1765 - val_accuracy: 0.7804
Epoch 814/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1788 - accuracy: 0.8535 - val_loss: 2.2889 - val_accuracy: 0.7710
Epoch 815/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1398 - accuracy: 0.8586 - val_loss: 2.3122 - val_accuracy: 0.7804
Epoch 816/1000
4/4 [=====] - 0s 12ms/step - loss: 0.0991 - accuracy: 0.8586 - val_loss: 2.3815 - val_accuracy: 0.7897
Epoch 817/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1132 - accuracy: 0.8638 - val_loss: 2.3671 - val_accuracy: 0.7757
Epoch 818/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0606 - accuracy: 0.8740 - val_loss: 2.2008 - val_accuracy: 0.7664
Epoch 819/1000
4/4 [=====] - 0s 12ms/step - loss: 0.0695 - accuracy: 0.8946 - val_loss: 2.2748 - val_accuracy: 0.7617
Epoch 820/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1097 - accuracy: 0.8715 - val_loss: 2.2293 - val_accuracy: 0.7570
Epoch 821/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1545 - accuracy: 0.8740 - val_loss: 2.1980 - val_accuracy: 0.7804
Epoch 822/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1122 - accuracy: 0.8638 - val_loss: 2.2407 - val_accuracy: 0.7804
Epoch 823/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1717 - accuracy: 0.8586 - val_loss: 2.2339 - val_accuracy: 0.7430
Epoch 824/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1204 - accuracy: 0.8638 - val_loss: 2.1084 - val_accuracy: 0.7477
Epoch 825/1000
4/4 [=====] - 0s 17ms/step - loss: 0.0860 - accuracy: 0.8689 - val_loss: 2.0522 - val_accuracy: 0.7430
Epoch 826/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1278 - accuracy: 0.8509 - val_loss: 2.1112 - val_accuracy: 0.7523
Epoch 827/1000
4/4 [=====] - 0s 18ms/step - loss: 0.0748 - accuracy: 0.8355 - val_loss: 1.9260 - val_accuracy: 0.7336
Epoch 828/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4568 - accuracy: 0.8355 - val_loss: 2.0255 - val_accuracy: 0.7336
Epoch 829/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1453 - accuracy: 0.8792 - val_loss: 2.0613 - val_accuracy: 0.7710
Epoch 830/1000
4/4 [=====] - 0s 17ms/step - loss: 0.1227 - accuracy: 0.8663 - val_loss: 2.2137 - val_accuracy: 0.7850
Epoch 831/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1879 - accuracy: 0.8612 - val_loss: 2.2830 - val_accuracy: 0.7757
Epoch 832/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1975 - accuracy: 0.8432 - val_loss: 2.2303 - val_accuracy: 0.7710
Epoch 833/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1859 - accuracy: 0.8406 - val_loss: 2.2311 - val_accuracy: 0.7757

```
accuracy: 0.7196
Epoch 834/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2188 - accuracy: 0.8226 - val_loss: 2.0324 - val_accuracy: 0.7710
Epoch 835/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1609 - accuracy: 0.8612 - val_loss: 2.2409 - val_accuracy: 0.7477
Epoch 836/1000
4/4 [=====] - 0s 15ms/step - loss: 0.0648 - accuracy: 0.8380 - val_loss: 2.3404 - val_accuracy: 0.7523
Epoch 837/1000
4/4 [=====] - 0s 18ms/step - loss: 0.1440 - accuracy: 0.8380 - val_loss: 2.2446 - val_accuracy: 0.7383
Epoch 838/1000
4/4 [=====] - 0s 18ms/step - loss: 0.2296 - accuracy: 0.8329 - val_loss: 2.3902 - val_accuracy: 0.7710
Epoch 839/1000
4/4 [=====] - 0s 17ms/step - loss: 0.1402 - accuracy: 0.8046 - val_loss: 2.1777 - val_accuracy: 0.7897
Epoch 840/1000
4/4 [=====] - 0s 18ms/step - loss: 0.1222 - accuracy: 0.8483 - val_loss: 2.1962 - val_accuracy: 0.7897
Epoch 841/1000
4/4 [=====] - 0s 18ms/step - loss: 0.0869 - accuracy: 0.8329 - val_loss: 2.1095 - val_accuracy: 0.7804
Epoch 842/1000
4/4 [=====] - 0s 19ms/step - loss: 0.1005 - accuracy: 0.8509 - val_loss: 1.9658 - val_accuracy: 0.7523
Epoch 843/1000
4/4 [=====] - 0s 17ms/step - loss: 0.1952 - accuracy: 0.8175 - val_loss: 2.0441 - val_accuracy: 0.7477
Epoch 844/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1376 - accuracy: 0.8329 - val_loss: 2.0075 - val_accuracy: 0.7103
Epoch 845/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2197 - accuracy: 0.8329 - val_loss: 2.0981 - val_accuracy: 0.7196
Epoch 846/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2038 - accuracy: 0.8175 - val_loss: 1.9242 - val_accuracy: 0.7103
Epoch 847/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1475 - accuracy: 0.8380 - val_loss: 1.9638 - val_accuracy: 0.7196
Epoch 848/1000
4/4 [=====] - 0s 16ms/step - loss: 0.0813 - accuracy: 0.8329 - val_loss: 2.0498 - val_accuracy: 0.7757
Epoch 849/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1180 - accuracy: 0.8201 - val_loss: 2.0487 - val_accuracy: 0.7617
Epoch 850/1000
4/4 [=====] - 0s 15ms/step - loss: 0.0791 - accuracy: 0.8303 - val_loss: 2.0499 - val_accuracy: 0.7336
Epoch 851/1000
4/4 [=====] - 0s 17ms/step - loss: 0.1633 - accuracy: 0.8226 - val_loss: 1.9632 - val_accuracy: 0.7243
Epoch 852/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1372 - accuracy: 0.8380 - val_loss: 1.9281 - val_accuracy: 0.7523
Epoch 853/1000
4/4 [=====] - 0s 17ms/step - loss: 0.1068 - accuracy: 0.8535 - val_loss: 1.9153 - val_accuracy: 0.7523
Epoch 854/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1670 - accuracy: 0.8560 - val_loss: 2.0390 - val_accuracy: 0.7710
Epoch 855/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1229 - accuracy: 0.8329 - val_loss: 1.9639 - val_accuracy: 0.6963
Epoch 856/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1435 - accuracy: 0.8201 - val_loss: 2.1257 - val_accuracy: 0.7243
Epoch 857/1000
4/4 [=====] - 0s 16ms/step - loss: 0.0933 - accuracy: 0.8329 - val_loss: 2.1361 - val_accuracy: 0.7243
Epoch 858/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1025 - accuracy: 0.8380 - val_loss: 2.0531 - val_accuracy: 0.7009
Epoch 859/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1228 - accuracy: 0.8278 - val_loss: 2.1979 - val_accuracy: 0.7243
Epoch 860/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1020 - accuracy: 0.8432 - val_loss: 2.0522 - val_accuracy: 0.7103
Epoch 861/1000
4/4 [=====] - 0s 14ms/step - loss: 0.0916 - accuracy: 0.8483 - val_loss: 2.1703 - val_accuracy: 0.7150
Epoch 862/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1246 - accuracy: 0.8432 - val_loss: 2.0480 - val_accuracy: 0.7103
Epoch 863/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.0728 - accuracy: 0.8303 - val_loss: 1.9899 - val_accuracy: 0.7243
Epoch 864/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1228 - accuracy: 0.8252 - val_loss: 2.0228 - val_accuracy: 0.7430
Epoch 865/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1146 - accuracy: 0.8201 - val_loss: 1.9952 - val_accuracy: 0.7383
Epoch 866/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1694 - accuracy: 0.8329 - val_loss: 1.9814 - val_accuracy: 0.7196
Epoch 867/1000
4/4 [=====] - 0s 14ms/step - loss: 0.0896 - accuracy: 0.8355 - val_loss: 1.8767 - val_accuracy: 0.7056
Epoch 868/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0724 - accuracy: 0.8278 - val_loss: 1.8976 - val_accuracy: 0.6963
Epoch 869/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1231 - accuracy: 0.8201 - val_loss: 1.9577 - val_accuracy: 0.6916
Epoch 870/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1388 - accuracy: 0.8303 - val_loss: 2.0812 - val_accuracy: 0.7383
Epoch 871/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0653 - accuracy: 0.8329 - val_loss: 1.8716 - val_accuracy: 0.6869
Epoch 872/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0384 - accuracy: 0.8329 - val_loss: 1.9805 - val_accuracy: 0.6916
Epoch 873/1000
4/4 [=====] - 0s 14ms/step - loss: 0.0657 - accuracy: 0.8303 - val_loss: 2.1265 - val_accuracy: 0.7336
Epoch 874/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1366 - accuracy: 0.8226 - val_loss: 1.9522 - val_accuracy: 0.6869
Epoch 875/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0918 - accuracy: 0.8021 - val_loss: 1.9772 - val_accuracy: 0.7103
Epoch 876/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1606 - accuracy: 0.8072 - val_loss: 1.9582 - val_accuracy: 0.7196
Epoch 877/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2204 - accuracy: 0.8201 - val_loss: 2.0868 - val_accuracy: 0.7103
Epoch 878/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1546 - accuracy: 0.8406 - val_loss: 2.1011 - val_accuracy: 0.7430
Epoch 879/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1081 - accuracy: 0.8380 - val_loss: 2.1711 - val_accuracy: 0.7570
Epoch 880/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1726 - accuracy: 0.8380 - val_loss: 2.0238 - val_accuracy: 0.7196
Epoch 881/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0603 - accuracy: 0.8329 - val_loss: 2.1160 - val_accuracy: 0.7523
Epoch 882/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1512 - accuracy: 0.8303 - val_loss: 2.1075 - val_accuracy: 0.7383
Epoch 883/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1047 - accuracy: 0.8355 - val_loss: 2.0793 - val_accuracy: 0.7430
Epoch 884/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1680 - accuracy: 0.8252 - val_loss: 2.1959 - val_accuracy: 0.7477
Epoch 885/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1472 - accuracy: 0.8355 - val_loss: 2.2490 - val_accuracy: 0.7477
Epoch 886/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1523 - accuracy: 0.8329 - val_loss: 2.2436 - val_accuracy: 0.7523
Epoch 887/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0381 - accuracy: 0.8638 - val_loss: 2.2075 - val_accuracy: 0.7570
Epoch 888/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1308 - accuracy: 0.8535 - val_loss: 2.0727 - val_accuracy: 0.7617
Epoch 889/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1224 - accuracy: 0.8329 - val_loss: 2.1194 - val_accuracy: 0.7570
Epoch 890/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1228 - accuracy: 0.8458 - val_loss: 2.0933 - val_accuracy: 0.7477
Epoch 891/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1632 - accuracy: 0.8638 - val_loss: 2.1691 - val_accuracy: 0.7243
Epoch 892/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1001 - accuracy: 0.8766 - val_loss: 2.1451 - val_accuracy: 0.7430
```

Epoch 893/1000
4/4 [=====] - 0s 14ms/step - loss: 0.0772 - accuracy: 0.8406 - val_loss: 2.2086 - val_accuracy: 0.7617
Epoch 894/1000
4/4 [=====] - 0s 14ms/step - loss: 0.0458 - accuracy: 0.8355 - val_loss: 2.1061 - val_accuracy: 0.7430
Epoch 895/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1548 - accuracy: 0.8303 - val_loss: 2.0737 - val_accuracy: 0.7290
Epoch 896/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1458 - accuracy: 0.8098 - val_loss: 2.2589 - val_accuracy: 0.7757
Epoch 897/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0594 - accuracy: 0.8380 - val_loss: 2.1877 - val_accuracy: 0.7570
Epoch 898/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1361 - accuracy: 0.8201 - val_loss: 2.2453 - val_accuracy: 0.7757
Epoch 899/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1146 - accuracy: 0.8483 - val_loss: 2.3036 - val_accuracy: 0.7336
Epoch 900/1000
4/4 [=====] - 0s 14ms/step - loss: 0.0492 - accuracy: 0.8432 - val_loss: 2.3750 - val_accuracy: 0.7243
Epoch 901/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1360 - accuracy: 0.8303 - val_loss: 2.3609 - val_accuracy: 0.7523
Epoch 902/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1707 - accuracy: 0.8123 - val_loss: 2.2123 - val_accuracy: 0.7336
Epoch 903/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0985 - accuracy: 0.8149 - val_loss: 2.3670 - val_accuracy: 0.7196
Epoch 904/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1325 - accuracy: 0.7943 - val_loss: 2.3552 - val_accuracy: 0.7336
Epoch 905/1000
4/4 [=====] - 0s 12ms/step - loss: 0.0866 - accuracy: 0.8098 - val_loss: 2.3463 - val_accuracy: 0.7056
Epoch 906/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0752 - accuracy: 0.8149 - val_loss: 2.3573 - val_accuracy: 0.7056
Epoch 907/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0590 - accuracy: 0.8123 - val_loss: 2.3678 - val_accuracy: 0.6869
Epoch 908/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0455 - accuracy: 0.7892 - val_loss: 2.2831 - val_accuracy: 0.6916
Epoch 909/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1307 - accuracy: 0.7841 - val_loss: 2.3207 - val_accuracy: 0.6776
Epoch 910/1000
4/4 [=====] - 0s 12ms/step - loss: 0.0995 - accuracy: 0.7815 - val_loss: 2.3784 - val_accuracy: 0.6869
Epoch 911/1000
4/4 [=====] - 0s 12ms/step - loss: 0.0937 - accuracy: 0.7969 - val_loss: 2.4246 - val_accuracy: 0.6916
Epoch 912/1000
4/4 [=====] - 0s 12ms/step - loss: 0.0847 - accuracy: 0.8123 - val_loss: 2.4010 - val_accuracy: 0.6682
Epoch 913/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1664 - accuracy: 0.7815 - val_loss: 2.3435 - val_accuracy: 0.6542
Epoch 914/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1587 - accuracy: 0.8098 - val_loss: 2.3075 - val_accuracy: 0.7009
Epoch 915/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0402 - accuracy: 0.8278 - val_loss: 2.2783 - val_accuracy: 0.7103
Epoch 916/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1341 - accuracy: 0.8458 - val_loss: 2.2491 - val_accuracy: 0.7103
Epoch 917/1000
4/4 [=====] - 0s 12ms/step - loss: 0.0630 - accuracy: 0.8098 - val_loss: 2.2204 - val_accuracy: 0.7009
Epoch 918/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0370 - accuracy: 0.8483 - val_loss: 2.2389 - val_accuracy: 0.6589
Epoch 919/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0702 - accuracy: 0.8123 - val_loss: 2.3142 - val_accuracy: 0.6636
Epoch 920/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1275 - accuracy: 0.8021 - val_loss: 2.2862 - val_accuracy: 0.6682
Epoch 921/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0414 - accuracy: 0.8072 - val_loss: 2.3188 - val_accuracy: 0.6916
Epoch 922/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1848 - accuracy: 0.8021 - val_loss: 2.1629 - val_accuracy: 0.7103

```

accuracy: 0.6963
Epoch 923/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1459 - accuracy: 0.8046 - val_loss: 2.1403 - val_
accuracy: 0.6542
Epoch 924/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2011 - accuracy: 0.7789 - val_loss: 2.1995 - val_
accuracy: 0.6168
Epoch 925/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2871 - accuracy: 0.7763 - val_loss: 2.2741 - val_
accuracy: 0.6636
Epoch 926/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2677 - accuracy: 0.7789 - val_loss: 2.3551 - val_
accuracy: 0.6682
Epoch 927/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1753 - accuracy: 0.8098 - val_loss: 2.3609 - val_
accuracy: 0.6869
Epoch 928/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2175 - accuracy: 0.8072 - val_loss: 2.3191 - val_
accuracy: 0.6729
Epoch 929/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3019 - accuracy: 0.8046 - val_loss: 2.3151 - val_
accuracy: 0.7009
Epoch 930/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1527 - accuracy: 0.7866 - val_loss: 2.3559 - val_
accuracy: 0.7009
Epoch 931/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1285 - accuracy: 0.8355 - val_loss: 2.2616 - val_
accuracy: 0.6776
Epoch 932/1000
4/4 [=====] - 0s 12ms/step - loss: 0.0868 - accuracy: 0.8123 - val_loss: 2.2290 - val_
accuracy: 0.6589
Epoch 933/1000
4/4 [=====] - 0s 12ms/step - loss: 0.0577 - accuracy: 0.8201 - val_loss: 2.2311 - val_
accuracy: 0.6963
Epoch 934/1000
4/4 [=====] - 0s 12ms/step - loss: 0.0600 - accuracy: 0.8021 - val_loss: 2.1911 - val_
accuracy: 0.6682
Epoch 935/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0824 - accuracy: 0.8072 - val_loss: 2.2202 - val_
accuracy: 0.6682
Epoch 936/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0376 - accuracy: 0.8252 - val_loss: 2.0919 - val_
accuracy: 0.6776
Epoch 937/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1164 - accuracy: 0.8278 - val_loss: 2.1782 - val_
accuracy: 0.6729
Epoch 938/1000
1/4 [====>.....] - ETA: 0s - loss: 0.0130 - accuracy: 0.8516Restoring model weights from th
e end of the best epoch: 788.
4/4 [=====] - 0s 14ms/step - loss: 0.1100 - accuracy: 0.8355 - val_loss: 2.2163 - val_
accuracy: 0.6682
Epoch 938: early stopping
2/2 [=====] - 0s 3ms/step - loss: 3.0869 - accuracy: 0.7674
[CV] END .....Dense1=100, Dense2=25; total time= 46.4s
Model: "sequential_87"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_348 (Dense)	(None, 100)	700
<hr/>		
batch_normalization_261 (BatchNormalization)	(None, 100)	400
activation_261 (Activation)	(None, 100)	0
dense_349 (Dense)	(None, 25)	2525
batch_normalization_262 (BatchNormalization)	(None, 25)	100
activation_262 (Activation)	(None, 25)	0
dense_350 (Dense)	(None, 10)	260
batch_normalization_263 (BatchNormalization)	(None, 10)	40
activation_263 (Activation)	(None, 10)	0
dense_351 (Dense)	(None, 2)	22
<hr/>		

Total params: 4,047
Trainable params: 3,777
Non-trainable params: 270

Epoch 1/1000
4/4 [=====] - 2s 59ms/step - loss: 5.2469 - accuracy: 0.6170 - val_loss: 2.9280 - val_
accuracy: 0.6542

Epoch 2/1000
4/4 [=====] - 0s 16ms/step - loss: 4.5207 - accuracy: 0.5835 - val_loss: 2.9688 - val_accuracy: 0.6729
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 4.3182 - accuracy: 0.6041 - val_loss: 2.8707 - val_accuracy: 0.5794
Epoch 4/1000
4/4 [=====] - 0s 15ms/step - loss: 4.3361 - accuracy: 0.5964 - val_loss: 2.8063 - val_accuracy: 0.5093
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 4.4248 - accuracy: 0.6093 - val_loss: 2.8569 - val_accuracy: 0.6636
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 4.2781 - accuracy: 0.5861 - val_loss: 2.7174 - val_accuracy: 0.6729
Epoch 7/1000
4/4 [=====] - 0s 15ms/step - loss: 4.0940 - accuracy: 0.5990 - val_loss: 2.5022 - val_accuracy: 0.6542
Epoch 8/1000
4/4 [=====] - 0s 15ms/step - loss: 4.0587 - accuracy: 0.6093 - val_loss: 2.3796 - val_accuracy: 0.6449
Epoch 9/1000
4/4 [=====] - 0s 15ms/step - loss: 4.0045 - accuracy: 0.6093 - val_loss: 2.3308 - val_accuracy: 0.6776
Epoch 10/1000
4/4 [=====] - 0s 15ms/step - loss: 4.0418 - accuracy: 0.5784 - val_loss: 2.2547 - val_accuracy: 0.6682
Epoch 11/1000
4/4 [=====] - 0s 15ms/step - loss: 3.9483 - accuracy: 0.5938 - val_loss: 2.2215 - val_accuracy: 0.6916
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9627 - accuracy: 0.5707 - val_loss: 2.1662 - val_accuracy: 0.6869
Epoch 13/1000
4/4 [=====] - 0s 15ms/step - loss: 3.8252 - accuracy: 0.5964 - val_loss: 2.1256 - val_accuracy: 0.7009
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8874 - accuracy: 0.5681 - val_loss: 2.0250 - val_accuracy: 0.7009
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 3.7544 - accuracy: 0.5784 - val_loss: 1.9361 - val_accuracy: 0.7056
Epoch 16/1000
4/4 [=====] - 0s 15ms/step - loss: 3.7481 - accuracy: 0.5835 - val_loss: 1.8796 - val_accuracy: 0.7150
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 3.6466 - accuracy: 0.5861 - val_loss: 1.8282 - val_accuracy: 0.6776
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6349 - accuracy: 0.5733 - val_loss: 1.7989 - val_accuracy: 0.6729
Epoch 19/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5876 - accuracy: 0.5964 - val_loss: 1.7672 - val_accuracy: 0.6916
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5071 - accuracy: 0.6041 - val_loss: 1.7350 - val_accuracy: 0.4720
Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4530 - accuracy: 0.5964 - val_loss: 1.7174 - val_accuracy: 0.4720
Epoch 22/1000
4/4 [=====] - 0s 14ms/step - loss: 3.2513 - accuracy: 0.6272 - val_loss: 1.7104 - val_accuracy: 0.4720
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3251 - accuracy: 0.6118 - val_loss: 1.6600 - val_accuracy: 0.6636
Epoch 24/1000
4/4 [=====] - 0s 14ms/step - loss: 3.2347 - accuracy: 0.5810 - val_loss: 1.6510 - val_accuracy: 0.6636
Epoch 25/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0487 - accuracy: 0.6195 - val_loss: 1.6350 - val_accuracy: 0.6729
Epoch 26/1000
4/4 [=====] - 0s 15ms/step - loss: 3.1300 - accuracy: 0.6247 - val_loss: 1.6079 - val_accuracy: 0.6495
Epoch 27/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0446 - accuracy: 0.6170 - val_loss: 1.5894 - val_accuracy: 0.4813
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9538 - accuracy: 0.6324 - val_loss: 1.5860 - val_accuracy: 0.4813
Epoch 29/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0981 - accuracy: 0.6144 - val_loss: 1.6351 - val_accuracy: 0.4766
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9015 - accuracy: 0.6170 - val_loss: 1.6560 - val_accuracy: 0.6495
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 2.9516 - accuracy: 0.6170 - val_loss: 1.6218 - val_accuracy: 0.6495

```
accuracy: 0.6589
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0492 - accuracy: 0.6118 - val_loss: 1.5819 - val_accuracy: 0.6402
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9256 - accuracy: 0.6067 - val_loss: 1.6270 - val_accuracy: 0.6402
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7443 - accuracy: 0.6093 - val_loss: 1.6050 - val_accuracy: 0.6822
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8179 - accuracy: 0.6401 - val_loss: 1.5620 - val_accuracy: 0.6262
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6194 - accuracy: 0.6401 - val_loss: 1.5555 - val_accuracy: 0.6075
Epoch 37/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6231 - accuracy: 0.6093 - val_loss: 1.5291 - val_accuracy: 0.6215
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6023 - accuracy: 0.6093 - val_loss: 1.5105 - val_accuracy: 0.6028
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5310 - accuracy: 0.6247 - val_loss: 1.5030 - val_accuracy: 0.6075
Epoch 40/1000
4/4 [=====] - 0s 15ms/step - loss: 2.4492 - accuracy: 0.6195 - val_loss: 1.4931 - val_accuracy: 0.6028
Epoch 41/1000
4/4 [=====] - 0s 15ms/step - loss: 2.2176 - accuracy: 0.6015 - val_loss: 1.4745 - val_accuracy: 0.6215
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1452 - accuracy: 0.6041 - val_loss: 1.4335 - val_accuracy: 0.6168
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0433 - accuracy: 0.6118 - val_loss: 1.4442 - val_accuracy: 0.6262
Epoch 44/1000
4/4 [=====] - 0s 15ms/step - loss: 2.0981 - accuracy: 0.6170 - val_loss: 1.4358 - val_accuracy: 0.6262
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1949 - accuracy: 0.6170 - val_loss: 1.4034 - val_accuracy: 0.6355
Epoch 46/1000
4/4 [=====] - 0s 15ms/step - loss: 2.1178 - accuracy: 0.5784 - val_loss: 1.4077 - val_accuracy: 0.6355
Epoch 47/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1202 - accuracy: 0.5990 - val_loss: 1.4154 - val_accuracy: 0.6308
Epoch 48/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9633 - accuracy: 0.5861 - val_loss: 1.4056 - val_accuracy: 0.6682
Epoch 49/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8368 - accuracy: 0.5887 - val_loss: 1.3959 - val_accuracy: 0.6729
Epoch 50/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7740 - accuracy: 0.6118 - val_loss: 1.3810 - val_accuracy: 0.6682
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6866 - accuracy: 0.6581 - val_loss: 1.3811 - val_accuracy: 0.6682
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7410 - accuracy: 0.6350 - val_loss: 1.3794 - val_accuracy: 0.6916
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5533 - accuracy: 0.6375 - val_loss: 1.3720 - val_accuracy: 0.6776
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5145 - accuracy: 0.6555 - val_loss: 1.3175 - val_accuracy: 0.6589
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5137 - accuracy: 0.6504 - val_loss: 1.3669 - val_accuracy: 0.6589
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1612 - accuracy: 0.6812 - val_loss: 1.3432 - val_accuracy: 0.6682
Epoch 57/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2519 - accuracy: 0.6941 - val_loss: 1.3415 - val_accuracy: 0.6589
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1531 - accuracy: 0.6941 - val_loss: 1.3362 - val_accuracy: 0.6542
Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0949 - accuracy: 0.7018 - val_loss: 1.2525 - val_accuracy: 0.6916
Epoch 60/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0407 - accuracy: 0.6915 - val_loss: 1.2464 - val_accuracy: 0.6776
Epoch 61/1000
```

```
4/4 [=====] - 0s 15ms/step - loss: 1.1891 - accuracy: 0.6710 - val_loss: 1.2365 - val_accuracy: 0.6776
Epoch 62/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0962 - accuracy: 0.6967 - val_loss: 1.2326 - val_accuracy: 0.6776
Epoch 63/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1066 - accuracy: 0.7018 - val_loss: 1.2012 - val_accuracy: 0.6822
Epoch 64/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1489 - accuracy: 0.6889 - val_loss: 1.1924 - val_accuracy: 0.6869
Epoch 65/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0999 - accuracy: 0.6967 - val_loss: 1.1891 - val_accuracy: 0.5187
Epoch 66/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9640 - accuracy: 0.7224 - val_loss: 1.1786 - val_accuracy: 0.5187
Epoch 67/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9979 - accuracy: 0.7404 - val_loss: 1.1753 - val_accuracy: 0.5187
Epoch 68/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9437 - accuracy: 0.7249 - val_loss: 1.1216 - val_accuracy: 0.5140
Epoch 69/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0614 - accuracy: 0.7352 - val_loss: 1.1378 - val_accuracy: 0.5187
Epoch 70/1000
4/4 [=====] - 0s 16ms/step - loss: 0.9713 - accuracy: 0.7301 - val_loss: 1.1017 - val_accuracy: 0.5187
Epoch 71/1000
4/4 [=====] - 0s 17ms/step - loss: 1.0376 - accuracy: 0.7455 - val_loss: 1.0868 - val_accuracy: 0.5327
Epoch 72/1000
4/4 [=====] - 0s 16ms/step - loss: 0.9451 - accuracy: 0.7404 - val_loss: 1.0812 - val_accuracy: 0.5467
Epoch 73/1000
4/4 [=====] - 0s 16ms/step - loss: 0.8887 - accuracy: 0.7429 - val_loss: 1.0716 - val_accuracy: 0.5467
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8690 - accuracy: 0.7558 - val_loss: 1.0614 - val_accuracy: 0.5421
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9114 - accuracy: 0.7481 - val_loss: 1.0562 - val_accuracy: 0.5374
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8983 - accuracy: 0.7455 - val_loss: 1.0444 - val_accuracy: 0.5374
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8110 - accuracy: 0.7584 - val_loss: 1.0294 - val_accuracy: 0.5374
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8143 - accuracy: 0.7506 - val_loss: 1.0145 - val_accuracy: 0.5421
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7306 - accuracy: 0.7455 - val_loss: 1.0066 - val_accuracy: 0.5421
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7475 - accuracy: 0.7532 - val_loss: 0.9992 - val_accuracy: 0.5421
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7071 - accuracy: 0.7352 - val_loss: 0.9857 - val_accuracy: 0.5514
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7295 - accuracy: 0.7481 - val_loss: 0.9857 - val_accuracy: 0.5467
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7477 - accuracy: 0.7635 - val_loss: 0.9754 - val_accuracy: 0.5607
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6700 - accuracy: 0.7481 - val_loss: 0.9655 - val_accuracy: 0.5654
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7010 - accuracy: 0.7506 - val_loss: 0.9546 - val_accuracy: 0.5794
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7244 - accuracy: 0.7712 - val_loss: 0.9314 - val_accuracy: 0.5935
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7451 - accuracy: 0.7506 - val_loss: 0.9196 - val_accuracy: 0.5981
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6364 - accuracy: 0.7532 - val_loss: 0.9073 - val_accuracy: 0.6028
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6521 - accuracy: 0.7661 - val_loss: 0.8840 - val_accuracy: 0.6075
Epoch 90/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7651 - accuracy: 0.7481 - val_loss: 0.8671 - val_accuracy: 0.6168
```

Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7341 - accuracy: 0.7763 - val_loss: 0.8118 - val_accuracy: 0.6355
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6092 - accuracy: 0.7841 - val_loss: 0.7994 - val_accuracy: 0.6262
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5939 - accuracy: 0.7558 - val_loss: 0.7929 - val_accuracy: 0.6355
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5711 - accuracy: 0.7738 - val_loss: 0.8360 - val_accuracy: 0.6355
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5905 - accuracy: 0.7532 - val_loss: 0.7693 - val_accuracy: 0.6355
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6741 - accuracy: 0.7969 - val_loss: 0.7676 - val_accuracy: 0.6355
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6116 - accuracy: 0.7532 - val_loss: 0.7737 - val_accuracy: 0.6262
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5840 - accuracy: 0.7789 - val_loss: 0.7880 - val_accuracy: 0.6308
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5463 - accuracy: 0.7789 - val_loss: 0.8128 - val_accuracy: 0.6355
Epoch 100/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6296 - accuracy: 0.7532 - val_loss: 0.7910 - val_accuracy: 0.6495
Epoch 101/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5447 - accuracy: 0.7326 - val_loss: 0.7808 - val_accuracy: 0.6402
Epoch 102/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5037 - accuracy: 0.7738 - val_loss: 0.7689 - val_accuracy: 0.6449
Epoch 103/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5034 - accuracy: 0.7661 - val_loss: 0.7114 - val_accuracy: 0.6636
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5443 - accuracy: 0.7635 - val_loss: 0.7308 - val_accuracy: 0.6776
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5218 - accuracy: 0.7815 - val_loss: 0.7479 - val_accuracy: 0.6963
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5156 - accuracy: 0.7841 - val_loss: 0.8074 - val_accuracy: 0.6916
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4928 - accuracy: 0.7763 - val_loss: 0.7701 - val_accuracy: 0.6822
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6145 - accuracy: 0.7841 - val_loss: 0.7475 - val_accuracy: 0.7103
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5314 - accuracy: 0.8149 - val_loss: 0.7944 - val_accuracy: 0.6822
Epoch 110/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4916 - accuracy: 0.7686 - val_loss: 0.7581 - val_accuracy: 0.6776
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6052 - accuracy: 0.7609 - val_loss: 0.7534 - val_accuracy: 0.6636
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4756 - accuracy: 0.7738 - val_loss: 0.7206 - val_accuracy: 0.6589
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4601 - accuracy: 0.7738 - val_loss: 0.7156 - val_accuracy: 0.6636
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5474 - accuracy: 0.7918 - val_loss: 0.7120 - val_accuracy: 0.6776
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5064 - accuracy: 0.8021 - val_loss: 0.7042 - val_accuracy: 0.6589
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4789 - accuracy: 0.7789 - val_loss: 0.7310 - val_accuracy: 0.6682
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4694 - accuracy: 0.7738 - val_loss: 0.7249 - val_accuracy: 0.6822
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4504 - accuracy: 0.7738 - val_loss: 0.7240 - val_accuracy: 0.6729
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4642 - accuracy: 0.7532 - val_loss: 0.6918 - val_accuracy: 0.6822
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5567 - accuracy: 0.7918 - val_loss: 0.7382 - val_accuracy: 0.6918

```
accuracy: 0.6869
Epoch 121/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4872 - accuracy: 0.7841 - val_loss: 0.7536 - val_accuracy: 0.6682
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4994 - accuracy: 0.7892 - val_loss: 0.7457 - val_accuracy: 0.6729
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5254 - accuracy: 0.7969 - val_loss: 0.6589 - val_accuracy: 0.6729
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5038 - accuracy: 0.7815 - val_loss: 0.6626 - val_accuracy: 0.6729
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4806 - accuracy: 0.7789 - val_loss: 0.6837 - val_accuracy: 0.6822
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4637 - accuracy: 0.7841 - val_loss: 0.6654 - val_accuracy: 0.6682
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4587 - accuracy: 0.7866 - val_loss: 0.6539 - val_accuracy: 0.6822
Epoch 128/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4239 - accuracy: 0.7918 - val_loss: 0.6478 - val_accuracy: 0.6822
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4213 - accuracy: 0.8098 - val_loss: 0.6702 - val_accuracy: 0.6963
Epoch 130/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5399 - accuracy: 0.7763 - val_loss: 0.6741 - val_accuracy: 0.6916
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4810 - accuracy: 0.8046 - val_loss: 0.6725 - val_accuracy: 0.6916
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4490 - accuracy: 0.8021 - val_loss: 0.6514 - val_accuracy: 0.7009
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4680 - accuracy: 0.8072 - val_loss: 0.6566 - val_accuracy: 0.6963
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4907 - accuracy: 0.8072 - val_loss: 0.6809 - val_accuracy: 0.7056
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5356 - accuracy: 0.7918 - val_loss: 0.6891 - val_accuracy: 0.6963
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4239 - accuracy: 0.7892 - val_loss: 0.7068 - val_accuracy: 0.7103
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4109 - accuracy: 0.7943 - val_loss: 0.6712 - val_accuracy: 0.7103
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4329 - accuracy: 0.7841 - val_loss: 0.7207 - val_accuracy: 0.7103
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4034 - accuracy: 0.7995 - val_loss: 0.6550 - val_accuracy: 0.7243
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4946 - accuracy: 0.7995 - val_loss: 0.6574 - val_accuracy: 0.7056
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4214 - accuracy: 0.7943 - val_loss: 0.6848 - val_accuracy: 0.7056
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4745 - accuracy: 0.7969 - val_loss: 0.6413 - val_accuracy: 0.7056
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4189 - accuracy: 0.8149 - val_loss: 0.6490 - val_accuracy: 0.6822
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4770 - accuracy: 0.7789 - val_loss: 0.6428 - val_accuracy: 0.6822
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4663 - accuracy: 0.7763 - val_loss: 0.6993 - val_accuracy: 0.6963
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4084 - accuracy: 0.8021 - val_loss: 0.6630 - val_accuracy: 0.7009
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3715 - accuracy: 0.7995 - val_loss: 0.6593 - val_accuracy: 0.7009
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4027 - accuracy: 0.7892 - val_loss: 0.6618 - val_accuracy: 0.7103
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4172 - accuracy: 0.7738 - val_loss: 0.6495 - val_accuracy: 0.7009
Epoch 150/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.4432 - accuracy: 0.7841 - val_loss: 0.6867 - val_accuracy: 0.6682
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4016 - accuracy: 0.7841 - val_loss: 0.7849 - val_accuracy: 0.6822
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4662 - accuracy: 0.7738 - val_loss: 0.8533 - val_accuracy: 0.7056
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3878 - accuracy: 0.8021 - val_loss: 0.8987 - val_accuracy: 0.7056
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4341 - accuracy: 0.7815 - val_loss: 0.9489 - val_accuracy: 0.7150
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3842 - accuracy: 0.7738 - val_loss: 0.9685 - val_accuracy: 0.7383
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5024 - accuracy: 0.7969 - val_loss: 0.9481 - val_accuracy: 0.7477
Epoch 157/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4229 - accuracy: 0.8046 - val_loss: 0.9653 - val_accuracy: 0.7570
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4369 - accuracy: 0.8098 - val_loss: 0.9947 - val_accuracy: 0.7664
Epoch 159/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3515 - accuracy: 0.8278 - val_loss: 0.9281 - val_accuracy: 0.7570
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3731 - accuracy: 0.8098 - val_loss: 0.8424 - val_accuracy: 0.7477
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4012 - accuracy: 0.8278 - val_loss: 0.8763 - val_accuracy: 0.7570
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4195 - accuracy: 0.8123 - val_loss: 0.8797 - val_accuracy: 0.7523
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3884 - accuracy: 0.8380 - val_loss: 0.8564 - val_accuracy: 0.7570
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4736 - accuracy: 0.8123 - val_loss: 0.8676 - val_accuracy: 0.7523
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4185 - accuracy: 0.7995 - val_loss: 0.8772 - val_accuracy: 0.7477
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4411 - accuracy: 0.8201 - val_loss: 0.8149 - val_accuracy: 0.7664
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4227 - accuracy: 0.8098 - val_loss: 0.8323 - val_accuracy: 0.7664
Epoch 168/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3857 - accuracy: 0.8278 - val_loss: 0.8074 - val_accuracy: 0.7710
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4485 - accuracy: 0.8252 - val_loss: 0.7362 - val_accuracy: 0.7850
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3379 - accuracy: 0.8201 - val_loss: 0.6992 - val_accuracy: 0.7710
Epoch 171/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3845 - accuracy: 0.8252 - val_loss: 0.9462 - val_accuracy: 0.7664
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3727 - accuracy: 0.8021 - val_loss: 0.9530 - val_accuracy: 0.7570
Epoch 173/1000
4/4 [=====] - 0s 17ms/step - loss: 0.3894 - accuracy: 0.8149 - val_loss: 0.8667 - val_accuracy: 0.7196
Epoch 174/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3343 - accuracy: 0.7969 - val_loss: 0.8933 - val_accuracy: 0.7290
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3663 - accuracy: 0.8046 - val_loss: 0.8907 - val_accuracy: 0.7336
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3396 - accuracy: 0.8021 - val_loss: 0.8750 - val_accuracy: 0.7243
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3417 - accuracy: 0.8046 - val_loss: 0.8644 - val_accuracy: 0.7056
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4025 - accuracy: 0.7866 - val_loss: 0.8315 - val_accuracy: 0.7150
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4940 - accuracy: 0.7918 - val_loss: 0.8232 - val_accuracy: 0.7103
```

Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4193 - accuracy: 0.7789 - val_loss: 0.7947 - val_accuracy: 0.7103
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3547 - accuracy: 0.7866 - val_loss: 0.8489 - val_accuracy: 0.7150
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4105 - accuracy: 0.7738 - val_loss: 0.9190 - val_accuracy: 0.7383
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3336 - accuracy: 0.7763 - val_loss: 0.9140 - val_accuracy: 0.7336
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3678 - accuracy: 0.7995 - val_loss: 0.9160 - val_accuracy: 0.7103
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3338 - accuracy: 0.7969 - val_loss: 0.9137 - val_accuracy: 0.7056
Epoch 186/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2963 - accuracy: 0.7763 - val_loss: 0.8783 - val_accuracy: 0.7150
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3892 - accuracy: 0.7712 - val_loss: 0.9032 - val_accuracy: 0.7150
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3590 - accuracy: 0.7738 - val_loss: 0.9009 - val_accuracy: 0.7150
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3128 - accuracy: 0.7841 - val_loss: 0.9061 - val_accuracy: 0.6963
Epoch 190/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4410 - accuracy: 0.7712 - val_loss: 0.9112 - val_accuracy: 0.6636
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5208 - accuracy: 0.7635 - val_loss: 0.9279 - val_accuracy: 0.7056
Epoch 192/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3566 - accuracy: 0.8175 - val_loss: 1.0057 - val_accuracy: 0.6869
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3474 - accuracy: 0.7969 - val_loss: 0.8930 - val_accuracy: 0.6916
Epoch 194/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3506 - accuracy: 0.7815 - val_loss: 0.8418 - val_accuracy: 0.6729
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3722 - accuracy: 0.7918 - val_loss: 0.9438 - val_accuracy: 0.6682
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3877 - accuracy: 0.7892 - val_loss: 0.9376 - val_accuracy: 0.6822
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3069 - accuracy: 0.8123 - val_loss: 0.9842 - val_accuracy: 0.7196
Epoch 198/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3964 - accuracy: 0.8149 - val_loss: 0.9899 - val_accuracy: 0.7056
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3227 - accuracy: 0.7918 - val_loss: 0.9069 - val_accuracy: 0.6869
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4011 - accuracy: 0.8021 - val_loss: 0.9140 - val_accuracy: 0.6963
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3496 - accuracy: 0.7943 - val_loss: 0.9468 - val_accuracy: 0.6822
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3808 - accuracy: 0.8072 - val_loss: 0.9685 - val_accuracy: 0.6963
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2996 - accuracy: 0.8098 - val_loss: 0.9325 - val_accuracy: 0.6589
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3486 - accuracy: 0.8149 - val_loss: 0.8979 - val_accuracy: 0.6495
Epoch 205/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3662 - accuracy: 0.8046 - val_loss: 0.8965 - val_accuracy: 0.6729
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3208 - accuracy: 0.8123 - val_loss: 0.9032 - val_accuracy: 0.6869
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3422 - accuracy: 0.8355 - val_loss: 0.8702 - val_accuracy: 0.6729
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4187 - accuracy: 0.8278 - val_loss: 0.8051 - val_accuracy: 0.6589
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3065 - accuracy: 0.8175 - val_loss: 0.8486 - val_accuracy: 0.6869

accuracy: 0.6402
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3017 - accuracy: 0.8252 - val_loss: 0.8428 - val_accuracy: 0.6355
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3447 - accuracy: 0.7969 - val_loss: 0.7769 - val_accuracy: 0.6028
Epoch 212/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3415 - accuracy: 0.7712 - val_loss: 0.7442 - val_accuracy: 0.6121
Epoch 213/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3450 - accuracy: 0.7789 - val_loss: 0.8320 - val_accuracy: 0.6495
Epoch 214/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3289 - accuracy: 0.7969 - val_loss: 0.8342 - val_accuracy: 0.6262
Epoch 215/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3625 - accuracy: 0.7943 - val_loss: 0.7806 - val_accuracy: 0.6262
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3352 - accuracy: 0.8252 - val_loss: 0.8899 - val_accuracy: 0.6121
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3293 - accuracy: 0.7763 - val_loss: 0.8836 - val_accuracy: 0.6075
Epoch 218/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4036 - accuracy: 0.8123 - val_loss: 0.8769 - val_accuracy: 0.6308
Epoch 219/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2900 - accuracy: 0.8149 - val_loss: 0.8324 - val_accuracy: 0.6402
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3819 - accuracy: 0.7686 - val_loss: 0.9459 - val_accuracy: 0.6495
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3532 - accuracy: 0.7789 - val_loss: 0.9376 - val_accuracy: 0.6495
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3743 - accuracy: 0.8175 - val_loss: 1.1419 - val_accuracy: 0.6963
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3984 - accuracy: 0.8046 - val_loss: 1.0468 - val_accuracy: 0.6963
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3155 - accuracy: 0.8201 - val_loss: 0.9977 - val_accuracy: 0.7056
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3652 - accuracy: 0.8226 - val_loss: 1.0234 - val_accuracy: 0.6963
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3155 - accuracy: 0.8406 - val_loss: 1.0269 - val_accuracy: 0.6963
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3364 - accuracy: 0.8380 - val_loss: 1.0255 - val_accuracy: 0.7056
Epoch 228/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3853 - accuracy: 0.8355 - val_loss: 0.9301 - val_accuracy: 0.7103
Epoch 229/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3509 - accuracy: 0.8329 - val_loss: 0.9164 - val_accuracy: 0.7290
Epoch 230/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2844 - accuracy: 0.8560 - val_loss: 0.9584 - val_accuracy: 0.7523
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3217 - accuracy: 0.8689 - val_loss: 0.9545 - val_accuracy: 0.7383
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3664 - accuracy: 0.8638 - val_loss: 0.9541 - val_accuracy: 0.7336
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3073 - accuracy: 0.8406 - val_loss: 0.9215 - val_accuracy: 0.7243
Epoch 234/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3501 - accuracy: 0.8689 - val_loss: 0.8611 - val_accuracy: 0.7009
Epoch 235/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3322 - accuracy: 0.8509 - val_loss: 0.9759 - val_accuracy: 0.7103
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3823 - accuracy: 0.8201 - val_loss: 0.9719 - val_accuracy: 0.7196
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3669 - accuracy: 0.8406 - val_loss: 0.9977 - val_accuracy: 0.7336
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2826 - accuracy: 0.8535 - val_loss: 0.9668 - val_accuracy: 0.7150
Epoch 239/1000

```
4/4 [=====] - 0s 13ms/step - loss: 0.3041 - accuracy: 0.8380 - val_loss: 0.9623 - val_accuracy: 0.7243
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2749 - accuracy: 0.8535 - val_loss: 0.9084 - val_accuracy: 0.7243
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2898 - accuracy: 0.8740 - val_loss: 0.9858 - val_accuracy: 0.7243
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3266 - accuracy: 0.8638 - val_loss: 0.9877 - val_accuracy: 0.7336
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3027 - accuracy: 0.8483 - val_loss: 0.9889 - val_accuracy: 0.7103
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2702 - accuracy: 0.8612 - val_loss: 0.9231 - val_accuracy: 0.6822
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3220 - accuracy: 0.8406 - val_loss: 0.9650 - val_accuracy: 0.6682
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3030 - accuracy: 0.8201 - val_loss: 0.9096 - val_accuracy: 0.6682
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2782 - accuracy: 0.8303 - val_loss: 0.8715 - val_accuracy: 0.6729
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2683 - accuracy: 0.8355 - val_loss: 0.8687 - val_accuracy: 0.6636
Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2762 - accuracy: 0.8355 - val_loss: 0.8940 - val_accuracy: 0.6822
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2943 - accuracy: 0.8226 - val_loss: 0.8790 - val_accuracy: 0.6822
Epoch 251/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3209 - accuracy: 0.8380 - val_loss: 0.9120 - val_accuracy: 0.6776
Epoch 252/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2791 - accuracy: 0.8380 - val_loss: 0.8982 - val_accuracy: 0.7056
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3216 - accuracy: 0.8612 - val_loss: 0.9361 - val_accuracy: 0.7243
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2691 - accuracy: 0.8535 - val_loss: 0.8982 - val_accuracy: 0.7103
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3402 - accuracy: 0.8535 - val_loss: 1.0846 - val_accuracy: 0.7336
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4502 - accuracy: 0.8380 - val_loss: 1.0757 - val_accuracy: 0.7336
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3339 - accuracy: 0.8329 - val_loss: 0.9867 - val_accuracy: 0.7243
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3695 - accuracy: 0.8226 - val_loss: 0.9757 - val_accuracy: 0.7103
Epoch 259/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2723 - accuracy: 0.8380 - val_loss: 0.9524 - val_accuracy: 0.6869
Epoch 260/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3447 - accuracy: 0.8175 - val_loss: 0.9870 - val_accuracy: 0.6729
Epoch 261/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2842 - accuracy: 0.8432 - val_loss: 0.9892 - val_accuracy: 0.6729
Epoch 262/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3243 - accuracy: 0.8329 - val_loss: 0.9216 - val_accuracy: 0.6729
Epoch 263/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2997 - accuracy: 0.8329 - val_loss: 0.9994 - val_accuracy: 0.6776
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2919 - accuracy: 0.8226 - val_loss: 1.0213 - val_accuracy: 0.6963
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2635 - accuracy: 0.8612 - val_loss: 1.0698 - val_accuracy: 0.7103
Epoch 266/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3233 - accuracy: 0.8458 - val_loss: 1.0566 - val_accuracy: 0.7056
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3488 - accuracy: 0.8406 - val_loss: 0.9056 - val_accuracy: 0.6869
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2761 - accuracy: 0.8432 - val_loss: 0.9557 - val_accuracy: 0.6916
```

Epoch 269/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2740 - accuracy: 0.8509 - val_loss: 0.9858 - val_accuracy: 0.6869
Epoch 270/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3046 - accuracy: 0.8535 - val_loss: 0.9226 - val_accuracy: 0.6822
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3238 - accuracy: 0.8535 - val_loss: 0.9529 - val_accuracy: 0.7009
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3031 - accuracy: 0.8560 - val_loss: 0.9547 - val_accuracy: 0.6776
Epoch 273/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2936 - accuracy: 0.8560 - val_loss: 0.8879 - val_accuracy: 0.6916
Epoch 274/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3027 - accuracy: 0.8483 - val_loss: 0.9674 - val_accuracy: 0.6916
Epoch 275/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3953 - accuracy: 0.8329 - val_loss: 0.9467 - val_accuracy: 0.7150
Epoch 276/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2874 - accuracy: 0.8586 - val_loss: 0.8845 - val_accuracy: 0.7009
Epoch 277/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3146 - accuracy: 0.8715 - val_loss: 0.9415 - val_accuracy: 0.7196
Epoch 278/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3323 - accuracy: 0.8740 - val_loss: 0.9552 - val_accuracy: 0.7570
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2671 - accuracy: 0.8740 - val_loss: 0.9895 - val_accuracy: 0.7430
Epoch 280/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2712 - accuracy: 0.8869 - val_loss: 0.9416 - val_accuracy: 0.7477
Epoch 281/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2979 - accuracy: 0.8586 - val_loss: 1.0205 - val_accuracy: 0.7336
Epoch 282/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4588 - accuracy: 0.8509 - val_loss: 1.1865 - val_accuracy: 0.7336
Epoch 283/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4328 - accuracy: 0.8329 - val_loss: 1.1529 - val_accuracy: 0.7430
Epoch 284/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3272 - accuracy: 0.8535 - val_loss: 1.1267 - val_accuracy: 0.7243
Epoch 285/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2732 - accuracy: 0.8458 - val_loss: 1.0653 - val_accuracy: 0.7196
Epoch 286/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3269 - accuracy: 0.8432 - val_loss: 0.9891 - val_accuracy: 0.7523
Epoch 287/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3191 - accuracy: 0.8458 - val_loss: 1.0618 - val_accuracy: 0.7477
Epoch 288/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3151 - accuracy: 0.8406 - val_loss: 1.0884 - val_accuracy: 0.7523
Epoch 289/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3142 - accuracy: 0.8535 - val_loss: 1.0470 - val_accuracy: 0.7383
Epoch 290/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3875 - accuracy: 0.8406 - val_loss: 1.0432 - val_accuracy: 0.7523
Epoch 291/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3885 - accuracy: 0.8380 - val_loss: 1.1304 - val_accuracy: 0.7477
Epoch 292/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2932 - accuracy: 0.8689 - val_loss: 1.1118 - val_accuracy: 0.7523
Epoch 293/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3270 - accuracy: 0.8689 - val_loss: 1.1431 - val_accuracy: 0.7570
Epoch 294/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3179 - accuracy: 0.8406 - val_loss: 1.0589 - val_accuracy: 0.7383
Epoch 295/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2987 - accuracy: 0.8560 - val_loss: 1.2623 - val_accuracy: 0.7290
Epoch 296/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2696 - accuracy: 0.8689 - val_loss: 1.1871 - val_accuracy: 0.7196
Epoch 297/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2699 - accuracy: 0.8380 - val_loss: 1.0092 - val_accuracy: 0.6776
Epoch 298/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2887 - accuracy: 0.8432 - val_loss: 1.0444 - val_accuracy: 0.7196

accuracy: 0.6729
Epoch 299/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2694 - accuracy: 0.8483 - val_loss: 0.9819 - val_accuracy: 0.7056
Epoch 300/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3203 - accuracy: 0.8123 - val_loss: 1.0664 - val_accuracy: 0.7196
Epoch 301/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3168 - accuracy: 0.8458 - val_loss: 1.1465 - val_accuracy: 0.7056
Epoch 302/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2858 - accuracy: 0.8458 - val_loss: 1.1543 - val_accuracy: 0.6869
Epoch 303/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3310 - accuracy: 0.8509 - val_loss: 1.0825 - val_accuracy: 0.6916
Epoch 304/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2441 - accuracy: 0.8483 - val_loss: 1.0366 - val_accuracy: 0.7336
Epoch 305/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2542 - accuracy: 0.8535 - val_loss: 1.0683 - val_accuracy: 0.7103
Epoch 306/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2591 - accuracy: 0.8380 - val_loss: 0.9675 - val_accuracy: 0.6822
Epoch 307/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2361 - accuracy: 0.8380 - val_loss: 0.9606 - val_accuracy: 0.7056
Epoch 308/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2606 - accuracy: 0.8380 - val_loss: 0.9408 - val_accuracy: 0.7150
Epoch 309/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2627 - accuracy: 0.8226 - val_loss: 0.9331 - val_accuracy: 0.7243
Epoch 310/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3229 - accuracy: 0.8355 - val_loss: 0.9621 - val_accuracy: 0.7103
Epoch 311/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3210 - accuracy: 0.8175 - val_loss: 1.0137 - val_accuracy: 0.7243
Epoch 312/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3358 - accuracy: 0.8098 - val_loss: 0.9564 - val_accuracy: 0.7523
Epoch 313/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2476 - accuracy: 0.8278 - val_loss: 0.9523 - val_accuracy: 0.7383
Epoch 314/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2847 - accuracy: 0.8329 - val_loss: 0.9535 - val_accuracy: 0.7290
Epoch 315/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2847 - accuracy: 0.8509 - val_loss: 0.9452 - val_accuracy: 0.7430
Epoch 316/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2806 - accuracy: 0.8406 - val_loss: 0.9445 - val_accuracy: 0.7196
Epoch 317/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2767 - accuracy: 0.8380 - val_loss: 1.0300 - val_accuracy: 0.7150
Epoch 318/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2427 - accuracy: 0.8483 - val_loss: 0.9932 - val_accuracy: 0.7196
Epoch 319/1000
1/4 [====>.....] - ETA: 0s - loss: 0.2691 - accuracy: 0.8359Restoring model weights from the end of the best epoch: 169.
4/4 [=====] - 0s 14ms/step - loss: 0.3023 - accuracy: 0.8201 - val_loss: 1.0525 - val_accuracy: 0.7290
Epoch 319: early stopping
2/2 [=====] - 0s 4ms/step - loss: 0.5062 - accuracy: 0.6512
[CV] ENDDense1=100, Dense2=25; total time= 17.0s
Model: "sequential_88"

Layer (type)	Output Shape	Param #
dense_352 (Dense)	(None, 100)	700
batch_normalization_264 (BatchNormalization)	(None, 100)	400
activation_264 (Activation)	(None, 100)	0
dense_353 (Dense)	(None, 25)	2525
batch_normalization_265 (BatchNormalization)	(None, 25)	100
activation_265 (Activation)	(None, 25)	0
dense_354 (Dense)	(None, 10)	260

batch_normalization_266 (Batch Normalization)	(None, 10)	40
activation_266 (Activation)	(None, 10)	0
dense_355 (Dense)	(None, 2)	22

Total params: 4,047
Trainable params: 3,777
Non-trainable params: 270

Epoch 1/1000
4/4 [=====] - 1s 58ms/step - loss: 4.8614 - accuracy: 0.5398 - val_loss: 3.9818 - val_accuracy: 0.7150
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 4.3942 - accuracy: 0.5064 - val_loss: 3.3008 - val_accuracy: 0.6729
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 4.1136 - accuracy: 0.5141 - val_loss: 2.8399 - val_accuracy: 0.6308
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8545 - accuracy: 0.5193 - val_loss: 2.6881 - val_accuracy: 0.5888
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 3.7810 - accuracy: 0.5347 - val_loss: 2.4788 - val_accuracy: 0.5607
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5693 - accuracy: 0.5424 - val_loss: 2.4487 - val_accuracy: 0.5701
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3492 - accuracy: 0.5321 - val_loss: 2.3376 - val_accuracy: 0.6355
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4668 - accuracy: 0.5656 - val_loss: 2.2461 - val_accuracy: 0.6262
Epoch 9/1000
4/4 [=====] - 0s 12ms/step - loss: 3.1360 - accuracy: 0.5810 - val_loss: 2.2169 - val_accuracy: 0.6121
Epoch 10/1000
4/4 [=====] - 0s 15ms/step - loss: 2.9900 - accuracy: 0.5578 - val_loss: 2.1716 - val_accuracy: 0.6121
Epoch 11/1000
4/4 [=====] - 0s 15ms/step - loss: 3.0471 - accuracy: 0.5527 - val_loss: 2.1500 - val_accuracy: 0.5748
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8765 - accuracy: 0.5373 - val_loss: 2.1672 - val_accuracy: 0.5841
Epoch 13/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7362 - accuracy: 0.5501 - val_loss: 2.1364 - val_accuracy: 0.5935
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7323 - accuracy: 0.6041 - val_loss: 2.0881 - val_accuracy: 0.5748
Epoch 15/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6914 - accuracy: 0.5887 - val_loss: 2.0942 - val_accuracy: 0.5187
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4878 - accuracy: 0.5758 - val_loss: 2.0994 - val_accuracy: 0.5280
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5737 - accuracy: 0.5656 - val_loss: 2.0253 - val_accuracy: 0.5187
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5158 - accuracy: 0.5604 - val_loss: 2.0388 - val_accuracy: 0.5327
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0779 - accuracy: 0.5270 - val_loss: 2.0105 - val_accuracy: 0.5561
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2052 - accuracy: 0.5630 - val_loss: 1.9754 - val_accuracy: 0.5701
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1157 - accuracy: 0.5656 - val_loss: 1.9522 - val_accuracy: 0.5888
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0949 - accuracy: 0.5630 - val_loss: 1.9266 - val_accuracy: 0.6075
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9678 - accuracy: 0.6041 - val_loss: 1.8848 - val_accuracy: 0.5140
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9797 - accuracy: 0.5527 - val_loss: 1.8867 - val_accuracy: 0.5047
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0975 - accuracy: 0.5270 - val_loss: 1.9639 - val_accuracy: 0.4907
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9322 - accuracy: 0.5167 - val_loss: 1.9381 - val_accuracy: 0.4907

```
accuracy: 0.4813
Epoch 27/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8483 - accuracy: 0.5167 - val_loss: 1.9122 - val_
accuracy: 0.4860
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8316 - accuracy: 0.5321 - val_loss: 1.9694 - val_
accuracy: 0.4813
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7385 - accuracy: 0.5938 - val_loss: 1.9344 - val_
accuracy: 0.4813
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6157 - accuracy: 0.5219 - val_loss: 1.9636 - val_
accuracy: 0.4673
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7951 - accuracy: 0.5270 - val_loss: 1.9857 - val_
accuracy: 0.4720
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5978 - accuracy: 0.5553 - val_loss: 1.9712 - val_
accuracy: 0.4720
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4750 - accuracy: 0.5064 - val_loss: 1.9550 - val_
accuracy: 0.4766
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3863 - accuracy: 0.5373 - val_loss: 1.8945 - val_
accuracy: 0.4766
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4976 - accuracy: 0.5090 - val_loss: 1.9171 - val_
accuracy: 0.4720
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4310 - accuracy: 0.5527 - val_loss: 1.9153 - val_
accuracy: 0.4766
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4647 - accuracy: 0.5476 - val_loss: 1.8391 - val_
accuracy: 0.4673
Epoch 38/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3418 - accuracy: 0.5244 - val_loss: 1.7749 - val_
accuracy: 0.4486
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2554 - accuracy: 0.5141 - val_loss: 1.7402 - val_
accuracy: 0.4626
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3562 - accuracy: 0.4987 - val_loss: 1.7160 - val_
accuracy: 0.4720
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3754 - accuracy: 0.5193 - val_loss: 1.7092 - val_
accuracy: 0.4813
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3150 - accuracy: 0.5219 - val_loss: 1.7015 - val_
accuracy: 0.4860
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3196 - accuracy: 0.5296 - val_loss: 1.7195 - val_
accuracy: 0.4907
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3056 - accuracy: 0.5347 - val_loss: 1.7384 - val_
accuracy: 0.4907
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2508 - accuracy: 0.5476 - val_loss: 1.7709 - val_
accuracy: 0.5047
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3124 - accuracy: 0.5553 - val_loss: 1.7867 - val_
accuracy: 0.4953
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1938 - accuracy: 0.5527 - val_loss: 1.7668 - val_
accuracy: 0.5047
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1823 - accuracy: 0.5656 - val_loss: 1.7392 - val_
accuracy: 0.5047
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2001 - accuracy: 0.5373 - val_loss: 1.7290 - val_
accuracy: 0.4953
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1980 - accuracy: 0.5321 - val_loss: 1.7134 - val_
accuracy: 0.5234
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0087 - accuracy: 0.5578 - val_loss: 1.6958 - val_
accuracy: 0.5234
Epoch 52/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1438 - accuracy: 0.5527 - val_loss: 1.6864 - val_
accuracy: 0.5234
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0331 - accuracy: 0.5784 - val_loss: 1.6748 - val_
accuracy: 0.5140
Epoch 54/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0982 - accuracy: 0.5681 - val_loss: 1.6536 - val_
accuracy: 0.5187
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0629 - accuracy: 0.5733 - val_loss: 1.6526 - val_
accuracy: 0.5000
Epoch 56/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 1.0372 - accuracy: 0.5887 - val_loss: 1.6378 - val_accuracy: 0.4766
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0111 - accuracy: 0.5810 - val_loss: 1.6141 - val_accuracy: 0.4860
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0562 - accuracy: 0.5424 - val_loss: 1.5922 - val_accuracy: 0.4860
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0165 - accuracy: 0.5398 - val_loss: 1.5446 - val_accuracy: 0.4860
Epoch 60/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9489 - accuracy: 0.5296 - val_loss: 1.5514 - val_accuracy: 0.4813
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9637 - accuracy: 0.5450 - val_loss: 1.5682 - val_accuracy: 0.4766
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9100 - accuracy: 0.5578 - val_loss: 1.5901 - val_accuracy: 0.4907
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7866 - accuracy: 0.5938 - val_loss: 1.5702 - val_accuracy: 0.5000
Epoch 64/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8478 - accuracy: 0.5707 - val_loss: 1.4969 - val_accuracy: 0.4953
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9285 - accuracy: 0.5810 - val_loss: 1.3944 - val_accuracy: 0.4953
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7347 - accuracy: 0.5476 - val_loss: 1.4064 - val_accuracy: 0.5093
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7975 - accuracy: 0.5707 - val_loss: 1.3856 - val_accuracy: 0.5000
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7720 - accuracy: 0.5501 - val_loss: 1.3349 - val_accuracy: 0.4860
Epoch 69/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7277 - accuracy: 0.5630 - val_loss: 1.3207 - val_accuracy: 0.5047
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6900 - accuracy: 0.5733 - val_loss: 1.2790 - val_accuracy: 0.5047
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8683 - accuracy: 0.5964 - val_loss: 1.1753 - val_accuracy: 0.5047
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7623 - accuracy: 0.5913 - val_loss: 1.1497 - val_accuracy: 0.5280
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7306 - accuracy: 0.5784 - val_loss: 1.1324 - val_accuracy: 0.5421
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7530 - accuracy: 0.5630 - val_loss: 1.1397 - val_accuracy: 0.5467
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6524 - accuracy: 0.5938 - val_loss: 1.1274 - val_accuracy: 0.5701
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8095 - accuracy: 0.5835 - val_loss: 1.0754 - val_accuracy: 0.5327
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6931 - accuracy: 0.6015 - val_loss: 1.0514 - val_accuracy: 0.5327
Epoch 78/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6633 - accuracy: 0.5913 - val_loss: 1.0637 - val_accuracy: 0.5467
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7158 - accuracy: 0.5913 - val_loss: 1.1187 - val_accuracy: 0.5047
Epoch 80/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6957 - accuracy: 0.5913 - val_loss: 1.0906 - val_accuracy: 0.5187
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7508 - accuracy: 0.5913 - val_loss: 1.0415 - val_accuracy: 0.5234
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7934 - accuracy: 0.5913 - val_loss: 1.0394 - val_accuracy: 0.5093
Epoch 83/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6836 - accuracy: 0.5810 - val_loss: 1.0506 - val_accuracy: 0.5280
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6733 - accuracy: 0.5656 - val_loss: 1.0382 - val_accuracy: 0.5234
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7626 - accuracy: 0.5501 - val_loss: 1.0134 - val_accuracy: 0.5280
```

Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6589 - accuracy: 0.5964 - val_loss: 0.9257 - val_accuracy: 0.5421
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6170 - accuracy: 0.5810 - val_loss: 0.9229 - val_accuracy: 0.5280
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6609 - accuracy: 0.5990 - val_loss: 0.9529 - val_accuracy: 0.5421
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7052 - accuracy: 0.5964 - val_loss: 0.9424 - val_accuracy: 0.5421
Epoch 90/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6583 - accuracy: 0.5887 - val_loss: 0.9462 - val_accuracy: 0.5374
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7213 - accuracy: 0.5656 - val_loss: 0.8852 - val_accuracy: 0.5421
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7942 - accuracy: 0.5578 - val_loss: 0.9062 - val_accuracy: 0.5374
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7442 - accuracy: 0.5193 - val_loss: 0.8334 - val_accuracy: 0.5374
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8080 - accuracy: 0.5398 - val_loss: 0.9087 - val_accuracy: 0.4860
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6921 - accuracy: 0.5321 - val_loss: 0.8867 - val_accuracy: 0.4252
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6834 - accuracy: 0.5193 - val_loss: 0.8678 - val_accuracy: 0.4673
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7629 - accuracy: 0.5810 - val_loss: 0.8852 - val_accuracy: 0.4720
Epoch 98/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7138 - accuracy: 0.5681 - val_loss: 0.8671 - val_accuracy: 0.4766
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6225 - accuracy: 0.5501 - val_loss: 0.8666 - val_accuracy: 0.4953
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5823 - accuracy: 0.5630 - val_loss: 0.8860 - val_accuracy: 0.3972
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6326 - accuracy: 0.4833 - val_loss: 0.9023 - val_accuracy: 0.3832
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6407 - accuracy: 0.5296 - val_loss: 0.8698 - val_accuracy: 0.3879
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6192 - accuracy: 0.5193 - val_loss: 0.9433 - val_accuracy: 0.3972
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6382 - accuracy: 0.5270 - val_loss: 0.9881 - val_accuracy: 0.4065
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5901 - accuracy: 0.5553 - val_loss: 0.9666 - val_accuracy: 0.4579
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5498 - accuracy: 0.5733 - val_loss: 0.9823 - val_accuracy: 0.4626
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6650 - accuracy: 0.5964 - val_loss: 0.9259 - val_accuracy: 0.4439
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6287 - accuracy: 0.5913 - val_loss: 0.9361 - val_accuracy: 0.4673
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6509 - accuracy: 0.5938 - val_loss: 0.9378 - val_accuracy: 0.4626
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5480 - accuracy: 0.6067 - val_loss: 0.9369 - val_accuracy: 0.4439
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5902 - accuracy: 0.5913 - val_loss: 0.9593 - val_accuracy: 0.4019
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6586 - accuracy: 0.5398 - val_loss: 0.9436 - val_accuracy: 0.4813
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5859 - accuracy: 0.5553 - val_loss: 0.9269 - val_accuracy: 0.4813
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5791 - accuracy: 0.5964 - val_loss: 0.8695 - val_accuracy: 0.4813
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6124 - accuracy: 0.6247 - val_loss: 0.8932 - val_accuracy: 0.4813

```
accuracy: 0.5187
Epoch 116/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5088 - accuracy: 0.6015 - val_loss: 0.9462 - val_accuracy: 0.5000
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5393 - accuracy: 0.5835 - val_loss: 0.9589 - val_accuracy: 0.5187
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6103 - accuracy: 0.6221 - val_loss: 0.7941 - val_accuracy: 0.5187
Epoch 119/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5110 - accuracy: 0.6298 - val_loss: 0.8208 - val_accuracy: 0.5187
Epoch 120/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5697 - accuracy: 0.6375 - val_loss: 0.9325 - val_accuracy: 0.5140
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5084 - accuracy: 0.6221 - val_loss: 0.8272 - val_accuracy: 0.5374
Epoch 122/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5113 - accuracy: 0.6118 - val_loss: 0.7798 - val_accuracy: 0.5093
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4797 - accuracy: 0.6324 - val_loss: 0.8635 - val_accuracy: 0.5140
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5857 - accuracy: 0.6195 - val_loss: 0.8387 - val_accuracy: 0.5093
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5193 - accuracy: 0.6401 - val_loss: 0.8472 - val_accuracy: 0.5187
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4902 - accuracy: 0.6221 - val_loss: 0.8923 - val_accuracy: 0.5187
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4861 - accuracy: 0.6272 - val_loss: 0.9190 - val_accuracy: 0.5187
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5369 - accuracy: 0.6427 - val_loss: 0.9249 - val_accuracy: 0.5280
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4816 - accuracy: 0.6375 - val_loss: 0.9528 - val_accuracy: 0.5280
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5087 - accuracy: 0.6195 - val_loss: 1.0377 - val_accuracy: 0.5187
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5348 - accuracy: 0.6015 - val_loss: 1.0330 - val_accuracy: 0.5421
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4923 - accuracy: 0.6298 - val_loss: 1.0933 - val_accuracy: 0.6028
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5053 - accuracy: 0.6298 - val_loss: 1.1193 - val_accuracy: 0.5935
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4121 - accuracy: 0.6684 - val_loss: 1.0211 - val_accuracy: 0.5935
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4970 - accuracy: 0.6298 - val_loss: 1.0698 - val_accuracy: 0.5794
Epoch 136/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3949 - accuracy: 0.6375 - val_loss: 1.0194 - val_accuracy: 0.5701
Epoch 137/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4108 - accuracy: 0.6504 - val_loss: 0.9586 - val_accuracy: 0.5841
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3475 - accuracy: 0.6761 - val_loss: 1.0730 - val_accuracy: 0.5981
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5547 - accuracy: 0.6530 - val_loss: 1.1012 - val_accuracy: 0.6028
Epoch 140/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3938 - accuracy: 0.6401 - val_loss: 1.0854 - val_accuracy: 0.5234
Epoch 141/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4739 - accuracy: 0.6170 - val_loss: 1.0986 - val_accuracy: 0.5421
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3627 - accuracy: 0.6427 - val_loss: 1.1822 - val_accuracy: 0.5374
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3622 - accuracy: 0.6041 - val_loss: 1.0396 - val_accuracy: 0.5234
Epoch 144/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3567 - accuracy: 0.6195 - val_loss: 1.0951 - val_accuracy: 0.5467
Epoch 145/1000
```

```

4/4 [=====] - 0s 12ms/step - loss: 0.3329 - accuracy: 0.6272 - val_loss: 1.4498 - val_accuracy: 0.5888
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3714 - accuracy: 0.5553 - val_loss: 1.5034 - val_accuracy: 0.5514
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3747 - accuracy: 0.5707 - val_loss: 1.5411 - val_accuracy: 0.5701
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3494 - accuracy: 0.5578 - val_loss: 1.5787 - val_accuracy: 0.5561
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3638 - accuracy: 0.5964 - val_loss: 1.4595 - val_accuracy: 0.5935
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4018 - accuracy: 0.6478 - val_loss: 1.4408 - val_accuracy: 0.5561
Epoch 151/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3205 - accuracy: 0.5000Restoring model weights from th
e end of the best epoch: 1.
4/4 [=====] - 0s 14ms/step - loss: 0.3460 - accuracy: 0.5784 - val_loss: 1.4012 - val_accuracy: 0.5841
Epoch 151: early stopping
2/2 [=====] - 0s 5ms/step - loss: 3.7224 - accuracy: 0.7674
[CV] END .....Dense1=100, Dense2=25; total time= 8.3s
Model: "sequential_89"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_356 (Dense)	(None, 100)	700
batch_normalization_267 (BatchNormalization)	(None, 100)	400
activation_267 (Activation)	(None, 100)	0
dense_357 (Dense)	(None, 50)	5050
batch_normalization_268 (BatchNormalization)	(None, 50)	200
activation_268 (Activation)	(None, 50)	0
dense_358 (Dense)	(None, 10)	510
batch_normalization_269 (BatchNormalization)	(None, 10)	40
activation_269 (Activation)	(None, 10)	0
dense_359 (Dense)	(None, 2)	22
<hr/>		
Total params: 6,922		
Trainable params: 6,602		
Non-trainable params: 320		

```

Epoch 1/1000
4/4 [=====] - 1s 57ms/step - loss: 4.6289 - accuracy: 0.4794 - val_loss: 2.4253 - val_accuracy: 0.5981
Epoch 2/1000
4/4 [=====] - 0s 12ms/step - loss: 3.0730 - accuracy: 0.5567 - val_loss: 2.3243 - val_accuracy: 0.5421
Epoch 3/1000
4/4 [=====] - 0s 11ms/step - loss: 2.5001 - accuracy: 0.5722 - val_loss: 2.2118 - val_accuracy: 0.4953
Epoch 4/1000
4/4 [=====] - 0s 11ms/step - loss: 2.2856 - accuracy: 0.5851 - val_loss: 2.1358 - val_accuracy: 0.3832
Epoch 5/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0494 - accuracy: 0.5593 - val_loss: 1.9683 - val_accuracy: 0.4439
Epoch 6/1000
4/4 [=====] - 0s 11ms/step - loss: 1.9368 - accuracy: 0.5851 - val_loss: 1.9538 - val_accuracy: 0.5701
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7588 - accuracy: 0.5876 - val_loss: 1.8927 - val_accuracy: 0.6449
Epoch 8/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5123 - accuracy: 0.6031 - val_loss: 1.9105 - val_accuracy: 0.6869
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4998 - accuracy: 0.6108 - val_loss: 1.8689 - val_accuracy: 0.6963
Epoch 10/1000
4/4 [=====] - 0s 11ms/step - loss: 1.5750 - accuracy: 0.5825 - val_loss: 1.8749 - val_accuracy: 0.6963
Epoch 11/1000
4/4 [=====] - 0s 11ms/step - loss: 1.4985 - accuracy: 0.6057 - val_loss: 1.9356 - val_

```

```
accuracy: 0.6869
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3733 - accuracy: 0.6340 - val_loss: 1.9312 - val_accuracy: 0.6776
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3928 - accuracy: 0.6237 - val_loss: 1.9056 - val_accuracy: 0.6822
Epoch 14/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2148 - accuracy: 0.6186 - val_loss: 1.8613 - val_accuracy: 0.6869
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2686 - accuracy: 0.6366 - val_loss: 1.7887 - val_accuracy: 0.6916
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2119 - accuracy: 0.6340 - val_loss: 1.7904 - val_accuracy: 0.6916
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1223 - accuracy: 0.6237 - val_loss: 1.7765 - val_accuracy: 0.6916
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0217 - accuracy: 0.6263 - val_loss: 1.7618 - val_accuracy: 0.6869
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9478 - accuracy: 0.6340 - val_loss: 1.8406 - val_accuracy: 0.6729
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9367 - accuracy: 0.6160 - val_loss: 1.7845 - val_accuracy: 0.6495
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8829 - accuracy: 0.5954 - val_loss: 1.7483 - val_accuracy: 0.6589
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8939 - accuracy: 0.6057 - val_loss: 1.7283 - val_accuracy: 0.6542
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8453 - accuracy: 0.6211 - val_loss: 1.6181 - val_accuracy: 0.6402
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8803 - accuracy: 0.6186 - val_loss: 1.5693 - val_accuracy: 0.6542
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8925 - accuracy: 0.5979 - val_loss: 1.4538 - val_accuracy: 0.6542
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7596 - accuracy: 0.6186 - val_loss: 1.4140 - val_accuracy: 0.6776
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9096 - accuracy: 0.6186 - val_loss: 1.3890 - val_accuracy: 0.6822
Epoch 28/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7896 - accuracy: 0.6108 - val_loss: 1.3610 - val_accuracy: 0.6869
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7233 - accuracy: 0.6057 - val_loss: 1.2994 - val_accuracy: 0.7150
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6285 - accuracy: 0.6366 - val_loss: 1.2641 - val_accuracy: 0.7196
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6401 - accuracy: 0.6160 - val_loss: 1.2518 - val_accuracy: 0.7336
Epoch 32/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6617 - accuracy: 0.6392 - val_loss: 1.2336 - val_accuracy: 0.7523
Epoch 33/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6862 - accuracy: 0.6495 - val_loss: 1.2292 - val_accuracy: 0.7523
Epoch 34/1000
4/4 [=====] - 0s 16ms/step - loss: 0.6929 - accuracy: 0.6624 - val_loss: 1.2386 - val_accuracy: 0.6869
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7123 - accuracy: 0.6546 - val_loss: 1.2440 - val_accuracy: 0.6822
Epoch 36/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7446 - accuracy: 0.6624 - val_loss: 1.2377 - val_accuracy: 0.6776
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6125 - accuracy: 0.6649 - val_loss: 1.2444 - val_accuracy: 0.6636
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5843 - accuracy: 0.6572 - val_loss: 1.2389 - val_accuracy: 0.6542
Epoch 39/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5676 - accuracy: 0.6804 - val_loss: 1.2374 - val_accuracy: 0.6542
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5659 - accuracy: 0.6778 - val_loss: 1.2295 - val_accuracy: 0.6729
Epoch 41/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.4904 - accuracy: 0.6624 - val_loss: 1.2319 - val_accuracy: 0.6869
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5145 - accuracy: 0.6675 - val_loss: 1.2545 - val_accuracy: 0.6869
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5435 - accuracy: 0.6701 - val_loss: 1.2529 - val_accuracy: 0.6682
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4031 - accuracy: 0.6572 - val_loss: 1.2713 - val_accuracy: 0.6636
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5687 - accuracy: 0.6701 - val_loss: 1.2518 - val_accuracy: 0.6636
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4707 - accuracy: 0.6856 - val_loss: 1.2055 - val_accuracy: 0.6729
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4408 - accuracy: 0.6598 - val_loss: 1.2225 - val_accuracy: 0.6963
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5858 - accuracy: 0.6443 - val_loss: 1.1601 - val_accuracy: 0.7150
Epoch 49/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5600 - accuracy: 0.6598 - val_loss: 1.1570 - val_accuracy: 0.7336
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6626 - accuracy: 0.6675 - val_loss: 1.1475 - val_accuracy: 0.7430
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4978 - accuracy: 0.6727 - val_loss: 1.1784 - val_accuracy: 0.7383
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4639 - accuracy: 0.6340 - val_loss: 1.1723 - val_accuracy: 0.7383
Epoch 53/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4652 - accuracy: 0.6521 - val_loss: 1.1699 - val_accuracy: 0.7336
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5148 - accuracy: 0.6418 - val_loss: 1.1455 - val_accuracy: 0.7290
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4345 - accuracy: 0.6443 - val_loss: 1.1244 - val_accuracy: 0.7336
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4512 - accuracy: 0.6907 - val_loss: 1.1018 - val_accuracy: 0.7290
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5339 - accuracy: 0.6624 - val_loss: 1.0836 - val_accuracy: 0.7290
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4594 - accuracy: 0.6727 - val_loss: 1.0630 - val_accuracy: 0.7290
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4888 - accuracy: 0.6753 - val_loss: 1.0489 - val_accuracy: 0.7290
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4395 - accuracy: 0.6753 - val_loss: 1.0221 - val_accuracy: 0.7103
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4099 - accuracy: 0.6933 - val_loss: 0.9990 - val_accuracy: 0.7196
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4317 - accuracy: 0.6701 - val_loss: 0.9899 - val_accuracy: 0.7383
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4773 - accuracy: 0.7139 - val_loss: 0.8900 - val_accuracy: 0.7430
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4034 - accuracy: 0.6804 - val_loss: 0.8569 - val_accuracy: 0.7477
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4414 - accuracy: 0.6856 - val_loss: 0.7649 - val_accuracy: 0.7430
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4698 - accuracy: 0.7113 - val_loss: 0.7594 - val_accuracy: 0.7477
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4058 - accuracy: 0.6959 - val_loss: 0.7263 - val_accuracy: 0.7243
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4068 - accuracy: 0.6881 - val_loss: 0.7067 - val_accuracy: 0.7336
Epoch 69/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4051 - accuracy: 0.7036 - val_loss: 0.7096 - val_accuracy: 0.7290
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4921 - accuracy: 0.6959 - val_loss: 0.7309 - val_accuracy: 0.7477
```

Epoch 71/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4106 - accuracy: 0.7191 - val_loss: 0.7167 - val_accuracy: 0.7383
Epoch 72/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3991 - accuracy: 0.7191 - val_loss: 0.7066 - val_accuracy: 0.7477
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4310 - accuracy: 0.7036 - val_loss: 0.7023 - val_accuracy: 0.7477
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4009 - accuracy: 0.7294 - val_loss: 0.7428 - val_accuracy: 0.7477
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4416 - accuracy: 0.7113 - val_loss: 0.7161 - val_accuracy: 0.7570
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3712 - accuracy: 0.7448 - val_loss: 0.7063 - val_accuracy: 0.7477
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3826 - accuracy: 0.7320 - val_loss: 0.7052 - val_accuracy: 0.7477
Epoch 78/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3754 - accuracy: 0.7397 - val_loss: 0.7297 - val_accuracy: 0.7383
Epoch 79/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5171 - accuracy: 0.7113 - val_loss: 0.7207 - val_accuracy: 0.7430
Epoch 80/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3236 - accuracy: 0.7423 - val_loss: 0.7074 - val_accuracy: 0.7336
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3745 - accuracy: 0.7552 - val_loss: 0.6537 - val_accuracy: 0.7243
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3737 - accuracy: 0.7191 - val_loss: 0.6807 - val_accuracy: 0.7523
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4490 - accuracy: 0.7320 - val_loss: 0.6695 - val_accuracy: 0.7383
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3555 - accuracy: 0.7268 - val_loss: 0.6735 - val_accuracy: 0.7336
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3987 - accuracy: 0.7423 - val_loss: 0.7270 - val_accuracy: 0.7383
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3759 - accuracy: 0.7294 - val_loss: 0.7613 - val_accuracy: 0.7290
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3294 - accuracy: 0.7268 - val_loss: 0.7467 - val_accuracy: 0.7290
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3585 - accuracy: 0.7294 - val_loss: 0.7421 - val_accuracy: 0.7336
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4084 - accuracy: 0.7371 - val_loss: 0.7450 - val_accuracy: 0.7383
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2855 - accuracy: 0.7345 - val_loss: 0.7930 - val_accuracy: 0.7430
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3857 - accuracy: 0.7113 - val_loss: 0.7746 - val_accuracy: 0.7477
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3556 - accuracy: 0.7423 - val_loss: 0.7768 - val_accuracy: 0.7430
Epoch 93/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3507 - accuracy: 0.7655 - val_loss: 0.8046 - val_accuracy: 0.7477
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2810 - accuracy: 0.7423 - val_loss: 0.7956 - val_accuracy: 0.7430
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3730 - accuracy: 0.7165 - val_loss: 0.7896 - val_accuracy: 0.6963
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3171 - accuracy: 0.7423 - val_loss: 0.8040 - val_accuracy: 0.7009
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2901 - accuracy: 0.7526 - val_loss: 0.8127 - val_accuracy: 0.7336
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2886 - accuracy: 0.7629 - val_loss: 0.8210 - val_accuracy: 0.7477
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3281 - accuracy: 0.7577 - val_loss: 0.8068 - val_accuracy: 0.7243
Epoch 100/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3171 - accuracy: 0.7552 - val_loss: 0.8392 - val_accuracy: 0.7243

```
accuracy: 0.6916
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2846 - accuracy: 0.7500 - val_loss: 0.8525 - val_accuracy: 0.7056
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3952 - accuracy: 0.7526 - val_loss: 0.8610 - val_accuracy: 0.7336
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3124 - accuracy: 0.7552 - val_loss: 0.8351 - val_accuracy: 0.7150
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3737 - accuracy: 0.7680 - val_loss: 0.8307 - val_accuracy: 0.7383
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3441 - accuracy: 0.7680 - val_loss: 0.7997 - val_accuracy: 0.7243
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3468 - accuracy: 0.7397 - val_loss: 0.7982 - val_accuracy: 0.7290
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3361 - accuracy: 0.7397 - val_loss: 0.8600 - val_accuracy: 0.7243
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3094 - accuracy: 0.7165 - val_loss: 0.8405 - val_accuracy: 0.7103
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2975 - accuracy: 0.7345 - val_loss: 0.9378 - val_accuracy: 0.7196
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2765 - accuracy: 0.7526 - val_loss: 0.9382 - val_accuracy: 0.7009
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2873 - accuracy: 0.7242 - val_loss: 0.9903 - val_accuracy: 0.7009
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3487 - accuracy: 0.7242 - val_loss: 0.9914 - val_accuracy: 0.7056
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3123 - accuracy: 0.7345 - val_loss: 0.9599 - val_accuracy: 0.7056
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2623 - accuracy: 0.7320 - val_loss: 0.9298 - val_accuracy: 0.7243
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2939 - accuracy: 0.7526 - val_loss: 0.9309 - val_accuracy: 0.7009
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2855 - accuracy: 0.7500 - val_loss: 0.9360 - val_accuracy: 0.7150
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2851 - accuracy: 0.7526 - val_loss: 0.9343 - val_accuracy: 0.7150
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2643 - accuracy: 0.7371 - val_loss: 0.9974 - val_accuracy: 0.7243
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3266 - accuracy: 0.7320 - val_loss: 0.8679 - val_accuracy: 0.7103
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3348 - accuracy: 0.7423 - val_loss: 0.9752 - val_accuracy: 0.7009
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2847 - accuracy: 0.7371 - val_loss: 0.9678 - val_accuracy: 0.7009
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3163 - accuracy: 0.7552 - val_loss: 0.9761 - val_accuracy: 0.7150
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3585 - accuracy: 0.7268 - val_loss: 0.9757 - val_accuracy: 0.7196
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2582 - accuracy: 0.7448 - val_loss: 1.0442 - val_accuracy: 0.7196
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2498 - accuracy: 0.7320 - val_loss: 1.1274 - val_accuracy: 0.7196
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3218 - accuracy: 0.7706 - val_loss: 1.1786 - val_accuracy: 0.7430
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3201 - accuracy: 0.7345 - val_loss: 1.2442 - val_accuracy: 0.6963
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2841 - accuracy: 0.7242 - val_loss: 1.1845 - val_accuracy: 0.7103
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3308 - accuracy: 0.7294 - val_loss: 1.1885 - val_accuracy: 0.7290
Epoch 130/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3380 - accuracy: 0.7552 - val_loss: 1.1306 - val_accuracy: 0.6963
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2655 - accuracy: 0.7423 - val_loss: 1.1491 - val_accuracy: 0.7009
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3045 - accuracy: 0.7371 - val_loss: 1.1762 - val_accuracy: 0.7009
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3227 - accuracy: 0.7474 - val_loss: 1.1397 - val_accuracy: 0.7103
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3270 - accuracy: 0.7706 - val_loss: 1.1390 - val_accuracy: 0.7009
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2852 - accuracy: 0.7448 - val_loss: 1.1385 - val_accuracy: 0.7056
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2538 - accuracy: 0.7423 - val_loss: 1.1636 - val_accuracy: 0.7056
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3369 - accuracy: 0.7603 - val_loss: 1.2174 - val_accuracy: 0.6963
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2780 - accuracy: 0.7629 - val_loss: 1.1914 - val_accuracy: 0.6869
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3501 - accuracy: 0.7423 - val_loss: 1.2127 - val_accuracy: 0.6869
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3659 - accuracy: 0.7655 - val_loss: 1.2419 - val_accuracy: 0.6542
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3343 - accuracy: 0.7758 - val_loss: 1.2824 - val_accuracy: 0.6869
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3360 - accuracy: 0.7655 - val_loss: 1.1961 - val_accuracy: 0.7009
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3284 - accuracy: 0.7680 - val_loss: 1.2520 - val_accuracy: 0.7056
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2554 - accuracy: 0.7784 - val_loss: 1.2510 - val_accuracy: 0.7150
Epoch 145/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2828 - accuracy: 0.7629 - val_loss: 1.2216 - val_accuracy: 0.7196
Epoch 146/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2805 - accuracy: 0.7758 - val_loss: 1.2167 - val_accuracy: 0.6963
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2797 - accuracy: 0.7448 - val_loss: 1.1939 - val_accuracy: 0.7196
Epoch 148/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3926 - accuracy: 0.7474 - val_loss: 1.2212 - val_accuracy: 0.6963
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3414 - accuracy: 0.7423 - val_loss: 1.2487 - val_accuracy: 0.6822
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3088 - accuracy: 0.7448 - val_loss: 1.2644 - val_accuracy: 0.6542
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2655 - accuracy: 0.7680 - val_loss: 1.2522 - val_accuracy: 0.6729
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2746 - accuracy: 0.7732 - val_loss: 1.2810 - val_accuracy: 0.6869
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2746 - accuracy: 0.7655 - val_loss: 1.2718 - val_accuracy: 0.7056
Epoch 154/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3002 - accuracy: 0.7680 - val_loss: 1.2620 - val_accuracy: 0.7009
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2729 - accuracy: 0.7835 - val_loss: 1.3217 - val_accuracy: 0.7150
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3210 - accuracy: 0.7990 - val_loss: 1.3689 - val_accuracy: 0.7056
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2730 - accuracy: 0.7603 - val_loss: 1.3292 - val_accuracy: 0.7056
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3177 - accuracy: 0.7809 - val_loss: 1.3994 - val_accuracy: 0.6963
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3028 - accuracy: 0.7680 - val_loss: 1.4603 - val_accuracy: 0.7103
```

Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3107 - accuracy: 0.7577 - val_loss: 1.4636 - val_accuracy: 0.7056
Epoch 161/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3506 - accuracy: 0.7552 - val_loss: 1.6033 - val_accuracy: 0.7009
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3316 - accuracy: 0.7732 - val_loss: 1.5715 - val_accuracy: 0.7009
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3280 - accuracy: 0.7577 - val_loss: 1.4822 - val_accuracy: 0.7196
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3338 - accuracy: 0.7809 - val_loss: 1.4903 - val_accuracy: 0.7196
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3904 - accuracy: 0.7655 - val_loss: 1.5686 - val_accuracy: 0.7009
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3144 - accuracy: 0.7500 - val_loss: 1.5144 - val_accuracy: 0.6916
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2696 - accuracy: 0.8041 - val_loss: 1.5152 - val_accuracy: 0.7103
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3066 - accuracy: 0.7526 - val_loss: 1.3783 - val_accuracy: 0.7150
Epoch 169/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3004 - accuracy: 0.7706 - val_loss: 1.4159 - val_accuracy: 0.7290
Epoch 170/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2480 - accuracy: 0.7706 - val_loss: 1.4139 - val_accuracy: 0.7383
Epoch 171/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3216 - accuracy: 0.7809 - val_loss: 1.4983 - val_accuracy: 0.7290
Epoch 172/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3166 - accuracy: 0.7680 - val_loss: 1.5267 - val_accuracy: 0.7103
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2797 - accuracy: 0.7474 - val_loss: 1.5271 - val_accuracy: 0.7150
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2643 - accuracy: 0.7655 - val_loss: 1.5212 - val_accuracy: 0.7009
Epoch 175/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2490 - accuracy: 0.7423 - val_loss: 1.4851 - val_accuracy: 0.6963
Epoch 176/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3162 - accuracy: 0.7603 - val_loss: 1.6198 - val_accuracy: 0.7056
Epoch 177/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2632 - accuracy: 0.7758 - val_loss: 1.6214 - val_accuracy: 0.6963
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2706 - accuracy: 0.7371 - val_loss: 1.5214 - val_accuracy: 0.7290
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2259 - accuracy: 0.7577 - val_loss: 1.5471 - val_accuracy: 0.7103
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2186 - accuracy: 0.7242 - val_loss: 1.4117 - val_accuracy: 0.7243
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1882 - accuracy: 0.7577 - val_loss: 1.4301 - val_accuracy: 0.7196
Epoch 182/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3323 - accuracy: 0.7552 - val_loss: 1.3946 - val_accuracy: 0.7430
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2037 - accuracy: 0.7887 - val_loss: 1.4929 - val_accuracy: 0.7477
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2834 - accuracy: 0.7706 - val_loss: 1.5124 - val_accuracy: 0.7430
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2194 - accuracy: 0.7706 - val_loss: 1.4711 - val_accuracy: 0.7103
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2095 - accuracy: 0.7835 - val_loss: 1.5269 - val_accuracy: 0.6869
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2346 - accuracy: 0.7706 - val_loss: 1.6629 - val_accuracy: 0.7196
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2830 - accuracy: 0.8067 - val_loss: 1.7173 - val_accuracy: 0.7383
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3289 - accuracy: 0.8170 - val_loss: 1.6384 - val_accuracy: 0.7383

```
accuracy: 0.7196
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3290 - accuracy: 0.7861 - val_loss: 1.4397 - val_
accuracy: 0.6963
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2582 - accuracy: 0.7655 - val_loss: 1.3866 - val_
accuracy: 0.6869
Epoch 192/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2244 - accuracy: 0.8015 - val_loss: 1.4424 - val_
accuracy: 0.6869
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2350 - accuracy: 0.7861 - val_loss: 1.4834 - val_
accuracy: 0.6776
Epoch 194/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2247 - accuracy: 0.7861 - val_loss: 1.5039 - val_
accuracy: 0.6963
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2196 - accuracy: 0.7784 - val_loss: 1.5036 - val_
accuracy: 0.7103
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2342 - accuracy: 0.7990 - val_loss: 1.5331 - val_
accuracy: 0.7103
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2195 - accuracy: 0.7990 - val_loss: 1.5268 - val_
accuracy: 0.7150
Epoch 198/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2440 - accuracy: 0.8041 - val_loss: 1.5773 - val_
accuracy: 0.7009
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4725 - accuracy: 0.7990 - val_loss: 1.7567 - val_
accuracy: 0.7009
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3692 - accuracy: 0.7861 - val_loss: 1.7068 - val_
accuracy: 0.7196
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2728 - accuracy: 0.7629 - val_loss: 1.6677 - val_
accuracy: 0.7290
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2287 - accuracy: 0.8144 - val_loss: 1.8711 - val_
accuracy: 0.7150
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2553 - accuracy: 0.7938 - val_loss: 1.7436 - val_
accuracy: 0.6869
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1932 - accuracy: 0.8144 - val_loss: 1.6341 - val_
accuracy: 0.6869
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2022 - accuracy: 0.8170 - val_loss: 1.5726 - val_
accuracy: 0.6822
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2524 - accuracy: 0.7861 - val_loss: 1.6162 - val_
accuracy: 0.7243
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2300 - accuracy: 0.7964 - val_loss: 1.6656 - val_
accuracy: 0.7243
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2536 - accuracy: 0.7732 - val_loss: 1.6604 - val_
accuracy: 0.7103
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3422 - accuracy: 0.7680 - val_loss: 1.6062 - val_
accuracy: 0.7383
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2264 - accuracy: 0.7835 - val_loss: 1.6795 - val_
accuracy: 0.7336
Epoch 211/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2270 - accuracy: 0.7938 - val_loss: 1.6313 - val_
accuracy: 0.7243
Epoch 212/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1833 - accuracy: 0.7990 - val_loss: 1.6894 - val_
accuracy: 0.7243
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2021 - accuracy: 0.8144 - val_loss: 1.6782 - val_
accuracy: 0.7383
Epoch 214/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1980 - accuracy: 0.8247 - val_loss: 1.6317 - val_
accuracy: 0.7430
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2098 - accuracy: 0.7964 - val_loss: 1.8093 - val_
accuracy: 0.7523
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2251 - accuracy: 0.7964 - val_loss: 1.7196 - val_
accuracy: 0.7383
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1934 - accuracy: 0.8067 - val_loss: 1.6062 - val_
accuracy: 0.7383
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2053 - accuracy: 0.7809 - val_loss: 1.6050 - val_
accuracy: 0.7009
Epoch 219/1000
```

```

4/4 [=====] - 0s 13ms/step - loss: 0.2760 - accuracy: 0.7990 - val_loss: 1.4934 - val_accuracy: 0.7009
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2352 - accuracy: 0.7784 - val_loss: 1.5349 - val_accuracy: 0.7103
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2883 - accuracy: 0.7835 - val_loss: 1.4773 - val_accuracy: 0.7009
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2240 - accuracy: 0.7835 - val_loss: 1.4154 - val_accuracy: 0.7056
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1968 - accuracy: 0.7809 - val_loss: 1.4549 - val_accuracy: 0.6729
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2127 - accuracy: 0.7809 - val_loss: 1.3971 - val_accuracy: 0.6729
Epoch 225/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3435 - accuracy: 0.7109Restoring model weights from th
e end of the best epoch: 75.
4/4 [=====] - 0s 13ms/step - loss: 0.1908 - accuracy: 0.7706 - val_loss: 1.3696 - val_accuracy: 0.6682
Epoch 225: early stopping
2/2 [=====] - 0s 5ms/step - loss: 1.0217 - accuracy: 0.7273
[CV] END .....Dense1=100, Dense2=50; total time= 11.6s
Model: "sequential_90"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_360 (Dense)	(None, 100)	700
batch_normalization_270 (BatchNormalization)	(None, 100)	400
activation_270 (Activation)	(None, 100)	0
dense_361 (Dense)	(None, 50)	5050
batch_normalization_271 (BatchNormalization)	(None, 50)	200
activation_271 (Activation)	(None, 50)	0
dense_362 (Dense)	(None, 10)	510
batch_normalization_272 (BatchNormalization)	(None, 10)	40
activation_272 (Activation)	(None, 10)	0
dense_363 (Dense)	(None, 2)	22
<hr/>		
Total params:	6,922	
Trainable params:	6,602	
Non-trainable params:	320	

```

Epoch 1/1000
4/4 [=====] - 2s 57ms/step - loss: 4.7827 - accuracy: 0.5902 - val_loss: 7.4138 - val_accuracy: 0.5374
Epoch 2/1000
4/4 [=====] - 0s 15ms/step - loss: 4.1783 - accuracy: 0.6186 - val_loss: 5.8089 - val_accuracy: 0.6869
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 4.0650 - accuracy: 0.6366 - val_loss: 5.2212 - val_accuracy: 0.6776
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9286 - accuracy: 0.6598 - val_loss: 4.7805 - val_accuracy: 0.6729
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 3.9253 - accuracy: 0.6701 - val_loss: 4.3774 - val_accuracy: 0.6636
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 3.9732 - accuracy: 0.7010 - val_loss: 3.9056 - val_accuracy: 0.6495
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 3.9024 - accuracy: 0.6727 - val_loss: 3.6129 - val_accuracy: 0.6402
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 3.8693 - accuracy: 0.6856 - val_loss: 3.2826 - val_accuracy: 0.6215
Epoch 9/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8939 - accuracy: 0.6881 - val_loss: 2.9156 - val_accuracy: 0.6262
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8589 - accuracy: 0.6649 - val_loss: 2.6872 - val_accuracy: 0.6168
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 3.9763 - accuracy: 0.7062 - val_loss: 2.5206 - val_

```

accuracy: 0.6075
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8869 - accuracy: 0.7191 - val_loss: 2.4336 - val_accuracy: 0.6168
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 3.9294 - accuracy: 0.7294 - val_loss: 2.2659 - val_accuracy: 0.6121
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 3.9453 - accuracy: 0.7113 - val_loss: 2.2412 - val_accuracy: 0.6121
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8530 - accuracy: 0.6933 - val_loss: 2.1834 - val_accuracy: 0.6075
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8696 - accuracy: 0.6933 - val_loss: 2.1123 - val_accuracy: 0.6168
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8548 - accuracy: 0.6959 - val_loss: 2.0885 - val_accuracy: 0.6168
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 3.9860 - accuracy: 0.6830 - val_loss: 2.0620 - val_accuracy: 0.6028
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8488 - accuracy: 0.7010 - val_loss: 2.0003 - val_accuracy: 0.5935
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8518 - accuracy: 0.7036 - val_loss: 1.9876 - val_accuracy: 0.5935
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 3.9087 - accuracy: 0.6881 - val_loss: 1.9721 - val_accuracy: 0.5981
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8317 - accuracy: 0.7139 - val_loss: 1.9551 - val_accuracy: 0.5935
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8370 - accuracy: 0.6881 - val_loss: 1.9368 - val_accuracy: 0.5841
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8849 - accuracy: 0.6856 - val_loss: 1.9323 - val_accuracy: 0.5888
Epoch 25/1000
4/4 [=====] - 0s 14ms/step - loss: 3.8083 - accuracy: 0.6907 - val_loss: 1.9191 - val_accuracy: 0.5794
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 3.9049 - accuracy: 0.7062 - val_loss: 1.8567 - val_accuracy: 0.5841
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8417 - accuracy: 0.6959 - val_loss: 1.8442 - val_accuracy: 0.5888
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8198 - accuracy: 0.7242 - val_loss: 1.8185 - val_accuracy: 0.5888
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8516 - accuracy: 0.7062 - val_loss: 1.7988 - val_accuracy: 0.5888
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8357 - accuracy: 0.7113 - val_loss: 1.7800 - val_accuracy: 0.5935
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8530 - accuracy: 0.7062 - val_loss: 1.7503 - val_accuracy: 0.6028
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8064 - accuracy: 0.7062 - val_loss: 1.7608 - val_accuracy: 0.5935
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7479 - accuracy: 0.7088 - val_loss: 1.7687 - val_accuracy: 0.5981
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7755 - accuracy: 0.7268 - val_loss: 1.8319 - val_accuracy: 0.5935
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8028 - accuracy: 0.7294 - val_loss: 1.7102 - val_accuracy: 0.5888
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7868 - accuracy: 0.7242 - val_loss: 1.7238 - val_accuracy: 0.5935
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8266 - accuracy: 0.7036 - val_loss: 1.7738 - val_accuracy: 0.5981
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8574 - accuracy: 0.6933 - val_loss: 1.7925 - val_accuracy: 0.5841
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8286 - accuracy: 0.7165 - val_loss: 1.8401 - val_accuracy: 0.5888
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7971 - accuracy: 0.7191 - val_loss: 1.7907 - val_accuracy: 0.5981
Epoch 41/1000

```
4/4 [=====] - 0s 13ms/step - loss: 3.8606 - accuracy: 0.7191 - val_loss: 1.7845 - val_accuracy: 0.5981
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7913 - accuracy: 0.7191 - val_loss: 1.8459 - val_accuracy: 0.5981
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7964 - accuracy: 0.7088 - val_loss: 1.9061 - val_accuracy: 0.5981
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7778 - accuracy: 0.7216 - val_loss: 1.9018 - val_accuracy: 0.5981
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8233 - accuracy: 0.7216 - val_loss: 1.8775 - val_accuracy: 0.5981
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8063 - accuracy: 0.7216 - val_loss: 1.9603 - val_accuracy: 0.6075
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7397 - accuracy: 0.7423 - val_loss: 1.8618 - val_accuracy: 0.6262
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7738 - accuracy: 0.7345 - val_loss: 1.8264 - val_accuracy: 0.6262
Epoch 49/1000
4/4 [=====] - 0s 11ms/step - loss: 3.7659 - accuracy: 0.7423 - val_loss: 1.8200 - val_accuracy: 0.6402
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7699 - accuracy: 0.7371 - val_loss: 1.7989 - val_accuracy: 0.6262
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7806 - accuracy: 0.7603 - val_loss: 1.8205 - val_accuracy: 0.6355
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7739 - accuracy: 0.7448 - val_loss: 1.7266 - val_accuracy: 0.6449
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8016 - accuracy: 0.7680 - val_loss: 1.8258 - val_accuracy: 0.6449
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7041 - accuracy: 0.7758 - val_loss: 1.8566 - val_accuracy: 0.6589
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7684 - accuracy: 0.7809 - val_loss: 1.9434 - val_accuracy: 0.6682
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7650 - accuracy: 0.7732 - val_loss: 1.9566 - val_accuracy: 0.6729
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7486 - accuracy: 0.7500 - val_loss: 1.9780 - val_accuracy: 0.6589
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7969 - accuracy: 0.7603 - val_loss: 2.0435 - val_accuracy: 0.6542
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8198 - accuracy: 0.7423 - val_loss: 2.0700 - val_accuracy: 0.6729
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7956 - accuracy: 0.7474 - val_loss: 2.0553 - val_accuracy: 0.6729
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8089 - accuracy: 0.7552 - val_loss: 2.0686 - val_accuracy: 0.6869
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7507 - accuracy: 0.7500 - val_loss: 2.1566 - val_accuracy: 0.6869
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7376 - accuracy: 0.7706 - val_loss: 2.2782 - val_accuracy: 0.6822
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6969 - accuracy: 0.7603 - val_loss: 2.3166 - val_accuracy: 0.6916
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8158 - accuracy: 0.7552 - val_loss: 2.3332 - val_accuracy: 0.6776
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7384 - accuracy: 0.7629 - val_loss: 2.3844 - val_accuracy: 0.6682
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7273 - accuracy: 0.7655 - val_loss: 2.3038 - val_accuracy: 0.6776
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7126 - accuracy: 0.7655 - val_loss: 2.3160 - val_accuracy: 0.6542
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7166 - accuracy: 0.7552 - val_loss: 2.3839 - val_accuracy: 0.6308
Epoch 70/1000
4/4 [=====] - 0s 11ms/step - loss: 3.6824 - accuracy: 0.7758 - val_loss: 2.3856 - val_accuracy: 0.6215
```

Epoch 71/1000
4/4 [=====] - 0s 11ms/step - loss: 3.7115 - accuracy: 0.7706 - val_loss: 2.3794 - val_accuracy: 0.6355
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7220 - accuracy: 0.7655 - val_loss: 2.3895 - val_accuracy: 0.6355
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 3.6657 - accuracy: 0.7552 - val_loss: 2.4768 - val_accuracy: 0.6215
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6977 - accuracy: 0.7603 - val_loss: 2.5704 - val_accuracy: 0.6121
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 3.6333 - accuracy: 0.7552 - val_loss: 2.7912 - val_accuracy: 0.6355
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6293 - accuracy: 0.7680 - val_loss: 2.7947 - val_accuracy: 0.6308
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 3.6322 - accuracy: 0.7809 - val_loss: 2.7390 - val_accuracy: 0.6495
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 3.6095 - accuracy: 0.7603 - val_loss: 2.7887 - val_accuracy: 0.6636
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 3.6822 - accuracy: 0.7474 - val_loss: 2.7430 - val_accuracy: 0.6589
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6858 - accuracy: 0.7320 - val_loss: 2.7019 - val_accuracy: 0.6449
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 3.6530 - accuracy: 0.7526 - val_loss: 2.6711 - val_accuracy: 0.6729
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 3.6785 - accuracy: 0.7680 - val_loss: 2.7516 - val_accuracy: 0.6776
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 3.6787 - accuracy: 0.7680 - val_loss: 2.6562 - val_accuracy: 0.6449
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7041 - accuracy: 0.7526 - val_loss: 2.6701 - val_accuracy: 0.6402
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 3.6048 - accuracy: 0.7474 - val_loss: 2.6501 - val_accuracy: 0.6682
Epoch 86/1000
4/4 [=====] - 0s 14ms/step - loss: 3.6538 - accuracy: 0.7680 - val_loss: 2.6879 - val_accuracy: 0.6636
Epoch 87/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5408 - accuracy: 0.7732 - val_loss: 2.7326 - val_accuracy: 0.6729
Epoch 88/1000
4/4 [=====] - 0s 15ms/step - loss: 3.6349 - accuracy: 0.7629 - val_loss: 2.7063 - val_accuracy: 0.6776
Epoch 89/1000
4/4 [=====] - 0s 20ms/step - loss: 3.4911 - accuracy: 0.7680 - val_loss: 2.6942 - val_accuracy: 0.6916
Epoch 90/1000
4/4 [=====] - 0s 17ms/step - loss: 3.4672 - accuracy: 0.7526 - val_loss: 2.6967 - val_accuracy: 0.6636
Epoch 91/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5899 - accuracy: 0.7835 - val_loss: 2.6956 - val_accuracy: 0.6822
Epoch 92/1000
4/4 [=====] - 0s 15ms/step - loss: 3.5308 - accuracy: 0.7577 - val_loss: 2.7504 - val_accuracy: 0.7009
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 3.4737 - accuracy: 0.7732 - val_loss: 2.7842 - val_accuracy: 0.6682
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5536 - accuracy: 0.7732 - val_loss: 2.7848 - val_accuracy: 0.6729
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5237 - accuracy: 0.7732 - val_loss: 2.7954 - val_accuracy: 0.6776
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3824 - accuracy: 0.7577 - val_loss: 3.0718 - val_accuracy: 0.6869
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3095 - accuracy: 0.7242 - val_loss: 2.9769 - val_accuracy: 0.6776
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3785 - accuracy: 0.7345 - val_loss: 2.9295 - val_accuracy: 0.6822
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2742 - accuracy: 0.7577 - val_loss: 3.0431 - val_accuracy: 0.6963
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3256 - accuracy: 0.7577 - val_loss: 3.0226 - val_accuracy: 0.6963

```
accuracy: 0.6729
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 3.2221 - accuracy: 0.7242 - val_loss: 3.1254 - val_accuracy: 0.6822
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 3.2187 - accuracy: 0.7320 - val_loss: 3.0118 - val_accuracy: 0.6776
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2084 - accuracy: 0.7371 - val_loss: 3.0611 - val_accuracy: 0.6682
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 3.1764 - accuracy: 0.7242 - val_loss: 3.2357 - val_accuracy: 0.6869
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 3.1468 - accuracy: 0.7320 - val_loss: 3.2472 - val_accuracy: 0.6963
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 3.1422 - accuracy: 0.7371 - val_loss: 2.7244 - val_accuracy: 0.6215
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9824 - accuracy: 0.7139 - val_loss: 2.5879 - val_accuracy: 0.6075
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 3.0031 - accuracy: 0.6933 - val_loss: 2.5095 - val_accuracy: 0.6215
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8840 - accuracy: 0.6856 - val_loss: 2.4923 - val_accuracy: 0.6262
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8242 - accuracy: 0.6933 - val_loss: 2.3647 - val_accuracy: 0.5935
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8668 - accuracy: 0.6985 - val_loss: 2.3318 - val_accuracy: 0.5981
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7562 - accuracy: 0.7010 - val_loss: 2.4032 - val_accuracy: 0.6121
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7333 - accuracy: 0.7165 - val_loss: 2.3947 - val_accuracy: 0.6075
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6873 - accuracy: 0.6959 - val_loss: 2.3081 - val_accuracy: 0.5794
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7820 - accuracy: 0.6881 - val_loss: 2.2265 - val_accuracy: 0.5794
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5958 - accuracy: 0.6830 - val_loss: 2.1875 - val_accuracy: 0.5561
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5634 - accuracy: 0.6753 - val_loss: 2.2315 - val_accuracy: 0.5701
Epoch 118/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5801 - accuracy: 0.6830 - val_loss: 2.1855 - val_accuracy: 0.5514
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5189 - accuracy: 0.6856 - val_loss: 2.1779 - val_accuracy: 0.5654
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6032 - accuracy: 0.6830 - val_loss: 2.1422 - val_accuracy: 0.5701
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 2.6313 - accuracy: 0.6804 - val_loss: 2.1714 - val_accuracy: 0.5794
Epoch 122/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5229 - accuracy: 0.6649 - val_loss: 2.1327 - val_accuracy: 0.5794
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4884 - accuracy: 0.6727 - val_loss: 2.1625 - val_accuracy: 0.5841
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4838 - accuracy: 0.6701 - val_loss: 2.2510 - val_accuracy: 0.5654
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5345 - accuracy: 0.7036 - val_loss: 2.2503 - val_accuracy: 0.5654
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 2.5041 - accuracy: 0.7062 - val_loss: 2.1855 - val_accuracy: 0.5561
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4333 - accuracy: 0.6778 - val_loss: 2.1628 - val_accuracy: 0.5794
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5107 - accuracy: 0.6881 - val_loss: 2.2275 - val_accuracy: 0.5701
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4754 - accuracy: 0.6959 - val_loss: 2.3058 - val_accuracy: 0.5701
Epoch 130/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 2.4323 - accuracy: 0.7010 - val_loss: 2.2972 - val_accuracy: 0.5701
Epoch 131/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2515 - accuracy: 0.6881 - val_loss: 2.1002 - val_accuracy: 0.5701
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2870 - accuracy: 0.6701 - val_loss: 2.1782 - val_accuracy: 0.5514
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2783 - accuracy: 0.6830 - val_loss: 2.1701 - val_accuracy: 0.5561
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3257 - accuracy: 0.6753 - val_loss: 2.2020 - val_accuracy: 0.5607
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2424 - accuracy: 0.6881 - val_loss: 2.0850 - val_accuracy: 0.5561
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1972 - accuracy: 0.6495 - val_loss: 2.0980 - val_accuracy: 0.5467
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1381 - accuracy: 0.6675 - val_loss: 2.0344 - val_accuracy: 0.5421
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1482 - accuracy: 0.6521 - val_loss: 1.9462 - val_accuracy: 0.5467
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0573 - accuracy: 0.6418 - val_loss: 1.7802 - val_accuracy: 0.5093
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9783 - accuracy: 0.6392 - val_loss: 1.7137 - val_accuracy: 0.5000
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9475 - accuracy: 0.6289 - val_loss: 1.7100 - val_accuracy: 0.4907
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9235 - accuracy: 0.6263 - val_loss: 1.6754 - val_accuracy: 0.4860
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9506 - accuracy: 0.6186 - val_loss: 1.6525 - val_accuracy: 0.4720
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9753 - accuracy: 0.6237 - val_loss: 1.6507 - val_accuracy: 0.4813
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9351 - accuracy: 0.6211 - val_loss: 1.8160 - val_accuracy: 0.4673
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8419 - accuracy: 0.6211 - val_loss: 1.7761 - val_accuracy: 0.5000
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8305 - accuracy: 0.6418 - val_loss: 1.7001 - val_accuracy: 0.4860
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8593 - accuracy: 0.6108 - val_loss: 1.6693 - val_accuracy: 0.5000
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7452 - accuracy: 0.6237 - val_loss: 1.6777 - val_accuracy: 0.5140
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7944 - accuracy: 0.6340 - val_loss: 1.7038 - val_accuracy: 0.5000
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7209 - accuracy: 0.6392 - val_loss: 1.6118 - val_accuracy: 0.5140
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7621 - accuracy: 0.6237 - val_loss: 1.6475 - val_accuracy: 0.5140
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6742 - accuracy: 0.6366 - val_loss: 1.6678 - val_accuracy: 0.5140
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6200 - accuracy: 0.6108 - val_loss: 1.6276 - val_accuracy: 0.4953
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6191 - accuracy: 0.6160 - val_loss: 1.5982 - val_accuracy: 0.4860
Epoch 156/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7327 - accuracy: 0.6366 - val_loss: 1.6310 - val_accuracy: 0.4907
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6204 - accuracy: 0.6211 - val_loss: 1.5969 - val_accuracy: 0.4720
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6526 - accuracy: 0.6160 - val_loss: 1.5925 - val_accuracy: 0.4860
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5273 - accuracy: 0.6082 - val_loss: 1.5600 - val_accuracy: 0.4860
```

Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4826 - accuracy: 0.6031 - val_loss: 1.4351 - val_accuracy: 0.4953
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5065 - accuracy: 0.6057 - val_loss: 1.4664 - val_accuracy: 0.4907
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4739 - accuracy: 0.6031 - val_loss: 1.4387 - val_accuracy: 0.4953
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4656 - accuracy: 0.6057 - val_loss: 1.4191 - val_accuracy: 0.4953
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4967 - accuracy: 0.5928 - val_loss: 1.4869 - val_accuracy: 0.4720
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3229 - accuracy: 0.6005 - val_loss: 1.4772 - val_accuracy: 0.4860
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3066 - accuracy: 0.6031 - val_loss: 1.4093 - val_accuracy: 0.4626
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3134 - accuracy: 0.5902 - val_loss: 1.3774 - val_accuracy: 0.4953
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2805 - accuracy: 0.5979 - val_loss: 1.4282 - val_accuracy: 0.4673
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2629 - accuracy: 0.5954 - val_loss: 1.4282 - val_accuracy: 0.4673
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2077 - accuracy: 0.5954 - val_loss: 1.4223 - val_accuracy: 0.4439
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2301 - accuracy: 0.5851 - val_loss: 1.4006 - val_accuracy: 0.4626
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2538 - accuracy: 0.5979 - val_loss: 1.4107 - val_accuracy: 0.4533
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1603 - accuracy: 0.5851 - val_loss: 1.3938 - val_accuracy: 0.4486
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1722 - accuracy: 0.5773 - val_loss: 1.3862 - val_accuracy: 0.4673
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2286 - accuracy: 0.5876 - val_loss: 1.3857 - val_accuracy: 0.4439
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1102 - accuracy: 0.5825 - val_loss: 1.3803 - val_accuracy: 0.4393
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1995 - accuracy: 0.5722 - val_loss: 1.2895 - val_accuracy: 0.4346
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2042 - accuracy: 0.5670 - val_loss: 1.3121 - val_accuracy: 0.4533
Epoch 179/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1651 - accuracy: 0.5722 - val_loss: 1.3087 - val_accuracy: 0.4346
Epoch 180/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1090 - accuracy: 0.5851 - val_loss: 1.2717 - val_accuracy: 0.4393
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0681 - accuracy: 0.5619 - val_loss: 1.2700 - val_accuracy: 0.4252
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1016 - accuracy: 0.5722 - val_loss: 1.2652 - val_accuracy: 0.4393
Epoch 183/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0689 - accuracy: 0.5619 - val_loss: 1.1734 - val_accuracy: 0.4252
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0862 - accuracy: 0.5670 - val_loss: 1.2018 - val_accuracy: 0.4252
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0998 - accuracy: 0.5696 - val_loss: 1.2615 - val_accuracy: 0.4579
Epoch 186/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0927 - accuracy: 0.5619 - val_loss: 1.2560 - val_accuracy: 0.4579
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0335 - accuracy: 0.5825 - val_loss: 1.2564 - val_accuracy: 0.4626
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0737 - accuracy: 0.5593 - val_loss: 1.2548 - val_accuracy: 0.4673
Epoch 189/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0666 - accuracy: 0.5696 - val_loss: 1.2539 - val_accuracy: 0.4673

```
accuracy: 0.4626
Epoch 190/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1237 - accuracy: 0.5593 - val_loss: 1.1708 - val_accuracy: 0.4673
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0577 - accuracy: 0.5644 - val_loss: 1.1922 - val_accuracy: 0.4860
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0096 - accuracy: 0.5799 - val_loss: 1.1896 - val_accuracy: 0.4860
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0385 - accuracy: 0.5670 - val_loss: 1.1575 - val_accuracy: 0.4860
Epoch 194/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0996 - accuracy: 0.5593 - val_loss: 1.1834 - val_accuracy: 0.4766
Epoch 195/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0227 - accuracy: 0.5619 - val_loss: 1.2145 - val_accuracy: 0.4673
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0879 - accuracy: 0.5773 - val_loss: 1.2126 - val_accuracy: 0.4766
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1293 - accuracy: 0.5644 - val_loss: 1.2357 - val_accuracy: 0.4626
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0524 - accuracy: 0.5902 - val_loss: 1.2642 - val_accuracy: 0.4673
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9951 - accuracy: 0.5644 - val_loss: 1.2329 - val_accuracy: 0.4860
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0310 - accuracy: 0.5902 - val_loss: 1.2627 - val_accuracy: 0.4907
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0844 - accuracy: 0.5799 - val_loss: 1.2253 - val_accuracy: 0.4720
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0431 - accuracy: 0.5670 - val_loss: 1.2568 - val_accuracy: 0.4813
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9887 - accuracy: 0.5670 - val_loss: 1.2247 - val_accuracy: 0.4439
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0042 - accuracy: 0.5670 - val_loss: 1.2463 - val_accuracy: 0.4439
Epoch 205/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0021 - accuracy: 0.5722 - val_loss: 1.2419 - val_accuracy: 0.4393
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9791 - accuracy: 0.5747 - val_loss: 1.2674 - val_accuracy: 0.4486
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9501 - accuracy: 0.5670 - val_loss: 1.2664 - val_accuracy: 0.4299
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9746 - accuracy: 0.5670 - val_loss: 1.2389 - val_accuracy: 0.3925
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9989 - accuracy: 0.5928 - val_loss: 1.2345 - val_accuracy: 0.4112
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9296 - accuracy: 0.5644 - val_loss: 1.2297 - val_accuracy: 0.4065
Epoch 211/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9682 - accuracy: 0.5593 - val_loss: 1.2311 - val_accuracy: 0.4112
Epoch 212/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8503 - accuracy: 0.5644 - val_loss: 1.1814 - val_accuracy: 0.3972
Epoch 213/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8819 - accuracy: 0.5696 - val_loss: 1.1731 - val_accuracy: 0.3972
Epoch 214/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8520 - accuracy: 0.5567 - val_loss: 1.1732 - val_accuracy: 0.4206
Epoch 215/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8670 - accuracy: 0.5541 - val_loss: 1.1665 - val_accuracy: 0.4206
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8857 - accuracy: 0.5490 - val_loss: 1.1642 - val_accuracy: 0.4065
Epoch 217/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8302 - accuracy: 0.5438 - val_loss: 1.1724 - val_accuracy: 0.4112
Epoch 218/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8140 - accuracy: 0.5593 - val_loss: 1.1668 - val_accuracy: 0.4112
Epoch 219/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.8240 - accuracy: 0.5490 - val_loss: 1.1632 - val_accuracy: 0.4159
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8060 - accuracy: 0.5490 - val_loss: 1.1276 - val_accuracy: 0.4159
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8488 - accuracy: 0.5515 - val_loss: 1.1215 - val_accuracy: 0.4159
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8798 - accuracy: 0.5490 - val_loss: 1.1496 - val_accuracy: 0.4159
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7972 - accuracy: 0.5619 - val_loss: 1.1257 - val_accuracy: 0.4252
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7823 - accuracy: 0.5722 - val_loss: 1.0608 - val_accuracy: 0.4159
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7283 - accuracy: 0.5438 - val_loss: 1.0993 - val_accuracy: 0.3832
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7831 - accuracy: 0.5284 - val_loss: 1.1821 - val_accuracy: 0.3692
Epoch 227/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7839 - accuracy: 0.5103 - val_loss: 1.1548 - val_accuracy: 0.3832
Epoch 228/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7083 - accuracy: 0.5258 - val_loss: 1.1178 - val_accuracy: 0.3925
Epoch 229/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8312 - accuracy: 0.5129 - val_loss: 1.1139 - val_accuracy: 0.4065
Epoch 230/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7302 - accuracy: 0.5335 - val_loss: 1.1416 - val_accuracy: 0.4112
Epoch 231/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7398 - accuracy: 0.5515 - val_loss: 1.1376 - val_accuracy: 0.4065
Epoch 232/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7962 - accuracy: 0.5309 - val_loss: 1.1344 - val_accuracy: 0.3972
Epoch 233/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7320 - accuracy: 0.5541 - val_loss: 1.1317 - val_accuracy: 0.7009
Epoch 234/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7132 - accuracy: 0.7861 - val_loss: 1.0823 - val_accuracy: 0.7243
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6960 - accuracy: 0.7938 - val_loss: 1.0176 - val_accuracy: 0.7290
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6681 - accuracy: 0.7912 - val_loss: 1.0453 - val_accuracy: 0.7290
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6757 - accuracy: 0.7680 - val_loss: 1.1091 - val_accuracy: 0.7150
Epoch 238/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6684 - accuracy: 0.7861 - val_loss: 1.0958 - val_accuracy: 0.7056
Epoch 239/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6654 - accuracy: 0.7990 - val_loss: 1.0442 - val_accuracy: 0.7196
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7465 - accuracy: 0.7680 - val_loss: 1.1396 - val_accuracy: 0.7196
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6220 - accuracy: 0.7861 - val_loss: 1.1306 - val_accuracy: 0.7103
Epoch 242/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6055 - accuracy: 0.7732 - val_loss: 1.1462 - val_accuracy: 0.7290
Epoch 243/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5922 - accuracy: 0.7835 - val_loss: 1.1183 - val_accuracy: 0.7290
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6630 - accuracy: 0.7861 - val_loss: 1.0858 - val_accuracy: 0.7290
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6348 - accuracy: 0.7938 - val_loss: 0.9900 - val_accuracy: 0.7243
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6359 - accuracy: 0.8015 - val_loss: 0.9853 - val_accuracy: 0.7056
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5732 - accuracy: 0.7990 - val_loss: 0.9340 - val_accuracy: 0.6916
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6154 - accuracy: 0.7809 - val_loss: 0.9546 - val_accuracy: 0.6916
```

Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5726 - accuracy: 0.6443 - val_loss: 0.9795 - val_accuracy: 0.4159
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5895 - accuracy: 0.5180 - val_loss: 0.8978 - val_accuracy: 0.4299
Epoch 251/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5864 - accuracy: 0.5258 - val_loss: 0.8733 - val_accuracy: 0.4346
Epoch 252/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5833 - accuracy: 0.5593 - val_loss: 0.8947 - val_accuracy: 0.4299
Epoch 253/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6015 - accuracy: 0.5387 - val_loss: 0.8752 - val_accuracy: 0.4206
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6481 - accuracy: 0.5284 - val_loss: 0.9780 - val_accuracy: 0.4626
Epoch 255/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6148 - accuracy: 0.5593 - val_loss: 1.0911 - val_accuracy: 0.4533
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5926 - accuracy: 0.5541 - val_loss: 0.9940 - val_accuracy: 0.7757
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5716 - accuracy: 0.7887 - val_loss: 1.0223 - val_accuracy: 0.4766
Epoch 258/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5924 - accuracy: 0.5541 - val_loss: 1.0209 - val_accuracy: 0.7523
Epoch 259/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6019 - accuracy: 0.7758 - val_loss: 0.9888 - val_accuracy: 0.7523
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6678 - accuracy: 0.7990 - val_loss: 1.0406 - val_accuracy: 0.7523
Epoch 261/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5602 - accuracy: 0.7732 - val_loss: 1.0083 - val_accuracy: 0.7523
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5360 - accuracy: 0.8222 - val_loss: 1.0131 - val_accuracy: 0.4907
Epoch 263/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5333 - accuracy: 0.5515 - val_loss: 1.0058 - val_accuracy: 0.7617
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5329 - accuracy: 0.8093 - val_loss: 1.0063 - val_accuracy: 0.4439
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5870 - accuracy: 0.5335 - val_loss: 1.0045 - val_accuracy: 0.4766
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5494 - accuracy: 0.5541 - val_loss: 0.9799 - val_accuracy: 0.4766
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5524 - accuracy: 0.5670 - val_loss: 0.9793 - val_accuracy: 0.4720
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5440 - accuracy: 0.5387 - val_loss: 0.9746 - val_accuracy: 0.4626
Epoch 269/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5202 - accuracy: 0.5567 - val_loss: 0.9800 - val_accuracy: 0.4907
Epoch 270/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5627 - accuracy: 0.5490 - val_loss: 0.9652 - val_accuracy: 0.5047
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6320 - accuracy: 0.5851 - val_loss: 0.9638 - val_accuracy: 0.4953
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5459 - accuracy: 0.5490 - val_loss: 0.9633 - val_accuracy: 0.4953
Epoch 273/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5701 - accuracy: 0.5412 - val_loss: 0.9345 - val_accuracy: 0.4813
Epoch 274/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5638 - accuracy: 0.5387 - val_loss: 0.9759 - val_accuracy: 0.4766
Epoch 275/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5193 - accuracy: 0.5541 - val_loss: 1.0001 - val_accuracy: 0.4860
Epoch 276/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5355 - accuracy: 0.5593 - val_loss: 0.9693 - val_accuracy: 0.4626
Epoch 277/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5029 - accuracy: 0.5515 - val_loss: 0.9278 - val_accuracy: 0.4579
Epoch 278/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5325 - accuracy: 0.5490 - val_loss: 0.9063 - val_accuracy: 0.4626

```
accuracy: 0.4439
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5497 - accuracy: 0.5541 - val_loss: 0.9068 - val_
accuracy: 0.4533
Epoch 280/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5542 - accuracy: 0.5515 - val_loss: 0.9303 - val_
accuracy: 0.4533
Epoch 281/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5142 - accuracy: 0.5644 - val_loss: 0.9279 - val_
accuracy: 0.4579
Epoch 282/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4881 - accuracy: 0.5490 - val_loss: 0.9305 - val_
accuracy: 0.4720
Epoch 283/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5478 - accuracy: 0.5541 - val_loss: 0.9382 - val_
accuracy: 0.4579
Epoch 284/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5245 - accuracy: 0.5438 - val_loss: 0.8945 - val_
accuracy: 0.4579
Epoch 285/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5154 - accuracy: 0.5361 - val_loss: 0.8741 - val_
accuracy: 0.4720
Epoch 286/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5344 - accuracy: 0.5567 - val_loss: 0.8946 - val_
accuracy: 0.4579
Epoch 287/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4877 - accuracy: 0.5412 - val_loss: 0.8982 - val_
accuracy: 0.4579
Epoch 288/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4820 - accuracy: 0.5644 - val_loss: 0.9508 - val_
accuracy: 0.4533
Epoch 289/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4785 - accuracy: 0.5593 - val_loss: 0.8565 - val_
accuracy: 0.4533
Epoch 290/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4783 - accuracy: 0.5593 - val_loss: 0.8889 - val_
accuracy: 0.4393
Epoch 291/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4682 - accuracy: 0.5696 - val_loss: 0.9249 - val_
accuracy: 0.4439
Epoch 292/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4739 - accuracy: 0.5541 - val_loss: 0.8675 - val_
accuracy: 0.4626
Epoch 293/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4709 - accuracy: 0.5644 - val_loss: 0.9720 - val_
accuracy: 0.4579
Epoch 294/1000
4/4 [=====] - 0s 19ms/step - loss: 0.4902 - accuracy: 0.5593 - val_loss: 1.0277 - val_
accuracy: 0.4813
Epoch 295/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4997 - accuracy: 0.5619 - val_loss: 1.1063 - val_
accuracy: 0.4953
Epoch 296/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4895 - accuracy: 0.5567 - val_loss: 1.0438 - val_
accuracy: 0.4907
Epoch 297/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5415 - accuracy: 0.5696 - val_loss: 1.0408 - val_
accuracy: 0.4953
Epoch 298/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5019 - accuracy: 0.5747 - val_loss: 1.0936 - val_
accuracy: 0.5000
Epoch 299/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4670 - accuracy: 0.5593 - val_loss: 0.9692 - val_
accuracy: 0.4953
Epoch 300/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4838 - accuracy: 0.5232 - val_loss: 0.9595 - val_
accuracy: 0.4953
Epoch 301/1000
4/4 [=====] - 0s 18ms/step - loss: 0.4740 - accuracy: 0.5747 - val_loss: 0.9839 - val_
accuracy: 0.5000
Epoch 302/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4599 - accuracy: 0.5799 - val_loss: 0.9549 - val_
accuracy: 0.5093
Epoch 303/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4831 - accuracy: 0.5670 - val_loss: 0.9911 - val_
accuracy: 0.5000
Epoch 304/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4571 - accuracy: 0.5567 - val_loss: 0.9164 - val_
accuracy: 0.5093
Epoch 305/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4437 - accuracy: 0.5644 - val_loss: 0.9171 - val_
accuracy: 0.4953
Epoch 306/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4949 - accuracy: 0.5696 - val_loss: 0.9180 - val_
accuracy: 0.5000
Epoch 307/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4914 - accuracy: 0.5644 - val_loss: 0.9127 - val_
accuracy: 0.5093
Epoch 308/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.4243 - accuracy: 0.5567 - val_loss: 1.0020 - val_accuracy: 0.4907
Epoch 309/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4499 - accuracy: 0.5670 - val_loss: 0.9799 - val_accuracy: 0.5093
Epoch 310/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4378 - accuracy: 0.5851 - val_loss: 1.0150 - val_accuracy: 0.5047
Epoch 311/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5220 - accuracy: 0.5593 - val_loss: 1.0622 - val_accuracy: 0.5047
Epoch 312/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4206 - accuracy: 0.5619 - val_loss: 0.9995 - val_accuracy: 0.5047
Epoch 313/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4200 - accuracy: 0.5644 - val_loss: 0.9987 - val_accuracy: 0.5140
Epoch 314/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3952 - accuracy: 0.5567 - val_loss: 0.9945 - val_accuracy: 0.4953
Epoch 315/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4425 - accuracy: 0.5722 - val_loss: 0.9969 - val_accuracy: 0.4953
Epoch 316/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4488 - accuracy: 0.5619 - val_loss: 0.9720 - val_accuracy: 0.4953
Epoch 317/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4029 - accuracy: 0.5567 - val_loss: 1.0110 - val_accuracy: 0.4953
Epoch 318/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4272 - accuracy: 0.5696 - val_loss: 1.0042 - val_accuracy: 0.4907
Epoch 319/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4347 - accuracy: 0.5696 - val_loss: 0.9157 - val_accuracy: 0.4907
Epoch 320/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4414 - accuracy: 0.5567 - val_loss: 0.9376 - val_accuracy: 0.4907
Epoch 321/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4641 - accuracy: 0.5619 - val_loss: 0.9059 - val_accuracy: 0.4907
Epoch 322/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4317 - accuracy: 0.5670 - val_loss: 0.9383 - val_accuracy: 0.4860
Epoch 323/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3975 - accuracy: 0.5670 - val_loss: 0.9116 - val_accuracy: 0.5000
Epoch 324/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4220 - accuracy: 0.5954 - val_loss: 0.9666 - val_accuracy: 0.5093
Epoch 325/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4738 - accuracy: 0.5567 - val_loss: 0.9629 - val_accuracy: 0.5234
Epoch 326/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3970 - accuracy: 0.5825 - val_loss: 0.9662 - val_accuracy: 0.5187
Epoch 327/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3953 - accuracy: 0.5722 - val_loss: 0.9133 - val_accuracy: 0.5140
Epoch 328/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3777 - accuracy: 0.5851 - val_loss: 0.8765 - val_accuracy: 0.5140
Epoch 329/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3730 - accuracy: 0.5696 - val_loss: 0.9388 - val_accuracy: 0.4907
Epoch 330/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4155 - accuracy: 0.5851 - val_loss: 0.9655 - val_accuracy: 0.5280
Epoch 331/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4487 - accuracy: 0.5825 - val_loss: 0.9501 - val_accuracy: 0.5187
Epoch 332/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3746 - accuracy: 0.5747 - val_loss: 0.9146 - val_accuracy: 0.4953
Epoch 333/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4734 - accuracy: 0.5696 - val_loss: 0.9528 - val_accuracy: 0.4907
Epoch 334/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3815 - accuracy: 0.5670 - val_loss: 0.8553 - val_accuracy: 0.5093
Epoch 335/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3818 - accuracy: 0.5722 - val_loss: 0.8550 - val_accuracy: 0.5047
Epoch 336/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3780 - accuracy: 0.5747 - val_loss: 0.8526 - val_accuracy: 0.5093
Epoch 337/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4304 - accuracy: 0.5541 - val_loss: 0.7952 - val_accuracy: 0.5047
```

Epoch 338/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3852 - accuracy: 0.5515 - val_loss: 0.8243 - val_accuracy: 0.5093
Epoch 339/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3771 - accuracy: 0.5541 - val_loss: 0.8160 - val_accuracy: 0.5187
Epoch 340/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3933 - accuracy: 0.5799 - val_loss: 0.8545 - val_accuracy: 0.5187
Epoch 341/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3665 - accuracy: 0.5619 - val_loss: 0.8812 - val_accuracy: 0.5140
Epoch 342/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3725 - accuracy: 0.5644 - val_loss: 0.8313 - val_accuracy: 0.5280
Epoch 343/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4105 - accuracy: 0.5593 - val_loss: 0.8815 - val_accuracy: 0.5280
Epoch 344/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4086 - accuracy: 0.5773 - val_loss: 0.8855 - val_accuracy: 0.5327
Epoch 345/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3914 - accuracy: 0.5773 - val_loss: 0.8582 - val_accuracy: 0.5187
Epoch 346/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4156 - accuracy: 0.5696 - val_loss: 0.8162 - val_accuracy: 0.5327
Epoch 347/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4136 - accuracy: 0.5670 - val_loss: 0.9091 - val_accuracy: 0.5140
Epoch 348/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4069 - accuracy: 0.5541 - val_loss: 0.8111 - val_accuracy: 0.5280
Epoch 349/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4317 - accuracy: 0.5541 - val_loss: 0.8021 - val_accuracy: 0.5374
Epoch 350/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4110 - accuracy: 0.5722 - val_loss: 0.8112 - val_accuracy: 0.5421
Epoch 351/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3494 - accuracy: 0.5593 - val_loss: 0.8707 - val_accuracy: 0.5327
Epoch 352/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3514 - accuracy: 0.5619 - val_loss: 0.8680 - val_accuracy: 0.5280
Epoch 353/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3835 - accuracy: 0.5773 - val_loss: 0.8723 - val_accuracy: 0.5280
Epoch 354/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3540 - accuracy: 0.5644 - val_loss: 0.9011 - val_accuracy: 0.5280
Epoch 355/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3352 - accuracy: 0.5490 - val_loss: 0.8433 - val_accuracy: 0.5327
Epoch 356/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3480 - accuracy: 0.5644 - val_loss: 0.8398 - val_accuracy: 0.5280
Epoch 357/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3552 - accuracy: 0.5644 - val_loss: 0.8466 - val_accuracy: 0.5093
Epoch 358/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3303 - accuracy: 0.5567 - val_loss: 0.8445 - val_accuracy: 0.5374
Epoch 359/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3333 - accuracy: 0.5541 - val_loss: 0.9004 - val_accuracy: 0.5467
Epoch 360/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3587 - accuracy: 0.5696 - val_loss: 0.8400 - val_accuracy: 0.5327
Epoch 361/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3312 - accuracy: 0.5747 - val_loss: 0.8715 - val_accuracy: 0.5561
Epoch 362/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3953 - accuracy: 0.5954 - val_loss: 0.8362 - val_accuracy: 0.5561
Epoch 363/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3330 - accuracy: 0.5722 - val_loss: 0.8340 - val_accuracy: 0.5280
Epoch 364/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3314 - accuracy: 0.5644 - val_loss: 0.8291 - val_accuracy: 0.5327
Epoch 365/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3763 - accuracy: 0.5825 - val_loss: 0.8620 - val_accuracy: 0.5327
Epoch 366/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3629 - accuracy: 0.5851 - val_loss: 0.8107 - val_accuracy: 0.5467
Epoch 367/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3626 - accuracy: 0.5619 - val_loss: 0.7981 - val_accuracy: 0.5467

```
accuracy: 0.5234
Epoch 368/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3936 - accuracy: 0.5593 - val_loss: 0.8060 - val_
accuracy: 0.5280
Epoch 369/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3883 - accuracy: 0.5593 - val_loss: 0.8089 - val_
accuracy: 0.5140
Epoch 370/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4138 - accuracy: 0.5773 - val_loss: 0.8080 - val_
accuracy: 0.5140
Epoch 371/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3655 - accuracy: 0.5619 - val_loss: 0.8019 - val_
accuracy: 0.5093
Epoch 372/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3709 - accuracy: 0.5515 - val_loss: 0.7924 - val_
accuracy: 0.5093
Epoch 373/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3904 - accuracy: 0.5799 - val_loss: 0.7678 - val_
accuracy: 0.5327
Epoch 374/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4410 - accuracy: 0.5773 - val_loss: 0.8181 - val_
accuracy: 0.5187
Epoch 375/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4138 - accuracy: 0.5670 - val_loss: 0.7887 - val_
accuracy: 0.5467
Epoch 376/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3781 - accuracy: 0.5799 - val_loss: 0.7965 - val_
accuracy: 0.5514
Epoch 377/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3387 - accuracy: 0.5851 - val_loss: 0.7867 - val_
accuracy: 0.5467
Epoch 378/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3623 - accuracy: 0.5799 - val_loss: 0.8518 - val_
accuracy: 0.5514
Epoch 379/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3189 - accuracy: 0.5567 - val_loss: 0.8520 - val_
accuracy: 0.5514
Epoch 380/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3151 - accuracy: 0.5644 - val_loss: 0.8605 - val_
accuracy: 0.5467
Epoch 381/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3513 - accuracy: 0.5619 - val_loss: 0.8575 - val_
accuracy: 0.5327
Epoch 382/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3646 - accuracy: 0.5747 - val_loss: 0.8525 - val_
accuracy: 0.5421
Epoch 383/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3072 - accuracy: 0.5928 - val_loss: 0.8562 - val_
accuracy: 0.5374
Epoch 384/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4176 - accuracy: 0.6005 - val_loss: 0.8288 - val_
accuracy: 0.5327
Epoch 385/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3070 - accuracy: 0.5928 - val_loss: 0.8282 - val_
accuracy: 0.5374
Epoch 386/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3091 - accuracy: 0.5928 - val_loss: 0.7949 - val_
accuracy: 0.5280
Epoch 387/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3724 - accuracy: 0.5902 - val_loss: 0.7919 - val_
accuracy: 0.5467
Epoch 388/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3495 - accuracy: 0.5825 - val_loss: 0.7926 - val_
accuracy: 0.5561
Epoch 389/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3495 - accuracy: 0.5825 - val_loss: 0.7990 - val_
accuracy: 0.5467
Epoch 390/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2912 - accuracy: 0.5773 - val_loss: 0.8017 - val_
accuracy: 0.5467
Epoch 391/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3319 - accuracy: 0.5851 - val_loss: 0.7971 - val_
accuracy: 0.5701
Epoch 392/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2938 - accuracy: 0.5567 - val_loss: 0.8279 - val_
accuracy: 0.5701
Epoch 393/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3757 - accuracy: 0.5696 - val_loss: 0.7950 - val_
accuracy: 0.5561
Epoch 394/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3484 - accuracy: 0.5747 - val_loss: 0.7938 - val_
accuracy: 0.5654
Epoch 395/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3313 - accuracy: 0.5799 - val_loss: 0.8009 - val_
accuracy: 0.5654
Epoch 396/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3040 - accuracy: 0.5747 - val_loss: 0.7747 - val_
accuracy: 0.5748
Epoch 397/1000
```

```

4/4 [=====] - 0s 13ms/step - loss: 0.3787 - accuracy: 0.5979 - val_loss: 0.7814 - val_accuracy: 0.5421
Epoch 398/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3162 - accuracy: 0.5799 - val_loss: 0.8004 - val_accuracy: 0.5467
Epoch 399/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3488 - accuracy: 0.5979 - val_loss: 0.7840 - val_accuracy: 0.5421
Epoch 400/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2931 - accuracy: 0.5851 - val_loss: 0.8516 - val_accuracy: 0.5327
Epoch 401/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3111 - accuracy: 0.6005 - val_loss: 0.9071 - val_accuracy: 0.5607
Epoch 402/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3436 - accuracy: 0.5902 - val_loss: 1.0346 - val_accuracy: 0.5514
Epoch 403/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3039 - accuracy: 0.5619 - val_loss: 1.0987 - val_accuracy: 0.5748
Epoch 404/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3244 - accuracy: 0.5851 - val_loss: 1.0678 - val_accuracy: 0.5514
Epoch 405/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3269 - accuracy: 0.5902 - val_loss: 1.0753 - val_accuracy: 0.5467
Epoch 406/1000
1/4 [=====>.....] - ETA: 0s - loss: 0.2511 - accuracy: 0.6328Restoring model weights from the end of the best epoch: 256.
4/4 [=====] - 0s 14ms/step - loss: 0.3399 - accuracy: 0.6082 - val_loss: 1.0648 - val_accuracy: 0.5234
Epoch 406: early stopping
2/2 [=====] - 0s 3ms/step - loss: 0.7816 - accuracy: 0.7500
[CV] END .....Dense1=100, Dense2=50; total time= 20.7s
Model: "sequential_91"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_364 (Dense)	(None, 100)	700
batch_normalization_273 (BatchNormalization)	(None, 100)	400
activation_273 (Activation)	(None, 100)	0
dense_365 (Dense)	(None, 50)	5050
batch_normalization_274 (BatchNormalization)	(None, 50)	200
activation_274 (Activation)	(None, 50)	0
dense_366 (Dense)	(None, 10)	510
batch_normalization_275 (BatchNormalization)	(None, 10)	40
activation_275 (Activation)	(None, 10)	0
dense_367 (Dense)	(None, 2)	22
<hr/>		
Total params:	6,922	
Trainable params:	6,602	
Non-trainable params:	320	

```

Epoch 1/1000
4/4 [=====] - 1s 59ms/step - loss: 4.6064 - accuracy: 0.3882 - val_loss: 4.6300 - val_accuracy: 0.5421
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4429 - accuracy: 0.4319 - val_loss: 3.7117 - val_accuracy: 0.4720
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7774 - accuracy: 0.4087 - val_loss: 2.9657 - val_accuracy: 0.4019
Epoch 4/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3088 - accuracy: 0.4267 - val_loss: 2.6797 - val_accuracy: 0.3738
Epoch 5/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2284 - accuracy: 0.3985 - val_loss: 2.3681 - val_accuracy: 0.3738
Epoch 6/1000
4/4 [=====] - 0s 11ms/step - loss: 2.2051 - accuracy: 0.3830 - val_loss: 2.1949 - val_accuracy: 0.3785
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0895 - accuracy: 0.3985 - val_loss: 2.1529 - val_accuracy: 0.3972
Epoch 8/1000
4/4 [=====] - 0s 12ms/step - loss: 2.2247 - accuracy: 0.4087 - val_loss: 2.0099 - val_

```

```
accuracy: 0.4159
Epoch 9/1000
4/4 [=====] - 0s 11ms/step - loss: 2.0416 - accuracy: 0.3933 - val_loss: 1.9967 - val_accuracy: 0.4346
Epoch 10/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8443 - accuracy: 0.4139 - val_loss: 1.9698 - val_accuracy: 0.4252
Epoch 11/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7950 - accuracy: 0.4499 - val_loss: 1.9500 - val_accuracy: 0.4393
Epoch 12/1000
4/4 [=====] - 0s 11ms/step - loss: 1.7816 - accuracy: 0.4190 - val_loss: 1.9525 - val_accuracy: 0.4299
Epoch 13/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5591 - accuracy: 0.4344 - val_loss: 1.9374 - val_accuracy: 0.4439
Epoch 14/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5597 - accuracy: 0.4190 - val_loss: 1.9555 - val_accuracy: 0.4486
Epoch 15/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4979 - accuracy: 0.4344 - val_loss: 1.9462 - val_accuracy: 0.4533
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5070 - accuracy: 0.4190 - val_loss: 1.8921 - val_accuracy: 0.4579
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3881 - accuracy: 0.4165 - val_loss: 1.8832 - val_accuracy: 0.4626
Epoch 18/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2841 - accuracy: 0.4267 - val_loss: 1.8823 - val_accuracy: 0.4579
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5156 - accuracy: 0.4396 - val_loss: 1.8415 - val_accuracy: 0.4533
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4456 - accuracy: 0.4190 - val_loss: 1.7943 - val_accuracy: 0.4486
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4173 - accuracy: 0.4036 - val_loss: 1.7780 - val_accuracy: 0.4486
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2519 - accuracy: 0.3959 - val_loss: 1.7610 - val_accuracy: 0.4579
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2386 - accuracy: 0.3907 - val_loss: 1.7062 - val_accuracy: 0.4579
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1412 - accuracy: 0.4087 - val_loss: 1.6342 - val_accuracy: 0.4533
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1905 - accuracy: 0.4036 - val_loss: 1.6106 - val_accuracy: 0.4533
Epoch 26/1000
4/4 [=====] - 0s 11ms/step - loss: 1.3690 - accuracy: 0.3830 - val_loss: 1.5864 - val_accuracy: 0.4579
Epoch 27/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2293 - accuracy: 0.4010 - val_loss: 1.5788 - val_accuracy: 0.4486
Epoch 28/1000
4/4 [=====] - 0s 11ms/step - loss: 1.3043 - accuracy: 0.3959 - val_loss: 1.5236 - val_accuracy: 0.4486
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2248 - accuracy: 0.3548 - val_loss: 1.5082 - val_accuracy: 0.4439
Epoch 30/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1377 - accuracy: 0.4087 - val_loss: 1.4831 - val_accuracy: 0.4486
Epoch 31/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1579 - accuracy: 0.3830 - val_loss: 1.4890 - val_accuracy: 0.4486
Epoch 32/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1208 - accuracy: 0.3779 - val_loss: 1.4353 - val_accuracy: 0.4439
Epoch 33/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0387 - accuracy: 0.4216 - val_loss: 1.4232 - val_accuracy: 0.4486
Epoch 34/1000
4/4 [=====] - 0s 11ms/step - loss: 1.0303 - accuracy: 0.3753 - val_loss: 1.3948 - val_accuracy: 0.4393
Epoch 35/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9740 - accuracy: 0.3702 - val_loss: 1.4012 - val_accuracy: 0.4486
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9912 - accuracy: 0.3856 - val_loss: 1.3935 - val_accuracy: 0.4393
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0535 - accuracy: 0.4036 - val_loss: 1.4206 - val_accuracy: 0.4439
Epoch 38/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.8644 - accuracy: 0.3753 - val_loss: 1.3683 - val_accuracy: 0.4439
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0221 - accuracy: 0.4165 - val_loss: 1.3271 - val_accuracy: 0.4393
Epoch 40/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7771 - accuracy: 0.3805 - val_loss: 1.2913 - val_accuracy: 0.4346
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8855 - accuracy: 0.3779 - val_loss: 1.2616 - val_accuracy: 0.4346
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9173 - accuracy: 0.4010 - val_loss: 1.2571 - val_accuracy: 0.4299
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9410 - accuracy: 0.3830 - val_loss: 1.2783 - val_accuracy: 0.4299
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9697 - accuracy: 0.3933 - val_loss: 1.2304 - val_accuracy: 0.4252
Epoch 45/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8838 - accuracy: 0.3959 - val_loss: 1.2518 - val_accuracy: 0.4346
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7827 - accuracy: 0.3856 - val_loss: 1.2168 - val_accuracy: 0.4346
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8532 - accuracy: 0.3753 - val_loss: 1.1901 - val_accuracy: 0.4346
Epoch 48/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7200 - accuracy: 0.3779 - val_loss: 1.2381 - val_accuracy: 0.4393
Epoch 49/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7154 - accuracy: 0.3907 - val_loss: 1.1962 - val_accuracy: 0.4439
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7933 - accuracy: 0.3830 - val_loss: 1.1916 - val_accuracy: 0.4486
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7722 - accuracy: 0.4062 - val_loss: 1.1687 - val_accuracy: 0.4299
Epoch 52/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7397 - accuracy: 0.3985 - val_loss: 1.1504 - val_accuracy: 0.4206
Epoch 53/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7064 - accuracy: 0.4062 - val_loss: 1.1438 - val_accuracy: 0.4393
Epoch 54/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6737 - accuracy: 0.4062 - val_loss: 1.1712 - val_accuracy: 0.4393
Epoch 55/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6498 - accuracy: 0.3959 - val_loss: 1.1655 - val_accuracy: 0.4439
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7467 - accuracy: 0.3856 - val_loss: 1.1319 - val_accuracy: 0.4486
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8095 - accuracy: 0.4062 - val_loss: 1.1312 - val_accuracy: 0.4486
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6776 - accuracy: 0.4293 - val_loss: 1.1318 - val_accuracy: 0.4206
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7306 - accuracy: 0.3933 - val_loss: 1.1729 - val_accuracy: 0.4206
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6731 - accuracy: 0.4396 - val_loss: 1.1446 - val_accuracy: 0.4299
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6249 - accuracy: 0.4087 - val_loss: 1.1275 - val_accuracy: 0.4252
Epoch 62/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7565 - accuracy: 0.4293 - val_loss: 1.1428 - val_accuracy: 0.4252
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6672 - accuracy: 0.4447 - val_loss: 1.0602 - val_accuracy: 0.4206
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5954 - accuracy: 0.4139 - val_loss: 1.0824 - val_accuracy: 0.4159
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6536 - accuracy: 0.4293 - val_loss: 0.9727 - val_accuracy: 0.3925
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6221 - accuracy: 0.4293 - val_loss: 0.9538 - val_accuracy: 0.3972
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6001 - accuracy: 0.4190 - val_loss: 0.9424 - val_accuracy: 0.3925
```

Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6459 - accuracy: 0.4422 - val_loss: 0.9199 - val_accuracy: 0.3925
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5748 - accuracy: 0.4344 - val_loss: 0.8907 - val_accuracy: 0.3832
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5644 - accuracy: 0.4422 - val_loss: 0.8829 - val_accuracy: 0.3925
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7138 - accuracy: 0.4344 - val_loss: 0.8571 - val_accuracy: 0.3972
Epoch 72/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7237 - accuracy: 0.4216 - val_loss: 0.8428 - val_accuracy: 0.4065
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6691 - accuracy: 0.4396 - val_loss: 0.8164 - val_accuracy: 0.3925
Epoch 74/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5966 - accuracy: 0.4524 - val_loss: 0.8724 - val_accuracy: 0.3972
Epoch 75/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6060 - accuracy: 0.4422 - val_loss: 0.8589 - val_accuracy: 0.4065
Epoch 76/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6580 - accuracy: 0.4370 - val_loss: 0.8443 - val_accuracy: 0.3972
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6027 - accuracy: 0.4370 - val_loss: 0.8230 - val_accuracy: 0.4112
Epoch 78/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6156 - accuracy: 0.4499 - val_loss: 0.8244 - val_accuracy: 0.4206
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5856 - accuracy: 0.4550 - val_loss: 0.8061 - val_accuracy: 0.4252
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5383 - accuracy: 0.4499 - val_loss: 0.8298 - val_accuracy: 0.4159
Epoch 81/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5683 - accuracy: 0.4679 - val_loss: 0.8268 - val_accuracy: 0.4252
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5180 - accuracy: 0.4679 - val_loss: 0.8142 - val_accuracy: 0.4206
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6607 - accuracy: 0.4550 - val_loss: 0.8137 - val_accuracy: 0.4252
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5033 - accuracy: 0.4422 - val_loss: 0.7654 - val_accuracy: 0.4159
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5667 - accuracy: 0.4730 - val_loss: 0.7836 - val_accuracy: 0.4159
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5200 - accuracy: 0.4781 - val_loss: 0.7681 - val_accuracy: 0.4206
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4913 - accuracy: 0.4756 - val_loss: 0.7592 - val_accuracy: 0.4299
Epoch 88/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4885 - accuracy: 0.4756 - val_loss: 0.7675 - val_accuracy: 0.4299
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4663 - accuracy: 0.4781 - val_loss: 0.7538 - val_accuracy: 0.4252
Epoch 90/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4877 - accuracy: 0.4884 - val_loss: 0.7033 - val_accuracy: 0.4206
Epoch 91/1000
4/4 [=====] - 0s 19ms/step - loss: 0.4366 - accuracy: 0.4627 - val_loss: 0.6977 - val_accuracy: 0.4252
Epoch 92/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4480 - accuracy: 0.4602 - val_loss: 0.6882 - val_accuracy: 0.4252
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4654 - accuracy: 0.4499 - val_loss: 0.6690 - val_accuracy: 0.4112
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4527 - accuracy: 0.4807 - val_loss: 0.6821 - val_accuracy: 0.4206
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4557 - accuracy: 0.4756 - val_loss: 0.7241 - val_accuracy: 0.4346
Epoch 96/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5054 - accuracy: 0.4936 - val_loss: 0.7473 - val_accuracy: 0.4439
Epoch 97/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4491 - accuracy: 0.4833 - val_loss: 0.7809 - val_accuracy: 0.4439

```
accuracy: 0.4393
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4063 - accuracy: 0.4756 - val_loss: 0.7819 - val_accuracy: 0.4346
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2969 - accuracy: 0.4602 - val_loss: 0.7696 - val_accuracy: 0.4206
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2831 - accuracy: 0.4859 - val_loss: 0.8069 - val_accuracy: 0.4159
Epoch 101/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3190 - accuracy: 0.4859 - val_loss: 0.6715 - val_accuracy: 0.4953
Epoch 102/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3639 - accuracy: 0.4936 - val_loss: 0.6459 - val_accuracy: 0.5047
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3460 - accuracy: 0.5039 - val_loss: 0.7203 - val_accuracy: 0.4579
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3322 - accuracy: 0.4961 - val_loss: 0.7185 - val_accuracy: 0.4626
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3000 - accuracy: 0.4910 - val_loss: 0.7510 - val_accuracy: 0.4673
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3132 - accuracy: 0.4653 - val_loss: 0.7474 - val_accuracy: 0.4720
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3460 - accuracy: 0.4961 - val_loss: 0.8165 - val_accuracy: 0.4720
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3146 - accuracy: 0.5064 - val_loss: 0.8163 - val_accuracy: 0.4673
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4422 - accuracy: 0.4807 - val_loss: 0.8002 - val_accuracy: 0.4720
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2851 - accuracy: 0.5064 - val_loss: 0.7655 - val_accuracy: 0.4766
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3441 - accuracy: 0.5013 - val_loss: 0.8305 - val_accuracy: 0.4766
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3072 - accuracy: 0.5219 - val_loss: 0.8387 - val_accuracy: 0.4813
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4471 - accuracy: 0.5244 - val_loss: 0.8595 - val_accuracy: 0.4673
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3463 - accuracy: 0.5167 - val_loss: 0.7721 - val_accuracy: 0.4626
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3108 - accuracy: 0.5193 - val_loss: 0.7715 - val_accuracy: 0.4393
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4985 - accuracy: 0.5064 - val_loss: 0.8070 - val_accuracy: 0.4439
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3401 - accuracy: 0.5219 - val_loss: 0.8563 - val_accuracy: 0.4533
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4962 - accuracy: 0.5296 - val_loss: 1.1721 - val_accuracy: 0.4720
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3058 - accuracy: 0.5219 - val_loss: 1.0733 - val_accuracy: 0.5000
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3365 - accuracy: 0.5398 - val_loss: 1.0376 - val_accuracy: 0.4953
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4132 - accuracy: 0.5373 - val_loss: 0.9118 - val_accuracy: 0.4673
Epoch 122/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3382 - accuracy: 0.5167 - val_loss: 0.9115 - val_accuracy: 0.4766
Epoch 123/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3481 - accuracy: 0.5244 - val_loss: 0.8896 - val_accuracy: 0.4813
Epoch 124/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3369 - accuracy: 0.5244 - val_loss: 0.9466 - val_accuracy: 0.4813
Epoch 125/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3132 - accuracy: 0.5347 - val_loss: 0.9533 - val_accuracy: 0.4907
Epoch 126/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3768 - accuracy: 0.5398 - val_loss: 0.9207 - val_accuracy: 0.4953
Epoch 127/1000
```

4/4 [=====] - 0s 17ms/step - loss: 0.3269 - accuracy: 0.5501 - val_loss: 0.8676 - val_accuracy: 0.5000
 Epoch 128/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.3517 - accuracy: 0.5244 - val_loss: 0.7813 - val_accuracy: 0.4953
 Epoch 129/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3307 - accuracy: 0.5296 - val_loss: 0.9027 - val_accuracy: 0.4813
 Epoch 130/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2764 - accuracy: 0.5347 - val_loss: 0.8342 - val_accuracy: 0.4860
 Epoch 131/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.2881 - accuracy: 0.5064 - val_loss: 0.8020 - val_accuracy: 0.4766
 Epoch 132/1000
 4/4 [=====] - 0s 16ms/step - loss: 0.3219 - accuracy: 0.5039 - val_loss: 0.8013 - val_accuracy: 0.4766
 Epoch 133/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.3531 - accuracy: 0.5373 - val_loss: 0.7812 - val_accuracy: 0.4720
 Epoch 134/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3743 - accuracy: 0.5321 - val_loss: 0.8160 - val_accuracy: 0.4673
 Epoch 135/1000
 4/4 [=====] - 0s 17ms/step - loss: 0.2489 - accuracy: 0.5064 - val_loss: 0.8198 - val_accuracy: 0.4907
 Epoch 136/1000
 4/4 [=====] - 0s 16ms/step - loss: 0.2508 - accuracy: 0.5424 - val_loss: 0.8747 - val_accuracy: 0.4907
 Epoch 137/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.2838 - accuracy: 0.5501 - val_loss: 0.9488 - val_accuracy: 0.4766
 Epoch 138/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.2857 - accuracy: 0.5219 - val_loss: 0.9245 - val_accuracy: 0.4813
 Epoch 139/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2229 - accuracy: 0.5424 - val_loss: 0.9083 - val_accuracy: 0.4813
 Epoch 140/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2838 - accuracy: 0.5116 - val_loss: 0.9356 - val_accuracy: 0.4907
 Epoch 141/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.2420 - accuracy: 0.5733 - val_loss: 0.9323 - val_accuracy: 0.4813
 Epoch 142/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.2948 - accuracy: 0.5219 - val_loss: 0.9858 - val_accuracy: 0.4673
 Epoch 143/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.3194 - accuracy: 0.5116 - val_loss: 0.9888 - val_accuracy: 0.4673
 Epoch 144/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.3583 - accuracy: 0.5424 - val_loss: 1.0573 - val_accuracy: 0.4533
 Epoch 145/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.3443 - accuracy: 0.5450 - val_loss: 1.0506 - val_accuracy: 0.4439
 Epoch 146/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2701 - accuracy: 0.5167 - val_loss: 1.1279 - val_accuracy: 0.4626
 Epoch 147/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.2932 - accuracy: 0.5373 - val_loss: 1.0028 - val_accuracy: 0.4907
 Epoch 148/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.2478 - accuracy: 0.5296 - val_loss: 0.9504 - val_accuracy: 0.4907
 Epoch 149/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.2358 - accuracy: 0.5373 - val_loss: 1.0358 - val_accuracy: 0.4907
 Epoch 150/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.2790 - accuracy: 0.5373 - val_loss: 0.9937 - val_accuracy: 0.4907
 Epoch 151/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.1821 - accuracy: 0.4844Restoring model weights from the end of the best epoch: 1.
 4/4 [=====] - 0s 16ms/step - loss: 0.3161 - accuracy: 0.5219 - val_loss: 1.0196 - val_accuracy: 0.4907
 Epoch 151: early stopping
 2/2 [=====] - 0s 3ms/step - loss: 4.8781 - accuracy: 0.5349
 [CV] ENDDense1=100, Dense2=50; total time= 8.4s
 Model: "sequential_92"

Layer (type)	Output Shape	Param #
dense_368 (Dense)	(None, 100)	700
batch_normalization_276 (BatchNormalization)	(None, 100)	400
activation_276 (Activation)	(None, 100)	0

dense_369 (Dense)	(None, 50)	5050
batch_normalization_277 (BatchNormalization)	(None, 50)	200
activation_277 (Activation)	(None, 50)	0
dense_370 (Dense)	(None, 10)	510
batch_normalization_278 (BatchNormalization)	(None, 10)	40
activation_278 (Activation)	(None, 10)	0
dense_371 (Dense)	(None, 2)	22

=====

Total params: 6,922
Trainable params: 6,602
Non-trainable params: 320

Epoch 1/1000
4/4 [=====] - 1s 57ms/step - loss: 4.1633 - accuracy: 0.5424 - val_loss: 6.6938 - val_accuracy: 0.5093
Epoch 2/1000
4/4 [=====] - 0s 15ms/step - loss: 2.9700 - accuracy: 0.5913 - val_loss: 6.0567 - val_accuracy: 0.5514
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 2.4024 - accuracy: 0.5501 - val_loss: 5.0643 - val_accuracy: 0.5701
Epoch 4/1000
4/4 [=====] - 0s 15ms/step - loss: 2.3389 - accuracy: 0.5476 - val_loss: 3.7667 - val_accuracy: 0.5467
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 2.1081 - accuracy: 0.5553 - val_loss: 2.8866 - val_accuracy: 0.5234
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9694 - accuracy: 0.5424 - val_loss: 2.6499 - val_accuracy: 0.4252
Epoch 7/1000
4/4 [=====] - 0s 15ms/step - loss: 2.1273 - accuracy: 0.5321 - val_loss: 2.5649 - val_accuracy: 0.4206
Epoch 8/1000
4/4 [=====] - 0s 15ms/step - loss: 2.1197 - accuracy: 0.5527 - val_loss: 2.3906 - val_accuracy: 0.4626
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0873 - accuracy: 0.5476 - val_loss: 2.3942 - val_accuracy: 0.4720
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0449 - accuracy: 0.5296 - val_loss: 2.3162 - val_accuracy: 0.4766
Epoch 11/1000
4/4 [=====] - 0s 15ms/step - loss: 2.1504 - accuracy: 0.5398 - val_loss: 2.2662 - val_accuracy: 0.4813
Epoch 12/1000
4/4 [=====] - 0s 15ms/step - loss: 1.6985 - accuracy: 0.5630 - val_loss: 2.2488 - val_accuracy: 0.4766
Epoch 13/1000
4/4 [=====] - 0s 15ms/step - loss: 1.7225 - accuracy: 0.5578 - val_loss: 2.2308 - val_accuracy: 0.4766
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6449 - accuracy: 0.5553 - val_loss: 2.1975 - val_accuracy: 0.4766
Epoch 15/1000
4/4 [=====] - 0s 17ms/step - loss: 1.7927 - accuracy: 0.5681 - val_loss: 2.1403 - val_accuracy: 0.4813
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4763 - accuracy: 0.5913 - val_loss: 2.1447 - val_accuracy: 0.4860
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5745 - accuracy: 0.5527 - val_loss: 2.0711 - val_accuracy: 0.4860
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4613 - accuracy: 0.5527 - val_loss: 2.0078 - val_accuracy: 0.4860
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4780 - accuracy: 0.5578 - val_loss: 1.9385 - val_accuracy: 0.4860
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4226 - accuracy: 0.5398 - val_loss: 1.9349 - val_accuracy: 0.4813
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3782 - accuracy: 0.5707 - val_loss: 1.9224 - val_accuracy: 0.4860
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3915 - accuracy: 0.5758 - val_loss: 1.9168 - val_accuracy: 0.4860
Epoch 23/1000

```
4/4 [=====] - 0s 14ms/step - loss: 1.2385 - accuracy: 0.5604 - val_loss: 1.8954 - val_accuracy: 0.4860
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3518 - accuracy: 0.5630 - val_loss: 1.8887 - val_accuracy: 0.4860
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2410 - accuracy: 0.5373 - val_loss: 1.8753 - val_accuracy: 0.4860
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2593 - accuracy: 0.5219 - val_loss: 1.8908 - val_accuracy: 0.4813
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0965 - accuracy: 0.5553 - val_loss: 1.8693 - val_accuracy: 0.4813
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0953 - accuracy: 0.5784 - val_loss: 1.8253 - val_accuracy: 0.4813
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2596 - accuracy: 0.5681 - val_loss: 1.8043 - val_accuracy: 0.4860
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0600 - accuracy: 0.5707 - val_loss: 1.8037 - val_accuracy: 0.5280
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1089 - accuracy: 0.5656 - val_loss: 1.7821 - val_accuracy: 0.5654
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1269 - accuracy: 0.5270 - val_loss: 1.7588 - val_accuracy: 0.5327
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1662 - accuracy: 0.5167 - val_loss: 1.7149 - val_accuracy: 0.5280
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9703 - accuracy: 0.4704 - val_loss: 1.6946 - val_accuracy: 0.5140
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9105 - accuracy: 0.4781 - val_loss: 1.6413 - val_accuracy: 0.5421
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9426 - accuracy: 0.4910 - val_loss: 1.6189 - val_accuracy: 0.5467
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0024 - accuracy: 0.4910 - val_loss: 1.5953 - val_accuracy: 0.5467
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9477 - accuracy: 0.4704 - val_loss: 1.5339 - val_accuracy: 0.4953
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9914 - accuracy: 0.4627 - val_loss: 1.5180 - val_accuracy: 0.5000
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9320 - accuracy: 0.4730 - val_loss: 1.5012 - val_accuracy: 0.4533
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9460 - accuracy: 0.4781 - val_loss: 1.4527 - val_accuracy: 0.4579
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8529 - accuracy: 0.4859 - val_loss: 1.4440 - val_accuracy: 0.4626
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7731 - accuracy: 0.4961 - val_loss: 1.4275 - val_accuracy: 0.5514
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8306 - accuracy: 0.5244 - val_loss: 1.4101 - val_accuracy: 0.5514
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7280 - accuracy: 0.5887 - val_loss: 1.3866 - val_accuracy: 0.4720
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7347 - accuracy: 0.5604 - val_loss: 1.2992 - val_accuracy: 0.4860
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6634 - accuracy: 0.5553 - val_loss: 1.2418 - val_accuracy: 0.4766
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6436 - accuracy: 0.5707 - val_loss: 1.1285 - val_accuracy: 0.4813
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7099 - accuracy: 0.5604 - val_loss: 1.1208 - val_accuracy: 0.4720
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5732 - accuracy: 0.5913 - val_loss: 1.1161 - val_accuracy: 0.4813
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6316 - accuracy: 0.5604 - val_loss: 1.0616 - val_accuracy: 0.4907
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6701 - accuracy: 0.5476 - val_loss: 1.0521 - val_accuracy: 0.4860
```

Epoch 53/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5851 - accuracy: 0.5681 - val_loss: 1.0637 - val_accuracy: 0.5187
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5000 - accuracy: 0.5656 - val_loss: 1.0384 - val_accuracy: 0.4813
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5474 - accuracy: 0.6041 - val_loss: 1.0067 - val_accuracy: 0.4673
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4393 - accuracy: 0.6118 - val_loss: 1.0245 - val_accuracy: 0.4813
Epoch 57/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5349 - accuracy: 0.5578 - val_loss: 0.9408 - val_accuracy: 0.3925
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5001 - accuracy: 0.5090 - val_loss: 0.9086 - val_accuracy: 0.4252
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5528 - accuracy: 0.5758 - val_loss: 0.8463 - val_accuracy: 0.4766
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4348 - accuracy: 0.5681 - val_loss: 0.8492 - val_accuracy: 0.4766
Epoch 61/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4624 - accuracy: 0.5938 - val_loss: 0.8597 - val_accuracy: 0.4813
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5181 - accuracy: 0.6041 - val_loss: 0.8250 - val_accuracy: 0.4813
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4726 - accuracy: 0.5810 - val_loss: 0.8339 - val_accuracy: 0.4766
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5098 - accuracy: 0.5938 - val_loss: 0.8250 - val_accuracy: 0.4626
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4727 - accuracy: 0.5681 - val_loss: 0.8713 - val_accuracy: 0.4626
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5318 - accuracy: 0.5913 - val_loss: 0.8067 - val_accuracy: 0.4486
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4521 - accuracy: 0.5964 - val_loss: 0.7980 - val_accuracy: 0.4486
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5121 - accuracy: 0.6093 - val_loss: 0.7958 - val_accuracy: 0.4533
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5276 - accuracy: 0.5938 - val_loss: 0.7542 - val_accuracy: 0.4626
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4227 - accuracy: 0.5938 - val_loss: 0.7794 - val_accuracy: 0.4766
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5112 - accuracy: 0.6144 - val_loss: 0.7271 - val_accuracy: 0.4720
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4550 - accuracy: 0.5938 - val_loss: 0.7690 - val_accuracy: 0.5047
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4531 - accuracy: 0.5835 - val_loss: 0.7279 - val_accuracy: 0.5000
Epoch 74/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5595 - accuracy: 0.6067 - val_loss: 0.7576 - val_accuracy: 0.4953
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3603 - accuracy: 0.6118 - val_loss: 0.6430 - val_accuracy: 0.4907
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4398 - accuracy: 0.6093 - val_loss: 0.6369 - val_accuracy: 0.5047
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4877 - accuracy: 0.6144 - val_loss: 0.6185 - val_accuracy: 0.4953
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5584 - accuracy: 0.6067 - val_loss: 0.6126 - val_accuracy: 0.5093
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4767 - accuracy: 0.6144 - val_loss: 0.5463 - val_accuracy: 0.5093
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4781 - accuracy: 0.6093 - val_loss: 0.5613 - val_accuracy: 0.5093
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3899 - accuracy: 0.6555 - val_loss: 0.5889 - val_accuracy: 0.4860
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4830 - accuracy: 0.6272 - val_loss: 0.6026 - val_accuracy: 0.5093

```
accuracy: 0.4907
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4675 - accuracy: 0.6041 - val_loss: 0.6019 - val_accuracy: 0.4953
Epoch 84/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4869 - accuracy: 0.6247 - val_loss: 0.5869 - val_accuracy: 0.4907
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4198 - accuracy: 0.6298 - val_loss: 0.5904 - val_accuracy: 0.5187
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3400 - accuracy: 0.6247 - val_loss: 0.6114 - val_accuracy: 0.4953
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4273 - accuracy: 0.6247 - val_loss: 0.6159 - val_accuracy: 0.5093
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3466 - accuracy: 0.6170 - val_loss: 0.6009 - val_accuracy: 0.5000
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4394 - accuracy: 0.6195 - val_loss: 0.5999 - val_accuracy: 0.5093
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3962 - accuracy: 0.6170 - val_loss: 0.6141 - val_accuracy: 0.5140
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4555 - accuracy: 0.6144 - val_loss: 0.5943 - val_accuracy: 0.4907
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4447 - accuracy: 0.6015 - val_loss: 0.6664 - val_accuracy: 0.4953
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3496 - accuracy: 0.6118 - val_loss: 0.6294 - val_accuracy: 0.4720
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3655 - accuracy: 0.6118 - val_loss: 0.6873 - val_accuracy: 0.4720
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3363 - accuracy: 0.5758 - val_loss: 0.7216 - val_accuracy: 0.4720
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3435 - accuracy: 0.6041 - val_loss: 0.7720 - val_accuracy: 0.4673
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5775 - accuracy: 0.5913 - val_loss: 0.6738 - val_accuracy: 0.4720
Epoch 98/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3992 - accuracy: 0.5964 - val_loss: 0.6763 - val_accuracy: 0.4720
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3698 - accuracy: 0.5810 - val_loss: 0.6825 - val_accuracy: 0.4720
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3343 - accuracy: 0.5835 - val_loss: 0.6843 - val_accuracy: 0.4720
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4021 - accuracy: 0.5810 - val_loss: 0.7091 - val_accuracy: 0.4766
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4447 - accuracy: 0.5810 - val_loss: 0.7731 - val_accuracy: 0.4860
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4234 - accuracy: 0.5835 - val_loss: 0.7435 - val_accuracy: 0.4813
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3803 - accuracy: 0.5758 - val_loss: 0.8342 - val_accuracy: 0.4860
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3499 - accuracy: 0.6067 - val_loss: 0.7656 - val_accuracy: 0.4953
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4306 - accuracy: 0.5887 - val_loss: 0.7686 - val_accuracy: 0.4813
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3588 - accuracy: 0.5784 - val_loss: 0.7455 - val_accuracy: 0.4907
Epoch 108/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3510 - accuracy: 0.5913 - val_loss: 0.7566 - val_accuracy: 0.4907
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3751 - accuracy: 0.5964 - val_loss: 0.9424 - val_accuracy: 0.4860
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3912 - accuracy: 0.5913 - val_loss: 1.0784 - val_accuracy: 0.4907
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3327 - accuracy: 0.6015 - val_loss: 1.0120 - val_accuracy: 0.4953
Epoch 112/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.3163 - accuracy: 0.5938 - val_loss: 0.9229 - val_accuracy: 0.4766
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3547 - accuracy: 0.5861 - val_loss: 0.9064 - val_accuracy: 0.4813
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3687 - accuracy: 0.6093 - val_loss: 0.9619 - val_accuracy: 0.4860
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3319 - accuracy: 0.6067 - val_loss: 0.9223 - val_accuracy: 0.4766
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3092 - accuracy: 0.6041 - val_loss: 0.9232 - val_accuracy: 0.4860
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3593 - accuracy: 0.6067 - val_loss: 0.9726 - val_accuracy: 0.4860
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4567 - accuracy: 0.5861 - val_loss: 1.0285 - val_accuracy: 0.4813
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4044 - accuracy: 0.5861 - val_loss: 1.0529 - val_accuracy: 0.4907
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3510 - accuracy: 0.5861 - val_loss: 1.1006 - val_accuracy: 0.4907
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3767 - accuracy: 0.5990 - val_loss: 1.1694 - val_accuracy: 0.4766
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3106 - accuracy: 0.5861 - val_loss: 1.0543 - val_accuracy: 0.4813
Epoch 123/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2911 - accuracy: 0.5964 - val_loss: 1.0353 - val_accuracy: 0.4813
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3526 - accuracy: 0.5861 - val_loss: 1.0400 - val_accuracy: 0.4907
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4465 - accuracy: 0.5861 - val_loss: 1.0459 - val_accuracy: 0.4766
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3738 - accuracy: 0.5810 - val_loss: 1.0151 - val_accuracy: 0.4766
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3406 - accuracy: 0.5733 - val_loss: 1.0357 - val_accuracy: 0.4673
Epoch 128/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3023 - accuracy: 0.5990 - val_loss: 1.1543 - val_accuracy: 0.4720
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3316 - accuracy: 0.5810 - val_loss: 1.1001 - val_accuracy: 0.4766
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3777 - accuracy: 0.5913 - val_loss: 1.1716 - val_accuracy: 0.4720
Epoch 131/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3155 - accuracy: 0.5861 - val_loss: 1.1675 - val_accuracy: 0.4673
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3361 - accuracy: 0.5835 - val_loss: 1.2224 - val_accuracy: 0.4626
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4575 - accuracy: 0.5913 - val_loss: 1.1931 - val_accuracy: 0.4953
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3664 - accuracy: 0.5887 - val_loss: 1.2184 - val_accuracy: 0.4813
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3030 - accuracy: 0.6015 - val_loss: 1.2094 - val_accuracy: 0.4766
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3536 - accuracy: 0.6015 - val_loss: 1.2279 - val_accuracy: 0.4720
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2718 - accuracy: 0.5810 - val_loss: 1.2591 - val_accuracy: 0.4813
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3008 - accuracy: 0.5990 - val_loss: 1.2666 - val_accuracy: 0.4720
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3314 - accuracy: 0.5990 - val_loss: 1.2664 - val_accuracy: 0.4907
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2754 - accuracy: 0.6118 - val_loss: 1.3180 - val_accuracy: 0.4860
Epoch 141/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3054 - accuracy: 0.5835 - val_loss: 1.2495 - val_accuracy: 0.4860
```

Epoch 142/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3465 - accuracy: 0.6221 - val_loss: 1.2587 - val_accuracy: 0.5047
 Epoch 143/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.2798 - accuracy: 0.6298 - val_loss: 1.2820 - val_accuracy: 0.5047
 Epoch 144/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.3462 - accuracy: 0.6093 - val_loss: 1.3177 - val_accuracy: 0.5047
 Epoch 145/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.3893 - accuracy: 0.6170 - val_loss: 1.2224 - val_accuracy: 0.4953
 Epoch 146/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3150 - accuracy: 0.6093 - val_loss: 1.2804 - val_accuracy: 0.5234
 Epoch 147/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2873 - accuracy: 0.6298 - val_loss: 1.3565 - val_accuracy: 0.5140
 Epoch 148/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3022 - accuracy: 0.6427 - val_loss: 1.4225 - val_accuracy: 0.5327
 Epoch 149/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.2975 - accuracy: 0.6684 - val_loss: 1.3774 - val_accuracy: 0.5280
 Epoch 150/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3127 - accuracy: 0.6350 - val_loss: 1.4678 - val_accuracy: 0.5234
 Epoch 151/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2745 - accuracy: 0.6478 - val_loss: 1.5518 - val_accuracy: 0.5093
 Epoch 152/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3998 - accuracy: 0.6530 - val_loss: 1.5193 - val_accuracy: 0.5187
 Epoch 153/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.1192 - accuracy: 0.6484 Restoring model weights from the end of the best epoch: 3.
 4/4 [=====] - 0s 13ms/step - loss: 0.2626 - accuracy: 0.6658 - val_loss: 1.5006 - val_accuracy: 0.5234
 Epoch 153: early stopping
 2/2 [=====] - 0s 3ms/step - loss: 3.3855 - accuracy: 0.6744
 [CV] END Dense1=100, Dense2=50; total time= 8.5s
 Model: "sequential_93"

Layer (type)	Output Shape	Param #
dense_372 (Dense)	(None, 100)	700
batch_normalization_279 (BatchNormalization)	(None, 100)	400
activation_279 (Activation)	(None, 100)	0
dense_373 (Dense)	(None, 50)	5050
batch_normalization_280 (BatchNormalization)	(None, 50)	200
activation_280 (Activation)	(None, 50)	0
dense_374 (Dense)	(None, 10)	510
batch_normalization_281 (BatchNormalization)	(None, 10)	40
activation_281 (Activation)	(None, 10)	0
dense_375 (Dense)	(None, 2)	22

Total params: 6,922
 Trainable params: 6,602
 Non-trainable params: 320

Epoch 1/1000
 4/4 [=====] - 2s 56ms/step - loss: 4.3948 - accuracy: 0.5887 - val_loss: 4.9919 - val_accuracy: 0.6402
 Epoch 2/1000
 4/4 [=====] - 0s 14ms/step - loss: 3.5598 - accuracy: 0.6735 - val_loss: 4.8656 - val_accuracy: 0.6495
 Epoch 3/1000
 4/4 [=====] - 0s 13ms/step - loss: 3.1984 - accuracy: 0.6735 - val_loss: 4.7595 - val_accuracy: 0.6308
 Epoch 4/1000
 4/4 [=====] - 0s 13ms/step - loss: 3.2118 - accuracy: 0.6607 - val_loss: 4.6891 - val_accuracy: 0.6168
 Epoch 5/1000
 4/4 [=====] - 0s 13ms/step - loss: 2.9986 - accuracy: 0.6658 - val_loss: 4.3933 - val_accuracy: 0.6121
 Epoch 6/1000

```
4/4 [=====] - 0s 13ms/step - loss: 2.7865 - accuracy: 0.6427 - val_loss: 4.0116 - val_accuracy: 0.6168
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7048 - accuracy: 0.6812 - val_loss: 3.3115 - val_accuracy: 0.6075
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5635 - accuracy: 0.6221 - val_loss: 2.9485 - val_accuracy: 0.6075
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4469 - accuracy: 0.5861 - val_loss: 2.7104 - val_accuracy: 0.6028
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3270 - accuracy: 0.6298 - val_loss: 2.4577 - val_accuracy: 0.5935
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2765 - accuracy: 0.6298 - val_loss: 2.3658 - val_accuracy: 0.6028
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2813 - accuracy: 0.6272 - val_loss: 2.2618 - val_accuracy: 0.5981
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1262 - accuracy: 0.5913 - val_loss: 2.2246 - val_accuracy: 0.5981
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1856 - accuracy: 0.6118 - val_loss: 2.1804 - val_accuracy: 0.5935
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0321 - accuracy: 0.5784 - val_loss: 2.1628 - val_accuracy: 0.5935
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0238 - accuracy: 0.5578 - val_loss: 2.1047 - val_accuracy: 0.5935
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7945 - accuracy: 0.5476 - val_loss: 2.0741 - val_accuracy: 0.5888
Epoch 18/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9647 - accuracy: 0.5476 - val_loss: 2.0141 - val_accuracy: 0.5935
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7574 - accuracy: 0.5090 - val_loss: 1.9944 - val_accuracy: 0.5888
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7882 - accuracy: 0.5476 - val_loss: 1.9347 - val_accuracy: 0.5888
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7564 - accuracy: 0.5244 - val_loss: 1.9081 - val_accuracy: 0.5888
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7434 - accuracy: 0.4936 - val_loss: 1.8264 - val_accuracy: 0.5841
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6222 - accuracy: 0.5193 - val_loss: 1.7996 - val_accuracy: 0.5841
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6504 - accuracy: 0.5244 - val_loss: 1.8240 - val_accuracy: 0.5841
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6740 - accuracy: 0.5604 - val_loss: 1.7399 - val_accuracy: 0.5841
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5873 - accuracy: 0.5270 - val_loss: 1.7406 - val_accuracy: 0.5841
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5865 - accuracy: 0.5219 - val_loss: 1.7387 - val_accuracy: 0.5841
Epoch 28/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6149 - accuracy: 0.5244 - val_loss: 1.7309 - val_accuracy: 0.5794
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5293 - accuracy: 0.5270 - val_loss: 1.7188 - val_accuracy: 0.5935
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6824 - accuracy: 0.5373 - val_loss: 1.7108 - val_accuracy: 0.5935
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5100 - accuracy: 0.5296 - val_loss: 1.6984 - val_accuracy: 0.5981
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4685 - accuracy: 0.5296 - val_loss: 1.6908 - val_accuracy: 0.5981
Epoch 33/1000
4/4 [=====] - 0s 18ms/step - loss: 1.4645 - accuracy: 0.5373 - val_loss: 1.6826 - val_accuracy: 0.5981
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4786 - accuracy: 0.5270 - val_loss: 1.6586 - val_accuracy: 0.5841
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4484 - accuracy: 0.5296 - val_loss: 1.6111 - val_accuracy: 0.5888
```

Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3519 - accuracy: 0.5219 - val_loss: 1.6226 - val_accuracy: 0.5888
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3851 - accuracy: 0.5321 - val_loss: 1.6109 - val_accuracy: 0.5888
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3887 - accuracy: 0.5167 - val_loss: 1.5999 - val_accuracy: 0.5888
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3232 - accuracy: 0.5373 - val_loss: 1.6121 - val_accuracy: 0.5794
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2954 - accuracy: 0.5398 - val_loss: 1.5622 - val_accuracy: 0.5327
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3594 - accuracy: 0.5424 - val_loss: 1.5494 - val_accuracy: 0.4533
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2183 - accuracy: 0.5424 - val_loss: 1.5624 - val_accuracy: 0.4579
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2534 - accuracy: 0.5758 - val_loss: 1.5402 - val_accuracy: 0.4579
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1784 - accuracy: 0.5604 - val_loss: 1.5191 - val_accuracy: 0.4626
Epoch 45/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2117 - accuracy: 0.5964 - val_loss: 1.5662 - val_accuracy: 0.4673
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1756 - accuracy: 0.5887 - val_loss: 1.4703 - val_accuracy: 0.4626
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0695 - accuracy: 0.5578 - val_loss: 1.4401 - val_accuracy: 0.4626
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0745 - accuracy: 0.5707 - val_loss: 1.4240 - val_accuracy: 0.4720
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1047 - accuracy: 0.5681 - val_loss: 1.4088 - val_accuracy: 0.4720
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9853 - accuracy: 0.5938 - val_loss: 1.3633 - val_accuracy: 0.4766
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0344 - accuracy: 0.5784 - val_loss: 1.3506 - val_accuracy: 0.4626
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9903 - accuracy: 0.6041 - val_loss: 1.3526 - val_accuracy: 0.4626
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9093 - accuracy: 0.5527 - val_loss: 1.3504 - val_accuracy: 0.4766
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8576 - accuracy: 0.5758 - val_loss: 1.3371 - val_accuracy: 0.4860
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0116 - accuracy: 0.5578 - val_loss: 1.3549 - val_accuracy: 0.4813
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8814 - accuracy: 0.5553 - val_loss: 1.3810 - val_accuracy: 0.4813
Epoch 57/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7847 - accuracy: 0.5810 - val_loss: 1.3597 - val_accuracy: 0.4766
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9206 - accuracy: 0.5424 - val_loss: 1.4263 - val_accuracy: 0.4579
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8427 - accuracy: 0.5758 - val_loss: 1.4407 - val_accuracy: 0.4626
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8230 - accuracy: 0.5758 - val_loss: 1.4394 - val_accuracy: 0.4626
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8412 - accuracy: 0.5630 - val_loss: 1.3929 - val_accuracy: 0.4813
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8456 - accuracy: 0.5630 - val_loss: 1.3153 - val_accuracy: 0.4860
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9025 - accuracy: 0.6041 - val_loss: 1.2756 - val_accuracy: 0.5093
Epoch 64/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8035 - accuracy: 0.6170 - val_loss: 1.2385 - val_accuracy: 0.5187
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8042 - accuracy: 0.5990 - val_loss: 1.2080 - val_accuracy: 0.5187

```
accuracy: 0.4953
Epoch 66/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8105 - accuracy: 0.5887 - val_loss: 1.2150 - val_accuracy: 0.4907
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7590 - accuracy: 0.5861 - val_loss: 1.1452 - val_accuracy: 0.5093
Epoch 68/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8352 - accuracy: 0.6401 - val_loss: 1.1474 - val_accuracy: 0.5234
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8781 - accuracy: 0.5938 - val_loss: 1.1120 - val_accuracy: 0.5140
Epoch 70/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8211 - accuracy: 0.5887 - val_loss: 1.0999 - val_accuracy: 0.5234
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7638 - accuracy: 0.5707 - val_loss: 1.1263 - val_accuracy: 0.5140
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7000 - accuracy: 0.5861 - val_loss: 1.0954 - val_accuracy: 0.5234
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6827 - accuracy: 0.5913 - val_loss: 1.0821 - val_accuracy: 0.5374
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7053 - accuracy: 0.5578 - val_loss: 1.0858 - val_accuracy: 0.5093
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7829 - accuracy: 0.5784 - val_loss: 1.0829 - val_accuracy: 0.5000
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7172 - accuracy: 0.5887 - val_loss: 1.0572 - val_accuracy: 0.4813
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7532 - accuracy: 0.5861 - val_loss: 1.0880 - val_accuracy: 0.4813
Epoch 78/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6726 - accuracy: 0.5347 - val_loss: 1.0766 - val_accuracy: 0.4860
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7316 - accuracy: 0.5373 - val_loss: 1.0696 - val_accuracy: 0.4860
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6541 - accuracy: 0.5476 - val_loss: 1.0708 - val_accuracy: 0.4626
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8114 - accuracy: 0.5527 - val_loss: 1.0352 - val_accuracy: 0.4766
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8019 - accuracy: 0.5861 - val_loss: 1.0117 - val_accuracy: 0.5000
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7067 - accuracy: 0.5681 - val_loss: 0.9398 - val_accuracy: 0.5561
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7568 - accuracy: 0.5450 - val_loss: 0.9365 - val_accuracy: 0.5467
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8317 - accuracy: 0.5296 - val_loss: 0.9668 - val_accuracy: 0.5374
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7432 - accuracy: 0.5424 - val_loss: 0.9327 - val_accuracy: 0.5514
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6466 - accuracy: 0.5270 - val_loss: 0.8968 - val_accuracy: 0.5561
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6134 - accuracy: 0.5501 - val_loss: 0.9391 - val_accuracy: 0.5467
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6721 - accuracy: 0.5578 - val_loss: 0.8853 - val_accuracy: 0.5654
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7106 - accuracy: 0.6067 - val_loss: 0.8796 - val_accuracy: 0.5561
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7109 - accuracy: 0.6195 - val_loss: 0.9462 - val_accuracy: 0.5327
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7235 - accuracy: 0.5604 - val_loss: 0.9512 - val_accuracy: 0.5561
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6785 - accuracy: 0.5604 - val_loss: 0.8864 - val_accuracy: 0.6075
Epoch 94/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6690 - accuracy: 0.5450 - val_loss: 0.8818 - val_accuracy: 0.6028
Epoch 95/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.6940 - accuracy: 0.5656 - val_loss: 0.9168 - val_accuracy: 0.5514
Epoch 96/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5611 - accuracy: 0.5141 - val_loss: 0.8997 - val_accuracy: 0.5935
Epoch 97/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6652 - accuracy: 0.5707 - val_loss: 0.8235 - val_accuracy: 0.5607
Epoch 98/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6305 - accuracy: 0.5501 - val_loss: 0.8872 - val_accuracy: 0.5794
Epoch 99/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5948 - accuracy: 0.5656 - val_loss: 0.9479 - val_accuracy: 0.5981
Epoch 100/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5876 - accuracy: 0.5810 - val_loss: 0.9344 - val_accuracy: 0.5888
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5716 - accuracy: 0.5964 - val_loss: 0.9044 - val_accuracy: 0.5794
Epoch 102/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4916 - accuracy: 0.5938 - val_loss: 0.9003 - val_accuracy: 0.5888
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5698 - accuracy: 0.5604 - val_loss: 0.9361 - val_accuracy: 0.5794
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6394 - accuracy: 0.6144 - val_loss: 1.0195 - val_accuracy: 0.5935
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5743 - accuracy: 0.5707 - val_loss: 0.8302 - val_accuracy: 0.5607
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5259 - accuracy: 0.5990 - val_loss: 0.9922 - val_accuracy: 0.5748
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6415 - accuracy: 0.6041 - val_loss: 0.9166 - val_accuracy: 0.5514
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4592 - accuracy: 0.5938 - val_loss: 0.8398 - val_accuracy: 0.5421
Epoch 109/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4642 - accuracy: 0.5861 - val_loss: 0.8736 - val_accuracy: 0.5607
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5291 - accuracy: 0.6170 - val_loss: 0.8153 - val_accuracy: 0.5607
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5667 - accuracy: 0.6093 - val_loss: 0.9073 - val_accuracy: 0.5421
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5427 - accuracy: 0.5887 - val_loss: 0.8912 - val_accuracy: 0.5327
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4643 - accuracy: 0.5861 - val_loss: 0.9382 - val_accuracy: 0.5327
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4891 - accuracy: 0.5553 - val_loss: 0.9316 - val_accuracy: 0.5514
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4954 - accuracy: 0.5656 - val_loss: 0.9763 - val_accuracy: 0.5374
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4098 - accuracy: 0.5835 - val_loss: 0.9723 - val_accuracy: 0.5280
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5358 - accuracy: 0.6118 - val_loss: 1.0126 - val_accuracy: 0.5374
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4636 - accuracy: 0.5733 - val_loss: 1.0406 - val_accuracy: 0.5421
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5020 - accuracy: 0.5681 - val_loss: 0.9578 - val_accuracy: 0.5280
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4233 - accuracy: 0.6195 - val_loss: 0.9457 - val_accuracy: 0.5187
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3498 - accuracy: 0.6015 - val_loss: 1.0214 - val_accuracy: 0.5280
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3443 - accuracy: 0.5938 - val_loss: 1.0563 - val_accuracy: 0.5514
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3497 - accuracy: 0.5861 - val_loss: 1.0295 - val_accuracy: 0.5654
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3635 - accuracy: 0.6093 - val_loss: 1.0350 - val_accuracy: 0.5607
```

Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3278 - accuracy: 0.6093 - val_loss: 1.0165 - val_accuracy: 0.5607
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3809 - accuracy: 0.6093 - val_loss: 1.0371 - val_accuracy: 0.5701
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3868 - accuracy: 0.5938 - val_loss: 1.0591 - val_accuracy: 0.5421
Epoch 128/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4598 - accuracy: 0.5938 - val_loss: 0.9764 - val_accuracy: 0.5607
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3497 - accuracy: 0.6041 - val_loss: 0.8499 - val_accuracy: 0.4953
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3453 - accuracy: 0.6298 - val_loss: 0.9445 - val_accuracy: 0.5280
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3698 - accuracy: 0.5656 - val_loss: 0.9311 - val_accuracy: 0.5467
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3054 - accuracy: 0.6041 - val_loss: 0.9576 - val_accuracy: 0.5561
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3535 - accuracy: 0.5681 - val_loss: 0.9588 - val_accuracy: 0.5607
Epoch 134/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4727 - accuracy: 0.6118 - val_loss: 1.0818 - val_accuracy: 0.5888
Epoch 135/1000
4/4 [=====] - 0s 19ms/step - loss: 0.4830 - accuracy: 0.6170 - val_loss: 1.0882 - val_accuracy: 0.6402
Epoch 136/1000
4/4 [=====] - 0s 18ms/step - loss: 0.3501 - accuracy: 0.5784 - val_loss: 1.0921 - val_accuracy: 0.6402
Epoch 137/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3219 - accuracy: 0.5656 - val_loss: 1.0785 - val_accuracy: 0.6215
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3270 - accuracy: 0.5398 - val_loss: 1.0906 - val_accuracy: 0.6449
Epoch 139/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3942 - accuracy: 0.6118 - val_loss: 1.1820 - val_accuracy: 0.6636
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4250 - accuracy: 0.5990 - val_loss: 1.0914 - val_accuracy: 0.6495
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3349 - accuracy: 0.6555 - val_loss: 1.1184 - val_accuracy: 0.6542
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3452 - accuracy: 0.6298 - val_loss: 1.0651 - val_accuracy: 0.6495
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3106 - accuracy: 0.5913 - val_loss: 1.0509 - val_accuracy: 0.6355
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2918 - accuracy: 0.6170 - val_loss: 0.9803 - val_accuracy: 0.6449
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3193 - accuracy: 0.6298 - val_loss: 0.9528 - val_accuracy: 0.6495
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3446 - accuracy: 0.6247 - val_loss: 0.9106 - val_accuracy: 0.6168
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3973 - accuracy: 0.5681 - val_loss: 1.0121 - val_accuracy: 0.6402
Epoch 148/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3057 - accuracy: 0.5938 - val_loss: 0.8959 - val_accuracy: 0.6402
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3050 - accuracy: 0.6170 - val_loss: 0.8970 - val_accuracy: 0.6355
Epoch 150/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3286 - accuracy: 0.6221 - val_loss: 0.9857 - val_accuracy: 0.6308
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3146 - accuracy: 0.6401 - val_loss: 1.0143 - val_accuracy: 0.6495
Epoch 152/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3050 - accuracy: 0.6221 - val_loss: 0.9879 - val_accuracy: 0.6121
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2893 - accuracy: 0.6170 - val_loss: 0.9898 - val_accuracy: 0.6168
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3122 - accuracy: 0.6093 - val_loss: 0.9382 - val_accuracy: 0.6093

```
accuracy: 0.6075
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2768 - accuracy: 0.6015 - val_loss: 0.9080 - val_
accuracy: 0.6168
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4229 - accuracy: 0.5913 - val_loss: 0.9366 - val_
accuracy: 0.6308
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2923 - accuracy: 0.6041 - val_loss: 0.9055 - val_
accuracy: 0.6308
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3121 - accuracy: 0.6375 - val_loss: 0.9234 - val_
accuracy: 0.6495
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3083 - accuracy: 0.6093 - val_loss: 0.9378 - val_
accuracy: 0.6308
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2871 - accuracy: 0.5681 - val_loss: 0.9101 - val_
accuracy: 0.6121
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2710 - accuracy: 0.6247 - val_loss: 0.9733 - val_
accuracy: 0.5981
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3622 - accuracy: 0.5938 - val_loss: 0.9411 - val_
accuracy: 0.6262
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3121 - accuracy: 0.5810 - val_loss: 1.0798 - val_
accuracy: 0.6449
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2807 - accuracy: 0.6118 - val_loss: 1.0637 - val_
accuracy: 0.6355
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3018 - accuracy: 0.6015 - val_loss: 0.9973 - val_
accuracy: 0.6542
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3688 - accuracy: 0.5861 - val_loss: 1.0609 - val_
accuracy: 0.6636
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3118 - accuracy: 0.6170 - val_loss: 0.9640 - val_
accuracy: 0.6636
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2978 - accuracy: 0.5990 - val_loss: 1.0703 - val_
accuracy: 0.6822
Epoch 169/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3178 - accuracy: 0.6195 - val_loss: 1.1583 - val_
accuracy: 0.6636
Epoch 170/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2710 - accuracy: 0.6170 - val_loss: 1.1469 - val_
accuracy: 0.6589
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2625 - accuracy: 0.5810 - val_loss: 1.0549 - val_
accuracy: 0.6355
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2292 - accuracy: 0.5887 - val_loss: 1.0666 - val_
accuracy: 0.6075
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2579 - accuracy: 0.6041 - val_loss: 1.0986 - val_
accuracy: 0.5514
Epoch 174/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2583 - accuracy: 0.6221 - val_loss: 1.0986 - val_
accuracy: 0.5935
Epoch 175/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3010 - accuracy: 0.6067 - val_loss: 1.0998 - val_
accuracy: 0.6075
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2390 - accuracy: 0.6221 - val_loss: 1.0782 - val_
accuracy: 0.5888
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2773 - accuracy: 0.5990 - val_loss: 1.0302 - val_
accuracy: 0.5935
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2405 - accuracy: 0.6221 - val_loss: 1.0095 - val_
accuracy: 0.5701
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2838 - accuracy: 0.5913 - val_loss: 1.0678 - val_
accuracy: 0.6262
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3628 - accuracy: 0.6221 - val_loss: 1.0822 - val_
accuracy: 0.6262
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3496 - accuracy: 0.6324 - val_loss: 1.0737 - val_
accuracy: 0.6215
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2942 - accuracy: 0.6375 - val_loss: 1.1194 - val_
accuracy: 0.6028
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2531 - accuracy: 0.5835 - val_loss: 1.2426 - val_
accuracy: 0.6308
Epoch 184/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.2632 - accuracy: 0.6067 - val_loss: 1.2600 - val_accuracy: 0.6028
Epoch 185/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2804 - accuracy: 0.5913 - val_loss: 1.4479 - val_accuracy: 0.6542
Epoch 186/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2834 - accuracy: 0.5733 - val_loss: 1.3690 - val_accuracy: 0.6495
Epoch 187/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2285 - accuracy: 0.5630 - val_loss: 1.3305 - val_accuracy: 0.6729
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2998 - accuracy: 0.5913 - val_loss: 1.3417 - val_accuracy: 0.6776
Epoch 189/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2658 - accuracy: 0.5244 - val_loss: 1.4512 - val_accuracy: 0.6589
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2367 - accuracy: 0.5553 - val_loss: 1.3574 - val_accuracy: 0.6495
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2611 - accuracy: 0.5630 - val_loss: 1.3582 - val_accuracy: 0.6402
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2643 - accuracy: 0.5578 - val_loss: 1.3529 - val_accuracy: 0.6308
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2492 - accuracy: 0.5835 - val_loss: 1.2593 - val_accuracy: 0.6028
Epoch 194/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2284 - accuracy: 0.5270 - val_loss: 1.2128 - val_accuracy: 0.5981
Epoch 195/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3016 - accuracy: 0.5501 - val_loss: 1.4091 - val_accuracy: 0.5888
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2617 - accuracy: 0.5861 - val_loss: 1.3733 - val_accuracy: 0.6121
Epoch 197/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2539 - accuracy: 0.5656 - val_loss: 1.3512 - val_accuracy: 0.6028
Epoch 198/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2565 - accuracy: 0.5835 - val_loss: 1.1955 - val_accuracy: 0.6028
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2781 - accuracy: 0.5835 - val_loss: 1.3222 - val_accuracy: 0.5888
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1933 - accuracy: 0.5501 - val_loss: 1.4271 - val_accuracy: 0.6028
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2704 - accuracy: 0.5835 - val_loss: 1.4379 - val_accuracy: 0.6168
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1955 - accuracy: 0.5630 - val_loss: 1.2452 - val_accuracy: 0.5467
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2109 - accuracy: 0.5604 - val_loss: 1.3108 - val_accuracy: 0.5421
Epoch 204/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2115 - accuracy: 0.5630 - val_loss: 1.3069 - val_accuracy: 0.6075
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2500 - accuracy: 0.6118 - val_loss: 1.3023 - val_accuracy: 0.5467
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2311 - accuracy: 0.5630 - val_loss: 1.3308 - val_accuracy: 0.5421
Epoch 207/1000
4/4 [=====] - 0s 17ms/step - loss: 0.2462 - accuracy: 0.5630 - val_loss: 1.3006 - val_accuracy: 0.5467
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2152 - accuracy: 0.5810 - val_loss: 1.3316 - val_accuracy: 0.5327
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2853 - accuracy: 0.5604 - val_loss: 1.3490 - val_accuracy: 0.5607
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2337 - accuracy: 0.5758 - val_loss: 1.3557 - val_accuracy: 0.6028
Epoch 211/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3316 - accuracy: 0.6247 - val_loss: 1.4380 - val_accuracy: 0.5981
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3016 - accuracy: 0.5861 - val_loss: 1.4242 - val_accuracy: 0.6121
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2956 - accuracy: 0.6041 - val_loss: 1.4469 - val_accuracy: 0.6355
```

Epoch 214/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2952 - accuracy: 0.6195 - val_loss: 1.4935 - val_accuracy: 0.6308
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2418 - accuracy: 0.5630 - val_loss: 1.3860 - val_accuracy: 0.6308
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2676 - accuracy: 0.6118 - val_loss: 1.3780 - val_accuracy: 0.6682
Epoch 217/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2278 - accuracy: 0.5835 - val_loss: 1.5751 - val_accuracy: 0.6776
Epoch 218/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2200 - accuracy: 0.6221 - val_loss: 1.4304 - val_accuracy: 0.7056
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1895 - accuracy: 0.5835 - val_loss: 1.2863 - val_accuracy: 0.6916
Epoch 220/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2079 - accuracy: 0.5578 - val_loss: 1.3499 - val_accuracy: 0.6822
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2185 - accuracy: 0.5861 - val_loss: 1.3836 - val_accuracy: 0.6776
Epoch 222/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2624 - accuracy: 0.5964 - val_loss: 1.4541 - val_accuracy: 0.6542
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2699 - accuracy: 0.5938 - val_loss: 1.4738 - val_accuracy: 0.6262
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1873 - accuracy: 0.5758 - val_loss: 1.4409 - val_accuracy: 0.6402
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1887 - accuracy: 0.5913 - val_loss: 1.3661 - val_accuracy: 0.6355
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2593 - accuracy: 0.6298 - val_loss: 1.2665 - val_accuracy: 0.6542
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2470 - accuracy: 0.6093 - val_loss: 1.0837 - val_accuracy: 0.6262
Epoch 228/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2162 - accuracy: 0.6350 - val_loss: 1.0560 - val_accuracy: 0.6168
Epoch 229/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2120 - accuracy: 0.6324 - val_loss: 1.0659 - val_accuracy: 0.6355
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1803 - accuracy: 0.6247 - val_loss: 1.2623 - val_accuracy: 0.6028
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2181 - accuracy: 0.6067 - val_loss: 1.1578 - val_accuracy: 0.6168
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2516 - accuracy: 0.6015 - val_loss: 1.2452 - val_accuracy: 0.5935
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2370 - accuracy: 0.5964 - val_loss: 1.1900 - val_accuracy: 0.5794
Epoch 234/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2339 - accuracy: 0.5913 - val_loss: 1.1726 - val_accuracy: 0.5935
Epoch 235/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2401 - accuracy: 0.5964 - val_loss: 1.2732 - val_accuracy: 0.5935
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1883 - accuracy: 0.5964 - val_loss: 1.2905 - val_accuracy: 0.5888
Epoch 237/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2411 - accuracy: 0.5887 - val_loss: 1.4276 - val_accuracy: 0.6028
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2114 - accuracy: 0.5990 - val_loss: 1.2447 - val_accuracy: 0.6075
Epoch 239/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2046 - accuracy: 0.6452 - val_loss: 1.2085 - val_accuracy: 0.6402
Epoch 240/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2244 - accuracy: 0.6324 - val_loss: 1.2589 - val_accuracy: 0.6449
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2259 - accuracy: 0.6530 - val_loss: 1.3133 - val_accuracy: 0.6355
Epoch 242/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1999 - accuracy: 0.6607 - val_loss: 1.4071 - val_accuracy: 0.6355
Epoch 243/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1712 - accuracy: 0.6427 - val_loss: 1.3755 - val_accuracy: 0.6355

```
accuracy: 0.6168
Epoch 244/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2846 - accuracy: 0.6221 - val_loss: 1.2834 - val_accuracy: 0.6402
Epoch 245/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2191 - accuracy: 0.6195 - val_loss: 1.2503 - val_accuracy: 0.6308
Epoch 246/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3364 - accuracy: 0.6144 - val_loss: 1.1465 - val_accuracy: 0.6402
Epoch 247/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2179 - accuracy: 0.6067 - val_loss: 1.3569 - val_accuracy: 0.6355
Epoch 248/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2006 - accuracy: 0.5964 - val_loss: 1.2848 - val_accuracy: 0.6449
Epoch 249/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2387 - accuracy: 0.6350 - val_loss: 1.1676 - val_accuracy: 0.6729
Epoch 250/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2623 - accuracy: 0.6170 - val_loss: 1.1591 - val_accuracy: 0.6495
Epoch 251/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2011 - accuracy: 0.5861 - val_loss: 1.1429 - val_accuracy: 0.6308
Epoch 252/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3038 - accuracy: 0.6272 - val_loss: 1.1540 - val_accuracy: 0.5981
Epoch 253/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1905 - accuracy: 0.5347 - val_loss: 1.1939 - val_accuracy: 0.5654
Epoch 254/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2307 - accuracy: 0.5835 - val_loss: 1.1981 - val_accuracy: 0.5607
Epoch 255/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2277 - accuracy: 0.5578 - val_loss: 1.1697 - val_accuracy: 0.5327
Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1862 - accuracy: 0.5296 - val_loss: 1.1762 - val_accuracy: 0.5374
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2703 - accuracy: 0.5656 - val_loss: 1.2916 - val_accuracy: 0.5421
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2251 - accuracy: 0.5784 - val_loss: 1.2882 - val_accuracy: 0.5561
Epoch 259/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1785 - accuracy: 0.5270 - val_loss: 1.2786 - val_accuracy: 0.5607
Epoch 260/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2513 - accuracy: 0.5373 - val_loss: 1.3786 - val_accuracy: 0.5794
Epoch 261/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2815 - accuracy: 0.5578 - val_loss: 1.3791 - val_accuracy: 0.5935
Epoch 262/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2193 - accuracy: 0.5810 - val_loss: 1.4451 - val_accuracy: 0.6355
Epoch 263/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2341 - accuracy: 0.5681 - val_loss: 1.2967 - val_accuracy: 0.6589
Epoch 264/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1698 - accuracy: 0.5758 - val_loss: 1.3858 - val_accuracy: 0.6028
Epoch 265/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1928 - accuracy: 0.6041 - val_loss: 1.2768 - val_accuracy: 0.5701
Epoch 266/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2108 - accuracy: 0.5707 - val_loss: 1.2891 - val_accuracy: 0.5607
Epoch 267/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1735 - accuracy: 0.5501 - val_loss: 1.2707 - val_accuracy: 0.5654
Epoch 268/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1521 - accuracy: 0.5476 - val_loss: 1.3344 - val_accuracy: 0.5701
Epoch 269/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2029 - accuracy: 0.5347 - val_loss: 1.6887 - val_accuracy: 0.5701
Epoch 270/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2474 - accuracy: 0.5450 - val_loss: 1.5944 - val_accuracy: 0.5421
Epoch 271/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2363 - accuracy: 0.5501 - val_loss: 1.3525 - val_accuracy: 0.5374
Epoch 272/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1710 - accuracy: 0.5656 - val_loss: 1.3406 - val_accuracy: 0.5421
Epoch 273/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.2112 - accuracy: 0.6144 - val_loss: 1.5923 - val_accuracy: 0.5514
Epoch 274/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2174 - accuracy: 0.5527 - val_loss: 1.3521 - val_accuracy: 0.5187
Epoch 275/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3259 - accuracy: 0.5321 - val_loss: 1.2395 - val_accuracy: 0.5187
Epoch 276/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2033 - accuracy: 0.5501 - val_loss: 1.2632 - val_accuracy: 0.5467
Epoch 277/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2014 - accuracy: 0.5656 - val_loss: 1.2827 - val_accuracy: 0.5467
Epoch 278/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1694 - accuracy: 0.5681 - val_loss: 1.1677 - val_accuracy: 0.5514
Epoch 279/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1666 - accuracy: 0.5476 - val_loss: 1.2811 - val_accuracy: 0.5935
Epoch 280/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2038 - accuracy: 0.5398 - val_loss: 1.2531 - val_accuracy: 0.6121
Epoch 281/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1684 - accuracy: 0.5578 - val_loss: 1.2958 - val_accuracy: 0.6308
Epoch 282/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1978 - accuracy: 0.5553 - val_loss: 1.3536 - val_accuracy: 0.6215
Epoch 283/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2238 - accuracy: 0.5656 - val_loss: 1.4749 - val_accuracy: 0.6682
Epoch 284/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3353 - accuracy: 0.5553 - val_loss: 1.4007 - val_accuracy: 0.6215
Epoch 285/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1803 - accuracy: 0.5733 - val_loss: 1.4611 - val_accuracy: 0.6542
Epoch 286/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1669 - accuracy: 0.5578 - val_loss: 1.6067 - val_accuracy: 0.6822
Epoch 287/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1988 - accuracy: 0.5681 - val_loss: 1.4341 - val_accuracy: 0.6636
Epoch 288/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2033 - accuracy: 0.5553 - val_loss: 1.4791 - val_accuracy: 0.6636
Epoch 289/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1722 - accuracy: 0.5733 - val_loss: 1.4595 - val_accuracy: 0.6355
Epoch 290/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2827 - accuracy: 0.5861 - val_loss: 1.2863 - val_accuracy: 0.6542
Epoch 291/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1624 - accuracy: 0.5733 - val_loss: 1.1771 - val_accuracy: 0.6589
Epoch 292/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3412 - accuracy: 0.6324 - val_loss: 1.2636 - val_accuracy: 0.6075
Epoch 293/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1650 - accuracy: 0.6298 - val_loss: 1.2578 - val_accuracy: 0.6168
Epoch 294/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2139 - accuracy: 0.6170 - val_loss: 1.2344 - val_accuracy: 0.6121
Epoch 295/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1712 - accuracy: 0.6144 - val_loss: 1.2371 - val_accuracy: 0.5841
Epoch 296/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1763 - accuracy: 0.5913 - val_loss: 1.1325 - val_accuracy: 0.5748
Epoch 297/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1779 - accuracy: 0.5604 - val_loss: 1.1741 - val_accuracy: 0.5935
Epoch 298/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1713 - accuracy: 0.5270 - val_loss: 1.2226 - val_accuracy: 0.5701
Epoch 299/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2086 - accuracy: 0.5861 - val_loss: 1.2249 - val_accuracy: 0.5654
Epoch 300/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2035 - accuracy: 0.5604 - val_loss: 1.3485 - val_accuracy: 0.5654
Epoch 301/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1995 - accuracy: 0.5296 - val_loss: 1.2839 - val_accuracy: 0.5561
Epoch 302/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1729 - accuracy: 0.5373 - val_loss: 1.2529 - val_accuracy: 0.5514
```

Epoch 303/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2358 - accuracy: 0.5656 - val_loss: 1.2087 - val_accuracy: 0.5748
Epoch 304/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1849 - accuracy: 0.5835 - val_loss: 1.1789 - val_accuracy: 0.5607
Epoch 305/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1546 - accuracy: 0.5964 - val_loss: 1.2595 - val_accuracy: 0.5561
Epoch 306/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2327 - accuracy: 0.5861 - val_loss: 1.3283 - val_accuracy: 0.5701
Epoch 307/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1867 - accuracy: 0.5964 - val_loss: 1.4270 - val_accuracy: 0.5841
Epoch 308/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1631 - accuracy: 0.5656 - val_loss: 1.3549 - val_accuracy: 0.5841
Epoch 309/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1603 - accuracy: 0.6041 - val_loss: 1.4291 - val_accuracy: 0.5654
Epoch 310/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1459 - accuracy: 0.5938 - val_loss: 1.4469 - val_accuracy: 0.5701
Epoch 311/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1715 - accuracy: 0.5861 - val_loss: 1.5285 - val_accuracy: 0.5935
Epoch 312/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1598 - accuracy: 0.5913 - val_loss: 1.3948 - val_accuracy: 0.5935
Epoch 313/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2198 - accuracy: 0.5861 - val_loss: 1.4496 - val_accuracy: 0.5841
Epoch 314/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1459 - accuracy: 0.5964 - val_loss: 1.4877 - val_accuracy: 0.5748
Epoch 315/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2055 - accuracy: 0.5913 - val_loss: 1.5694 - val_accuracy: 0.5607
Epoch 316/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3466 - accuracy: 0.6041 - val_loss: 1.4629 - val_accuracy: 0.6215
Epoch 317/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1768 - accuracy: 0.6478 - val_loss: 1.4671 - val_accuracy: 0.6168
Epoch 318/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2648 - accuracy: 0.6170 - val_loss: 1.3008 - val_accuracy: 0.6168
Epoch 319/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2079 - accuracy: 0.5810 - val_loss: 1.3801 - val_accuracy: 0.6028
Epoch 320/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1581 - accuracy: 0.5990 - val_loss: 1.3202 - val_accuracy: 0.6262
Epoch 321/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1843 - accuracy: 0.5964 - val_loss: 1.4972 - val_accuracy: 0.6262
Epoch 322/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2227 - accuracy: 0.6221 - val_loss: 1.4363 - val_accuracy: 0.6262
Epoch 323/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3863 - accuracy: 0.5681 - val_loss: 1.5231 - val_accuracy: 0.6075
Epoch 324/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2061 - accuracy: 0.5733 - val_loss: 1.4541 - val_accuracy: 0.5935
Epoch 325/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2666 - accuracy: 0.5707 - val_loss: 1.4371 - val_accuracy: 0.5841
Epoch 326/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1544 - accuracy: 0.5784 - val_loss: 1.5352 - val_accuracy: 0.5841
Epoch 327/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2108 - accuracy: 0.5707 - val_loss: 1.5425 - val_accuracy: 0.5935
Epoch 328/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1969 - accuracy: 0.5270 - val_loss: 1.5122 - val_accuracy: 0.5841
Epoch 329/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1419 - accuracy: 0.5476 - val_loss: 1.5101 - val_accuracy: 0.5841
Epoch 330/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1943 - accuracy: 0.5913 - val_loss: 1.5452 - val_accuracy: 0.5888
Epoch 331/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2413 - accuracy: 0.5656 - val_loss: 1.4799 - val_accuracy: 0.5841
Epoch 332/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1520 - accuracy: 0.5604 - val_loss: 1.4660 - val_accuracy: 0.5841

```
accuracy: 0.5888
Epoch 333/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1900 - accuracy: 0.5810 - val_loss: 1.4206 - val_
accuracy: 0.5935
Epoch 334/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1792 - accuracy: 0.5630 - val_loss: 1.5103 - val_
accuracy: 0.5888
Epoch 335/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1753 - accuracy: 0.5758 - val_loss: 1.5053 - val_
accuracy: 0.5701
Epoch 336/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1428 - accuracy: 0.5733 - val_loss: 1.4356 - val_
accuracy: 0.5794
Epoch 337/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1702 - accuracy: 0.5887 - val_loss: 1.3696 - val_
accuracy: 0.5701
Epoch 338/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1874 - accuracy: 0.5938 - val_loss: 1.2970 - val_
accuracy: 0.6028
Epoch 339/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1417 - accuracy: 0.5938 - val_loss: 1.4450 - val_
accuracy: 0.5935
Epoch 340/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2073 - accuracy: 0.5733 - val_loss: 1.5327 - val_
accuracy: 0.5748
Epoch 341/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1346 - accuracy: 0.6093 - val_loss: 1.5433 - val_
accuracy: 0.5748
Epoch 342/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2406 - accuracy: 0.6144 - val_loss: 1.5690 - val_
accuracy: 0.5841
Epoch 343/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3705 - accuracy: 0.5784 - val_loss: 1.5929 - val_
accuracy: 0.5935
Epoch 344/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2034 - accuracy: 0.5861 - val_loss: 1.4739 - val_
accuracy: 0.5935
Epoch 345/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1547 - accuracy: 0.5810 - val_loss: 1.5129 - val_
accuracy: 0.5841
Epoch 346/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2712 - accuracy: 0.5604 - val_loss: 1.6576 - val_
accuracy: 0.6028
Epoch 347/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2747 - accuracy: 0.5887 - val_loss: 1.6205 - val_
accuracy: 0.6075
Epoch 348/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2005 - accuracy: 0.5835 - val_loss: 1.5244 - val_
accuracy: 0.5935
Epoch 349/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2083 - accuracy: 0.5887 - val_loss: 1.5993 - val_
accuracy: 0.6168
Epoch 350/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2113 - accuracy: 0.5861 - val_loss: 1.5878 - val_
accuracy: 0.5841
Epoch 351/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1512 - accuracy: 0.5784 - val_loss: 1.6120 - val_
accuracy: 0.6168
Epoch 352/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2232 - accuracy: 0.6015 - val_loss: 1.6805 - val_
accuracy: 0.5981
Epoch 353/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2817 - accuracy: 0.5861 - val_loss: 1.8296 - val_
accuracy: 0.5514
Epoch 354/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1716 - accuracy: 0.5578 - val_loss: 1.7965 - val_
accuracy: 0.6262
Epoch 355/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2188 - accuracy: 0.6067 - val_loss: 1.7949 - val_
accuracy: 0.6168
Epoch 356/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1788 - accuracy: 0.6401 - val_loss: 1.7575 - val_
accuracy: 0.6402
Epoch 357/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2230 - accuracy: 0.6093 - val_loss: 1.6379 - val_
accuracy: 0.6542
Epoch 358/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2330 - accuracy: 0.6195 - val_loss: 1.6420 - val_
accuracy: 0.5701
Epoch 359/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1399 - accuracy: 0.6041 - val_loss: 1.9017 - val_
accuracy: 0.5748
Epoch 360/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2632 - accuracy: 0.6170 - val_loss: 1.6969 - val_
accuracy: 0.5794
Epoch 361/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1860 - accuracy: 0.6015 - val_loss: 1.7017 - val_
accuracy: 0.5935
Epoch 362/1000
```

```

4/4 [=====] - 0s 13ms/step - loss: 0.1995 - accuracy: 0.6118 - val_loss: 1.6123 - val_accuracy: 0.5701
Epoch 363/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1641 - accuracy: 0.6375 - val_loss: 1.7133 - val_accuracy: 0.6262
Epoch 364/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1632 - accuracy: 0.6067 - val_loss: 1.6344 - val_accuracy: 0.6542
Epoch 365/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1384 - accuracy: 0.6144 - val_loss: 1.5485 - val_accuracy: 0.6402
Epoch 366/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2120 - accuracy: 0.6041 - val_loss: 1.5073 - val_accuracy: 0.6168
Epoch 367/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1368 - accuracy: 0.6015 - val_loss: 1.5220 - val_accuracy: 0.6075
Epoch 368/1000
1/4 [====>.....] - ETA: 0s - loss: 0.1573 - accuracy: 0.6406Restoring model weights from th
e end of the best epoch: 218.
4/4 [=====] - 0s 16ms/step - loss: 0.2549 - accuracy: 0.6093 - val_loss: 1.7531 - val_accuracy: 0.6308
Epoch 368: early stopping
2/2 [=====] - 0s 3ms/step - loss: 0.8455 - accuracy: 0.6279
[CV] END .....Dense1=100, Dense2=50; total time= 19.4s
Model: "sequential_94"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_376 (Dense)	(None, 100)	700
batch_normalization_282 (BatchNormalization)	(None, 100)	400
activation_282 (Activation)	(None, 100)	0
dense_377 (Dense)	(None, 50)	5050
batch_normalization_283 (BatchNormalization)	(None, 50)	200
activation_283 (Activation)	(None, 50)	0
dense_378 (Dense)	(None, 10)	510
batch_normalization_284 (BatchNormalization)	(None, 10)	40
activation_284 (Activation)	(None, 10)	0
dense_379 (Dense)	(None, 2)	22
<hr/>		
Total params:	6,922	
Trainable params:	6,602	
Non-trainable params:	320	

Epoch 1/1000

```

4/4 [=====] - 1s 61ms/step - loss: 5.4727 - accuracy: 0.5193 - val_loss: 5.3801 - val_accuracy: 0.4579
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 4.3418 - accuracy: 0.5758 - val_loss: 5.1140 - val_accuracy: 0.4579
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 3.9804 - accuracy: 0.5476 - val_loss: 4.3109 - val_accuracy: 0.4579
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 3.6456 - accuracy: 0.5193 - val_loss: 3.6588 - val_accuracy: 0.4579
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3366 - accuracy: 0.5141 - val_loss: 3.2213 - val_accuracy: 0.4533
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3915 - accuracy: 0.4987 - val_loss: 2.9474 - val_accuracy: 0.4206
Epoch 7/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9447 - accuracy: 0.5193 - val_loss: 2.7743 - val_accuracy: 0.4439
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 2.9448 - accuracy: 0.5039 - val_loss: 2.6977 - val_accuracy: 0.4159
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8322 - accuracy: 0.5090 - val_loss: 2.5661 - val_accuracy: 0.4953
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8244 - accuracy: 0.4987 - val_loss: 2.3984 - val_accuracy: 0.4953
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7832 - accuracy: 0.4987 - val_loss: 2.4044 - val_

```

```
accuracy: 0.4673
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7323 - accuracy: 0.4781 - val_loss: 2.3300 - val_accuracy: 0.4813
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6169 - accuracy: 0.4936 - val_loss: 2.2879 - val_accuracy: 0.5327
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4173 - accuracy: 0.4884 - val_loss: 2.2723 - val_accuracy: 0.5748
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5216 - accuracy: 0.4910 - val_loss: 2.2421 - val_accuracy: 0.5888
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3585 - accuracy: 0.4653 - val_loss: 2.1819 - val_accuracy: 0.6075
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3170 - accuracy: 0.4807 - val_loss: 2.1164 - val_accuracy: 0.6168
Epoch 18/1000
4/4 [=====] - 0s 15ms/step - loss: 2.2300 - accuracy: 0.4627 - val_loss: 2.1057 - val_accuracy: 0.6262
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2625 - accuracy: 0.4730 - val_loss: 2.0967 - val_accuracy: 0.6215
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2818 - accuracy: 0.4704 - val_loss: 2.0754 - val_accuracy: 0.6215
Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1545 - accuracy: 0.4807 - val_loss: 2.0266 - val_accuracy: 0.6215
Epoch 22/1000
4/4 [=====] - 0s 15ms/step - loss: 2.0590 - accuracy: 0.4704 - val_loss: 2.0099 - val_accuracy: 0.6168
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9238 - accuracy: 0.4807 - val_loss: 1.9622 - val_accuracy: 0.6075
Epoch 24/1000
4/4 [=====] - 0s 15ms/step - loss: 1.9127 - accuracy: 0.4679 - val_loss: 1.9479 - val_accuracy: 0.6308
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8906 - accuracy: 0.4781 - val_loss: 1.9093 - val_accuracy: 0.6215
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8657 - accuracy: 0.4704 - val_loss: 1.8874 - val_accuracy: 0.6168
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8789 - accuracy: 0.4833 - val_loss: 1.9233 - val_accuracy: 0.6075
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7757 - accuracy: 0.4679 - val_loss: 1.9364 - val_accuracy: 0.5935
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7803 - accuracy: 0.4576 - val_loss: 1.9256 - val_accuracy: 0.5841
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7651 - accuracy: 0.4781 - val_loss: 1.9172 - val_accuracy: 0.5841
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7385 - accuracy: 0.4396 - val_loss: 1.9823 - val_accuracy: 0.5981
Epoch 32/1000
4/4 [=====] - 0s 19ms/step - loss: 1.6918 - accuracy: 0.4576 - val_loss: 1.9421 - val_accuracy: 0.6028
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8093 - accuracy: 0.4550 - val_loss: 1.8960 - val_accuracy: 0.5981
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6751 - accuracy: 0.4524 - val_loss: 1.8542 - val_accuracy: 0.6028
Epoch 35/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6845 - accuracy: 0.4499 - val_loss: 1.8537 - val_accuracy: 0.6028
Epoch 36/1000
4/4 [=====] - 0s 15ms/step - loss: 1.6439 - accuracy: 0.4370 - val_loss: 1.8456 - val_accuracy: 0.6028
Epoch 37/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5967 - accuracy: 0.4602 - val_loss: 1.8122 - val_accuracy: 0.5935
Epoch 38/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6053 - accuracy: 0.4396 - val_loss: 1.8220 - val_accuracy: 0.5888
Epoch 39/1000
4/4 [=====] - 0s 15ms/step - loss: 1.5593 - accuracy: 0.4293 - val_loss: 1.8188 - val_accuracy: 0.5935
Epoch 40/1000
4/4 [=====] - 0s 15ms/step - loss: 1.5124 - accuracy: 0.4344 - val_loss: 1.7790 - val_accuracy: 0.5841
Epoch 41/1000
```

```
4/4 [=====] - 0s 15ms/step - loss: 1.5739 - accuracy: 0.4550 - val_loss: 1.7875 - val_accuracy: 0.6121
Epoch 42/1000
4/4 [=====] - 0s 15ms/step - loss: 1.4355 - accuracy: 0.4319 - val_loss: 1.7807 - val_accuracy: 0.6168
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4605 - accuracy: 0.4190 - val_loss: 1.7537 - val_accuracy: 0.6028
Epoch 44/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4518 - accuracy: 0.4190 - val_loss: 1.7217 - val_accuracy: 0.5888
Epoch 45/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3699 - accuracy: 0.4370 - val_loss: 1.6241 - val_accuracy: 0.5935
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4925 - accuracy: 0.4087 - val_loss: 1.6064 - val_accuracy: 0.5841
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4778 - accuracy: 0.4293 - val_loss: 1.6057 - val_accuracy: 0.5841
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3420 - accuracy: 0.4370 - val_loss: 1.5957 - val_accuracy: 0.5888
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3315 - accuracy: 0.4242 - val_loss: 1.5926 - val_accuracy: 0.5748
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4564 - accuracy: 0.4473 - val_loss: 1.5046 - val_accuracy: 0.5841
Epoch 51/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3921 - accuracy: 0.4319 - val_loss: 1.4845 - val_accuracy: 0.5841
Epoch 52/1000
4/4 [=====] - 0s 15ms/step - loss: 1.3274 - accuracy: 0.4524 - val_loss: 1.4711 - val_accuracy: 0.5935
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2892 - accuracy: 0.4396 - val_loss: 1.3772 - val_accuracy: 0.6028
Epoch 54/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3203 - accuracy: 0.4576 - val_loss: 1.3610 - val_accuracy: 0.6028
Epoch 55/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2589 - accuracy: 0.4396 - val_loss: 1.3652 - val_accuracy: 0.6075
Epoch 56/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2400 - accuracy: 0.4293 - val_loss: 1.3355 - val_accuracy: 0.6028
Epoch 57/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2913 - accuracy: 0.4344 - val_loss: 1.3344 - val_accuracy: 0.6168
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2019 - accuracy: 0.4576 - val_loss: 1.3335 - val_accuracy: 0.6121
Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3788 - accuracy: 0.4422 - val_loss: 1.3372 - val_accuracy: 0.6121
Epoch 60/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2381 - accuracy: 0.4524 - val_loss: 1.3534 - val_accuracy: 0.6121
Epoch 61/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1869 - accuracy: 0.4781 - val_loss: 1.3510 - val_accuracy: 0.6121
Epoch 62/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2640 - accuracy: 0.4447 - val_loss: 1.3440 - val_accuracy: 0.6121
Epoch 63/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1767 - accuracy: 0.4447 - val_loss: 1.3305 - val_accuracy: 0.6168
Epoch 64/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2488 - accuracy: 0.4319 - val_loss: 1.3235 - val_accuracy: 0.6168
Epoch 65/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2419 - accuracy: 0.4396 - val_loss: 1.3177 - val_accuracy: 0.6355
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2397 - accuracy: 0.4422 - val_loss: 1.3120 - val_accuracy: 0.6121
Epoch 67/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1578 - accuracy: 0.4473 - val_loss: 1.3015 - val_accuracy: 0.6121
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1926 - accuracy: 0.4190 - val_loss: 1.3074 - val_accuracy: 0.5981
Epoch 69/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1672 - accuracy: 0.4319 - val_loss: 1.3014 - val_accuracy: 0.5935
Epoch 70/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1430 - accuracy: 0.4190 - val_loss: 1.2965 - val_accuracy: 0.5888
```

Epoch 71/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0695 - accuracy: 0.4319 - val_loss: 1.2956 - val_accuracy: 0.5888
Epoch 72/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9734 - accuracy: 0.4267 - val_loss: 1.2911 - val_accuracy: 0.5841
Epoch 73/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9737 - accuracy: 0.4524 - val_loss: 1.2901 - val_accuracy: 0.5981
Epoch 74/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0501 - accuracy: 0.4267 - val_loss: 1.2696 - val_accuracy: 0.5841
Epoch 75/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9153 - accuracy: 0.4344 - val_loss: 1.2535 - val_accuracy: 0.5794
Epoch 76/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9585 - accuracy: 0.4036 - val_loss: 1.2518 - val_accuracy: 0.5748
Epoch 77/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9748 - accuracy: 0.4190 - val_loss: 1.2298 - val_accuracy: 0.5748
Epoch 78/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9433 - accuracy: 0.4242 - val_loss: 1.2476 - val_accuracy: 0.5748
Epoch 79/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9623 - accuracy: 0.4087 - val_loss: 1.2152 - val_accuracy: 0.5748
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8760 - accuracy: 0.4242 - val_loss: 1.2116 - val_accuracy: 0.5794
Epoch 81/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9852 - accuracy: 0.4319 - val_loss: 1.2321 - val_accuracy: 0.5701
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8633 - accuracy: 0.4216 - val_loss: 1.2164 - val_accuracy: 0.5888
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8799 - accuracy: 0.4422 - val_loss: 1.1796 - val_accuracy: 0.5888
Epoch 84/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9302 - accuracy: 0.4602 - val_loss: 1.1404 - val_accuracy: 0.5607
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9233 - accuracy: 0.4473 - val_loss: 1.1495 - val_accuracy: 0.5748
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8606 - accuracy: 0.4422 - val_loss: 1.1342 - val_accuracy: 0.5701
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7639 - accuracy: 0.4293 - val_loss: 1.1250 - val_accuracy: 0.5654
Epoch 88/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8090 - accuracy: 0.4216 - val_loss: 1.0986 - val_accuracy: 0.5467
Epoch 89/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8018 - accuracy: 0.4293 - val_loss: 1.0797 - val_accuracy: 0.5280
Epoch 90/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8593 - accuracy: 0.4087 - val_loss: 1.0783 - val_accuracy: 0.5374
Epoch 91/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8400 - accuracy: 0.4216 - val_loss: 1.0581 - val_accuracy: 0.5327
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0354 - accuracy: 0.4242 - val_loss: 1.0489 - val_accuracy: 0.5280
Epoch 93/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7545 - accuracy: 0.4344 - val_loss: 1.0079 - val_accuracy: 0.5234
Epoch 94/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7208 - accuracy: 0.4396 - val_loss: 0.9874 - val_accuracy: 0.5280
Epoch 95/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7348 - accuracy: 0.4550 - val_loss: 0.9813 - val_accuracy: 0.5234
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6666 - accuracy: 0.4653 - val_loss: 0.8994 - val_accuracy: 0.4766
Epoch 97/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6895 - accuracy: 0.4627 - val_loss: 0.8960 - val_accuracy: 0.5047
Epoch 98/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7072 - accuracy: 0.4499 - val_loss: 0.8805 - val_accuracy: 0.4813
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5928 - accuracy: 0.4447 - val_loss: 0.8744 - val_accuracy: 0.5047
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6017 - accuracy: 0.4936 - val_loss: 0.8691 - val_accuracy: 0.5047

```
accuracy: 0.5047
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6622 - accuracy: 0.4550 - val_loss: 0.8801 - val_accuracy: 0.5093
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6813 - accuracy: 0.4704 - val_loss: 0.8815 - val_accuracy: 0.4860
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5858 - accuracy: 0.4756 - val_loss: 0.8647 - val_accuracy: 0.4953
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6630 - accuracy: 0.4781 - val_loss: 0.8568 - val_accuracy: 0.4720
Epoch 105/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6060 - accuracy: 0.4781 - val_loss: 0.8614 - val_accuracy: 0.4907
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5868 - accuracy: 0.4987 - val_loss: 0.8583 - val_accuracy: 0.4953
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6204 - accuracy: 0.4704 - val_loss: 0.8730 - val_accuracy: 0.4953
Epoch 108/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5997 - accuracy: 0.4961 - val_loss: 0.8652 - val_accuracy: 0.5047
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5939 - accuracy: 0.4936 - val_loss: 0.8973 - val_accuracy: 0.5140
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6162 - accuracy: 0.5219 - val_loss: 0.8768 - val_accuracy: 0.5093
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6028 - accuracy: 0.4679 - val_loss: 0.9287 - val_accuracy: 0.5280
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5494 - accuracy: 0.4833 - val_loss: 0.8295 - val_accuracy: 0.5187
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5120 - accuracy: 0.5167 - val_loss: 0.8830 - val_accuracy: 0.4907
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4906 - accuracy: 0.5167 - val_loss: 0.8242 - val_accuracy: 0.5187
Epoch 115/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4583 - accuracy: 0.4987 - val_loss: 0.7963 - val_accuracy: 0.5280
Epoch 116/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4150 - accuracy: 0.5167 - val_loss: 0.7933 - val_accuracy: 0.5234
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5348 - accuracy: 0.4833 - val_loss: 0.7474 - val_accuracy: 0.5093
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4220 - accuracy: 0.4756 - val_loss: 0.7764 - val_accuracy: 0.5093
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3912 - accuracy: 0.4936 - val_loss: 0.7349 - val_accuracy: 0.5280
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3980 - accuracy: 0.4884 - val_loss: 0.7477 - val_accuracy: 0.5280
Epoch 121/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3825 - accuracy: 0.5141 - val_loss: 0.8210 - val_accuracy: 0.5514
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3308 - accuracy: 0.5296 - val_loss: 0.6114 - val_accuracy: 0.5514
Epoch 123/1000
4/4 [=====] - 0s 33ms/step - loss: 0.4188 - accuracy: 0.6093 - val_loss: 0.7056 - val_accuracy: 0.5280
Epoch 124/1000
4/4 [=====] - 0s 36ms/step - loss: 0.4334 - accuracy: 0.5141 - val_loss: 0.6852 - val_accuracy: 0.5187
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4593 - accuracy: 0.5039 - val_loss: 0.6137 - val_accuracy: 0.5280
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3528 - accuracy: 0.5347 - val_loss: 0.6078 - val_accuracy: 0.5467
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3930 - accuracy: 0.5244 - val_loss: 0.6830 - val_accuracy: 0.5514
Epoch 128/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3681 - accuracy: 0.5424 - val_loss: 0.7197 - val_accuracy: 0.5561
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3113 - accuracy: 0.5527 - val_loss: 0.7253 - val_accuracy: 0.5561
Epoch 130/1000
```

4/4 [=====] - 0s 13ms/step - loss: 0.3688 - accuracy: 0.5244 - val_loss: 0.7326 - val_accuracy: 0.5607
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3879 - accuracy: 0.5270 - val_loss: 0.6956 - val_accuracy: 0.5607
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3600 - accuracy: 0.4936 - val_loss: 0.6641 - val_accuracy: 0.5280
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2525 - accuracy: 0.5193 - val_loss: 0.6922 - val_accuracy: 0.5561
Epoch 134/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3017 - accuracy: 0.5296 - val_loss: 0.7996 - val_accuracy: 0.5327
Epoch 135/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3300 - accuracy: 0.5450 - val_loss: 0.7940 - val_accuracy: 0.5701
Epoch 136/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3876 - accuracy: 0.5501 - val_loss: 0.9333 - val_accuracy: 0.5327
Epoch 137/1000
4/4 [=====] - 0s 18ms/step - loss: 0.3052 - accuracy: 0.5373 - val_loss: 0.8517 - val_accuracy: 0.5421
Epoch 138/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3071 - accuracy: 0.5476 - val_loss: 0.7627 - val_accuracy: 0.5421
Epoch 139/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3051 - accuracy: 0.5193 - val_loss: 0.7949 - val_accuracy: 0.5280
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2849 - accuracy: 0.5193 - val_loss: 0.7989 - val_accuracy: 0.5140
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2369 - accuracy: 0.5398 - val_loss: 0.8862 - val_accuracy: 0.4953
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2611 - accuracy: 0.5476 - val_loss: 0.9752 - val_accuracy: 0.4953
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2443 - accuracy: 0.5116 - val_loss: 0.8613 - val_accuracy: 0.4953
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3238 - accuracy: 0.5398 - val_loss: 0.7646 - val_accuracy: 0.4813
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2599 - accuracy: 0.5450 - val_loss: 0.7622 - val_accuracy: 0.5000
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3240 - accuracy: 0.5219 - val_loss: 0.8142 - val_accuracy: 0.5093
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2909 - accuracy: 0.5476 - val_loss: 0.8308 - val_accuracy: 0.5514
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3361 - accuracy: 0.5450 - val_loss: 0.7864 - val_accuracy: 0.5374
Epoch 149/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3053 - accuracy: 0.5270 - val_loss: 0.7901 - val_accuracy: 0.5327
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3234 - accuracy: 0.4936 - val_loss: 0.8644 - val_accuracy: 0.5047
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2834 - accuracy: 0.5090 - val_loss: 0.8094 - val_accuracy: 0.5187
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2823 - accuracy: 0.5373 - val_loss: 0.8275 - val_accuracy: 0.5514
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2255 - accuracy: 0.5450 - val_loss: 0.8295 - val_accuracy: 0.5561
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2971 - accuracy: 0.4936 - val_loss: 0.8631 - val_accuracy: 0.4953
Epoch 155/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2802 - accuracy: 0.5296 - val_loss: 0.8423 - val_accuracy: 0.5561
Epoch 156/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3201 - accuracy: 0.5347 - val_loss: 0.8613 - val_accuracy: 0.5701
Epoch 157/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2321 - accuracy: 0.5167 - val_loss: 0.8071 - val_accuracy: 0.5421
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4015 - accuracy: 0.5604 - val_loss: 0.8186 - val_accuracy: 0.5421
Epoch 159/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3064 - accuracy: 0.5244 - val_loss: 0.8275 - val_accuracy: 0.5467

Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4644 - accuracy: 0.5553 - val_loss: 0.8157 - val_accuracy: 0.5467
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2925 - accuracy: 0.5424 - val_loss: 0.8469 - val_accuracy: 0.5234
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3133 - accuracy: 0.5167 - val_loss: 0.8304 - val_accuracy: 0.5187
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2713 - accuracy: 0.5244 - val_loss: 1.0850 - val_accuracy: 0.4953
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3750 - accuracy: 0.5193 - val_loss: 0.9410 - val_accuracy: 0.5187
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3313 - accuracy: 0.5141 - val_loss: 0.8747 - val_accuracy: 0.5140
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3274 - accuracy: 0.5270 - val_loss: 0.9980 - val_accuracy: 0.4907
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3234 - accuracy: 0.5347 - val_loss: 1.2862 - val_accuracy: 0.4907
Epoch 168/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2895 - accuracy: 0.5707 - val_loss: 1.2625 - val_accuracy: 0.5000
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4487 - accuracy: 0.5707 - val_loss: 1.2151 - val_accuracy: 0.4953
Epoch 170/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3866 - accuracy: 0.5733 - val_loss: 1.1077 - val_accuracy: 0.5140
Epoch 171/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2815 - accuracy: 0.5913 - val_loss: 1.0233 - val_accuracy: 0.5280
Epoch 172/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2667 - accuracy: 0.5938 - val_loss: 1.2582 - val_accuracy: 0.5093
Epoch 173/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3413 - accuracy: 0.5861 - val_loss: 1.1149 - val_accuracy: 0.5280
Epoch 174/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3364 - accuracy: 0.5424 - val_loss: 1.1774 - val_accuracy: 0.5047
Epoch 175/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2196 - accuracy: 0.5553 - val_loss: 1.1593 - val_accuracy: 0.5327
Epoch 176/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2980 - accuracy: 0.5424 - val_loss: 1.1948 - val_accuracy: 0.5234
Epoch 177/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3109 - accuracy: 0.5707 - val_loss: 1.2184 - val_accuracy: 0.5187
Epoch 178/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2900 - accuracy: 0.5476 - val_loss: 1.2456 - val_accuracy: 0.5047
Epoch 179/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3337 - accuracy: 0.5758 - val_loss: 1.2442 - val_accuracy: 0.5374
Epoch 180/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3272 - accuracy: 0.5347 - val_loss: 1.1199 - val_accuracy: 0.4907
Epoch 181/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2780 - accuracy: 0.5347 - val_loss: 1.3064 - val_accuracy: 0.5327
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2229 - accuracy: 0.5373 - val_loss: 1.4655 - val_accuracy: 0.4813
Epoch 183/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3589 - accuracy: 0.5270 - val_loss: 1.2028 - val_accuracy: 0.5093
Epoch 184/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3585 - accuracy: 0.5193 - val_loss: 1.3490 - val_accuracy: 0.4299
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3432 - accuracy: 0.5193 - val_loss: 1.4602 - val_accuracy: 0.4393
Epoch 186/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3326 - accuracy: 0.5193 - val_loss: 1.6219 - val_accuracy: 0.4393
Epoch 187/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3078 - accuracy: 0.5244 - val_loss: 1.4440 - val_accuracy: 0.4626
Epoch 188/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2424 - accuracy: 0.5321 - val_loss: 1.3974 - val_accuracy: 0.4860
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2744 - accuracy: 0.5270 - val_loss: 1.3912 - val_accuracy: 0.5270

accuracy: 0.4860
Epoch 190/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3015 - accuracy: 0.5424 - val_loss: 1.3544 - val_accuracy: 0.4860
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2452 - accuracy: 0.5501 - val_loss: 1.2880 - val_accuracy: 0.4953
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2460 - accuracy: 0.5656 - val_loss: 1.1176 - val_accuracy: 0.5514
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2337 - accuracy: 0.5398 - val_loss: 1.1914 - val_accuracy: 0.5421
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3247 - accuracy: 0.5450 - val_loss: 1.1332 - val_accuracy: 0.5514
Epoch 195/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2994 - accuracy: 0.5373 - val_loss: 1.3177 - val_accuracy: 0.4533
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2609 - accuracy: 0.5167 - val_loss: 1.1790 - val_accuracy: 0.4626
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3053 - accuracy: 0.5039 - val_loss: 1.1601 - val_accuracy: 0.4766
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2259 - accuracy: 0.5116 - val_loss: 1.1770 - val_accuracy: 0.4813
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3411 - accuracy: 0.5373 - val_loss: 1.0942 - val_accuracy: 0.5047
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3424 - accuracy: 0.5090 - val_loss: 1.0515 - val_accuracy: 0.4673
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2364 - accuracy: 0.5116 - val_loss: 1.0718 - val_accuracy: 0.4486
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2082 - accuracy: 0.5193 - val_loss: 1.1212 - val_accuracy: 0.4673
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3131 - accuracy: 0.5321 - val_loss: 1.1225 - val_accuracy: 0.4813
Epoch 204/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2207 - accuracy: 0.5193 - val_loss: 1.2551 - val_accuracy: 0.4720
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2545 - accuracy: 0.5013 - val_loss: 1.2530 - val_accuracy: 0.4720
Epoch 206/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2784 - accuracy: 0.4627 - val_loss: 1.2042 - val_accuracy: 0.4860
Epoch 207/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2478 - accuracy: 0.4730 - val_loss: 1.2377 - val_accuracy: 0.4673
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3853 - accuracy: 0.4833 - val_loss: 1.2914 - val_accuracy: 0.4439
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3032 - accuracy: 0.4833 - val_loss: 1.0936 - val_accuracy: 0.5467
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2483 - accuracy: 0.5141 - val_loss: 1.1811 - val_accuracy: 0.5234
Epoch 211/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2491 - accuracy: 0.5321 - val_loss: 1.1769 - val_accuracy: 0.5140
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2946 - accuracy: 0.5193 - val_loss: 1.2187 - val_accuracy: 0.5047
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2626 - accuracy: 0.4910 - val_loss: 1.2249 - val_accuracy: 0.5140
Epoch 214/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3290 - accuracy: 0.5219 - val_loss: 1.2862 - val_accuracy: 0.5561
Epoch 215/1000
1/4 [=====] - ETA: 0s - loss: 0.2495 - accuracy: 0.5000Restoring model weights from the end of the best epoch: 65.
4/4 [=====] - 0s 14ms/step - loss: 0.3178 - accuracy: 0.5244 - val_loss: 1.3064 - val_accuracy: 0.5280
Epoch 215: early stopping
2/2 [=====] - 0s 3ms/step - loss: 1.0089 - accuracy: 0.5349
[CV] ENDDense1=100, Dense2=50; total time= 12.1s
Model: "sequential_95"

Layer (type)	Output Shape	Param #
dense_380 (Dense)	(None, 100)	700

batch_normalization_285 (BatchNormalization)	(None, 100)	400
activation_285 (Activation)	(None, 100)	0
dense_381 (Dense)	(None, 50)	5050
batch_normalization_286 (BatchNormalization)	(None, 50)	200
activation_286 (Activation)	(None, 50)	0
dense_382 (Dense)	(None, 10)	510
batch_normalization_287 (BatchNormalization)	(None, 10)	40
activation_287 (Activation)	(None, 10)	0
dense_383 (Dense)	(None, 2)	22

Total params: 6,922
Trainable params: 6,602
Non-trainable params: 320

Epoch 1/1000
4/4 [=====] - 1s 63ms/step - loss: 4.7898 - accuracy: 0.5321 - val_loss: 4.9457 - val_accuracy: 0.4579
Epoch 2/1000
4/4 [=====] - 0s 12ms/step - loss: 3.4357 - accuracy: 0.5450 - val_loss: 4.4079 - val_accuracy: 0.4486
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0785 - accuracy: 0.5270 - val_loss: 3.3449 - val_accuracy: 0.5374
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 3.2349 - accuracy: 0.6298 - val_loss: 3.0260 - val_accuracy: 0.6308
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8439 - accuracy: 0.6015 - val_loss: 2.8152 - val_accuracy: 0.5000
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 2.7531 - accuracy: 0.5219 - val_loss: 2.7077 - val_accuracy: 0.4766
Epoch 7/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4974 - accuracy: 0.5450 - val_loss: 2.5487 - val_accuracy: 0.4673
Epoch 8/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3853 - accuracy: 0.5219 - val_loss: 2.4867 - val_accuracy: 0.4486
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1589 - accuracy: 0.5219 - val_loss: 2.4122 - val_accuracy: 0.4299
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0774 - accuracy: 0.5270 - val_loss: 2.3801 - val_accuracy: 0.4393
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0694 - accuracy: 0.5270 - val_loss: 2.3091 - val_accuracy: 0.4393
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8918 - accuracy: 0.5398 - val_loss: 2.2517 - val_accuracy: 0.4393
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8585 - accuracy: 0.5244 - val_loss: 2.2171 - val_accuracy: 0.4346
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7919 - accuracy: 0.5424 - val_loss: 2.1624 - val_accuracy: 0.4439
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6235 - accuracy: 0.5321 - val_loss: 2.1619 - val_accuracy: 0.4439
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6497 - accuracy: 0.5116 - val_loss: 2.0985 - val_accuracy: 0.4439
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5668 - accuracy: 0.5373 - val_loss: 2.0327 - val_accuracy: 0.4346
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5050 - accuracy: 0.5244 - val_loss: 2.0001 - val_accuracy: 0.4299
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4389 - accuracy: 0.5090 - val_loss: 1.9629 - val_accuracy: 0.4252
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3304 - accuracy: 0.5321 - val_loss: 1.9444 - val_accuracy: 0.5888
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3787 - accuracy: 0.5938 - val_loss: 1.8546 - val_accuracy: 0.5888

```
accuracy: 0.5888
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2745 - accuracy: 0.6118 - val_loss: 1.8063 - val_
accuracy: 0.5841
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2919 - accuracy: 0.5964 - val_loss: 1.8122 - val_
accuracy: 0.5888
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2239 - accuracy: 0.6041 - val_loss: 1.7939 - val_
accuracy: 0.5841
Epoch 25/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1803 - accuracy: 0.6067 - val_loss: 1.7750 - val_
accuracy: 0.5794
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1857 - accuracy: 0.5784 - val_loss: 1.7324 - val_
accuracy: 0.5794
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1321 - accuracy: 0.5835 - val_loss: 1.7421 - val_
accuracy: 0.5748
Epoch 28/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0794 - accuracy: 0.5861 - val_loss: 1.7521 - val_
accuracy: 0.5841
Epoch 29/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1452 - accuracy: 0.5887 - val_loss: 1.7428 - val_
accuracy: 0.5794
Epoch 30/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1337 - accuracy: 0.5938 - val_loss: 1.6865 - val_
accuracy: 0.5794
Epoch 31/1000
4/4 [=====] - 0s 21ms/step - loss: 1.1561 - accuracy: 0.5964 - val_loss: 1.6737 - val_
accuracy: 0.5794
Epoch 32/1000
4/4 [=====] - 0s 16ms/step - loss: 1.0046 - accuracy: 0.6144 - val_loss: 1.6451 - val_
accuracy: 0.5748
Epoch 33/1000
4/4 [=====] - 0s 17ms/step - loss: 0.9895 - accuracy: 0.6041 - val_loss: 1.6268 - val_
accuracy: 0.4299
Epoch 34/1000
4/4 [=====] - 0s 16ms/step - loss: 0.9414 - accuracy: 0.5733 - val_loss: 1.6170 - val_
accuracy: 0.5748
Epoch 35/1000
4/4 [=====] - 0s 17ms/step - loss: 0.9346 - accuracy: 0.5810 - val_loss: 1.5482 - val_
accuracy: 0.5748
Epoch 36/1000
4/4 [=====] - 0s 17ms/step - loss: 0.9206 - accuracy: 0.5604 - val_loss: 1.5506 - val_
accuracy: 0.5701
Epoch 37/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9081 - accuracy: 0.5758 - val_loss: 1.5719 - val_
accuracy: 0.5888
Epoch 38/1000
4/4 [=====] - 0s 16ms/step - loss: 0.9059 - accuracy: 0.5835 - val_loss: 1.5539 - val_
accuracy: 0.5794
Epoch 39/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9360 - accuracy: 0.5990 - val_loss: 1.5522 - val_
accuracy: 0.5841
Epoch 40/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8941 - accuracy: 0.6041 - val_loss: 1.5552 - val_
accuracy: 0.5841
Epoch 41/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7971 - accuracy: 0.6195 - val_loss: 1.5964 - val_
accuracy: 0.5841
Epoch 42/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9228 - accuracy: 0.6067 - val_loss: 1.5519 - val_
accuracy: 0.5841
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7617 - accuracy: 0.6247 - val_loss: 1.5160 - val_
accuracy: 0.5841
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7737 - accuracy: 0.6838 - val_loss: 1.5013 - val_
accuracy: 0.5841
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7982 - accuracy: 0.6967 - val_loss: 1.5017 - val_
accuracy: 0.5841
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7983 - accuracy: 0.6992 - val_loss: 1.4383 - val_
accuracy: 0.5841
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7160 - accuracy: 0.6992 - val_loss: 1.4171 - val_
accuracy: 0.5748
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7717 - accuracy: 0.6684 - val_loss: 1.4039 - val_
accuracy: 0.5888
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6471 - accuracy: 0.7044 - val_loss: 1.3152 - val_
accuracy: 0.5888
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6420 - accuracy: 0.6941 - val_loss: 1.3060 - val_
accuracy: 0.5935
Epoch 51/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 0.6871 - accuracy: 0.6864 - val_loss: 1.2388 - val_accuracy: 0.5748
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6525 - accuracy: 0.6761 - val_loss: 1.2642 - val_accuracy: 0.5748
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7286 - accuracy: 0.6684 - val_loss: 1.2482 - val_accuracy: 0.5701
Epoch 54/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6601 - accuracy: 0.6632 - val_loss: 1.2577 - val_accuracy: 0.5841
Epoch 55/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6894 - accuracy: 0.6864 - val_loss: 1.2563 - val_accuracy: 0.5841
Epoch 56/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6238 - accuracy: 0.6787 - val_loss: 1.2983 - val_accuracy: 0.5841
Epoch 57/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6832 - accuracy: 0.6838 - val_loss: 1.3010 - val_accuracy: 0.5841
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6190 - accuracy: 0.6812 - val_loss: 1.2703 - val_accuracy: 0.5841
Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5279 - accuracy: 0.6710 - val_loss: 1.1696 - val_accuracy: 0.5888
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6078 - accuracy: 0.6298 - val_loss: 1.2127 - val_accuracy: 0.4206
Epoch 61/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5329 - accuracy: 0.6401 - val_loss: 1.1621 - val_accuracy: 0.4206
Epoch 62/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5827 - accuracy: 0.6221 - val_loss: 1.1545 - val_accuracy: 0.4206
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5485 - accuracy: 0.6530 - val_loss: 1.1216 - val_accuracy: 0.4252
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5052 - accuracy: 0.6555 - val_loss: 1.0891 - val_accuracy: 0.4252
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5461 - accuracy: 0.6581 - val_loss: 1.1751 - val_accuracy: 0.4206
Epoch 66/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5504 - accuracy: 0.6401 - val_loss: 1.1559 - val_accuracy: 0.4206
Epoch 67/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5229 - accuracy: 0.6427 - val_loss: 1.1512 - val_accuracy: 0.4112
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5233 - accuracy: 0.6684 - val_loss: 1.1500 - val_accuracy: 0.4112
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5022 - accuracy: 0.6889 - val_loss: 1.0791 - val_accuracy: 0.4206
Epoch 70/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5284 - accuracy: 0.7044 - val_loss: 1.0816 - val_accuracy: 0.4159
Epoch 71/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5002 - accuracy: 0.6710 - val_loss: 1.0367 - val_accuracy: 0.4206
Epoch 72/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5625 - accuracy: 0.6427 - val_loss: 1.0118 - val_accuracy: 0.4159
Epoch 73/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5241 - accuracy: 0.6375 - val_loss: 0.9958 - val_accuracy: 0.4065
Epoch 74/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4651 - accuracy: 0.6684 - val_loss: 0.9307 - val_accuracy: 0.5607
Epoch 75/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5028 - accuracy: 0.7609 - val_loss: 0.9285 - val_accuracy: 0.6168
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4122 - accuracy: 0.6889 - val_loss: 0.8781 - val_accuracy: 0.5935
Epoch 77/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4689 - accuracy: 0.7095 - val_loss: 0.7797 - val_accuracy: 0.6028
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4938 - accuracy: 0.6735 - val_loss: 0.8757 - val_accuracy: 0.5981
Epoch 79/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5159 - accuracy: 0.6812 - val_loss: 0.8411 - val_accuracy: 0.5935
Epoch 80/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4817 - accuracy: 0.6761 - val_loss: 0.8423 - val_accuracy: 0.5841
```

Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3919 - accuracy: 0.6864 - val_loss: 0.7728 - val_accuracy: 0.5794
Epoch 82/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4292 - accuracy: 0.6787 - val_loss: 0.7626 - val_accuracy: 0.5841
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4400 - accuracy: 0.6864 - val_loss: 0.7428 - val_accuracy: 0.5888
Epoch 84/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4994 - accuracy: 0.6504 - val_loss: 0.7525 - val_accuracy: 0.5841
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4730 - accuracy: 0.6427 - val_loss: 0.6998 - val_accuracy: 0.5794
Epoch 86/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4662 - accuracy: 0.6812 - val_loss: 0.7038 - val_accuracy: 0.5841
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3849 - accuracy: 0.6761 - val_loss: 0.6909 - val_accuracy: 0.5935
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4611 - accuracy: 0.6889 - val_loss: 0.6292 - val_accuracy: 0.5981
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4817 - accuracy: 0.6812 - val_loss: 0.6204 - val_accuracy: 0.6121
Epoch 90/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4028 - accuracy: 0.7018 - val_loss: 0.5958 - val_accuracy: 0.6215
Epoch 91/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4179 - accuracy: 0.6787 - val_loss: 0.5779 - val_accuracy: 0.6262
Epoch 92/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5182 - accuracy: 0.7147 - val_loss: 0.5909 - val_accuracy: 0.6215
Epoch 93/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5001 - accuracy: 0.6941 - val_loss: 0.6064 - val_accuracy: 0.6168
Epoch 94/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3585 - accuracy: 0.6838 - val_loss: 0.5973 - val_accuracy: 0.6168
Epoch 95/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5062 - accuracy: 0.6761 - val_loss: 0.5587 - val_accuracy: 0.6262
Epoch 96/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4748 - accuracy: 0.6915 - val_loss: 0.5545 - val_accuracy: 0.6168
Epoch 97/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4381 - accuracy: 0.6889 - val_loss: 0.5538 - val_accuracy: 0.6168
Epoch 98/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4294 - accuracy: 0.6812 - val_loss: 0.5542 - val_accuracy: 0.6168
Epoch 99/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3879 - accuracy: 0.6838 - val_loss: 0.5886 - val_accuracy: 0.6121
Epoch 100/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4225 - accuracy: 0.6710 - val_loss: 0.6333 - val_accuracy: 0.6262
Epoch 101/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4256 - accuracy: 0.6710 - val_loss: 0.6551 - val_accuracy: 0.6308
Epoch 102/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5006 - accuracy: 0.6992 - val_loss: 0.6837 - val_accuracy: 0.6262
Epoch 103/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4496 - accuracy: 0.7095 - val_loss: 0.6328 - val_accuracy: 0.6308
Epoch 104/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4834 - accuracy: 0.6915 - val_loss: 0.6940 - val_accuracy: 0.6262
Epoch 105/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4719 - accuracy: 0.6967 - val_loss: 0.7161 - val_accuracy: 0.6168
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4663 - accuracy: 0.6967 - val_loss: 0.7152 - val_accuracy: 0.6262
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4314 - accuracy: 0.7044 - val_loss: 0.6422 - val_accuracy: 0.6262
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4262 - accuracy: 0.7018 - val_loss: 0.6515 - val_accuracy: 0.6215
Epoch 109/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4348 - accuracy: 0.6761 - val_loss: 0.6500 - val_accuracy: 0.6262
Epoch 110/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3890 - accuracy: 0.6967 - val_loss: 0.7045 - val_accuracy: 0.6168

```
accuracy: 0.6262
Epoch 111/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3815 - accuracy: 0.6941 - val_loss: 0.6780 - val_
accuracy: 0.6121
Epoch 112/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4601 - accuracy: 0.6915 - val_loss: 0.6808 - val_
accuracy: 0.6168
Epoch 113/1000
4/4 [=====] - 0s 17ms/step - loss: 0.4084 - accuracy: 0.6864 - val_loss: 0.6796 - val_
accuracy: 0.6215
Epoch 114/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4460 - accuracy: 0.6889 - val_loss: 0.7749 - val_
accuracy: 0.6262
Epoch 115/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4700 - accuracy: 0.7044 - val_loss: 0.7697 - val_
accuracy: 0.6308
Epoch 116/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4751 - accuracy: 0.6838 - val_loss: 0.7629 - val_
accuracy: 0.6308
Epoch 117/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4248 - accuracy: 0.6941 - val_loss: 0.7761 - val_
accuracy: 0.6262
Epoch 118/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4199 - accuracy: 0.7147 - val_loss: 0.7439 - val_
accuracy: 0.6355
Epoch 119/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3707 - accuracy: 0.6812 - val_loss: 0.7446 - val_
accuracy: 0.6402
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5106 - accuracy: 0.6838 - val_loss: 0.7126 - val_
accuracy: 0.6402
Epoch 121/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4866 - accuracy: 0.6941 - val_loss: 0.8137 - val_
accuracy: 0.6495
Epoch 122/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4179 - accuracy: 0.7044 - val_loss: 0.8089 - val_
accuracy: 0.6542
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4470 - accuracy: 0.6710 - val_loss: 0.8120 - val_
accuracy: 0.6495
Epoch 124/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3853 - accuracy: 0.7044 - val_loss: 0.8066 - val_
accuracy: 0.6449
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3383 - accuracy: 0.6941 - val_loss: 0.7826 - val_
accuracy: 0.6402
Epoch 126/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3613 - accuracy: 0.6838 - val_loss: 0.7663 - val_
accuracy: 0.6495
Epoch 127/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4632 - accuracy: 0.6787 - val_loss: 0.7316 - val_
accuracy: 0.6495
Epoch 128/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4050 - accuracy: 0.6710 - val_loss: 0.7328 - val_
accuracy: 0.6402
Epoch 129/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3436 - accuracy: 0.6941 - val_loss: 0.7300 - val_
accuracy: 0.6308
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4492 - accuracy: 0.6889 - val_loss: 0.7353 - val_
accuracy: 0.6168
Epoch 131/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3838 - accuracy: 0.6787 - val_loss: 0.7538 - val_
accuracy: 0.6402
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3848 - accuracy: 0.6889 - val_loss: 0.7774 - val_
accuracy: 0.6495
Epoch 133/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4892 - accuracy: 0.6787 - val_loss: 0.7830 - val_
accuracy: 0.6308
Epoch 134/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4134 - accuracy: 0.6812 - val_loss: 0.7486 - val_
accuracy: 0.6308
Epoch 135/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3536 - accuracy: 0.7044 - val_loss: 0.7515 - val_
accuracy: 0.6402
Epoch 136/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3910 - accuracy: 0.7147 - val_loss: 0.8185 - val_
accuracy: 0.6449
Epoch 137/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4455 - accuracy: 0.7172 - val_loss: 0.8943 - val_
accuracy: 0.6355
Epoch 138/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3785 - accuracy: 0.6812 - val_loss: 0.8560 - val_
accuracy: 0.6355
Epoch 139/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3911 - accuracy: 0.6941 - val_loss: 0.8737 - val_
accuracy: 0.6355
Epoch 140/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.4595 - accuracy: 0.6838 - val_loss: 0.8808 - val_accuracy: 0.6355
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4092 - accuracy: 0.6838 - val_loss: 0.8745 - val_accuracy: 0.6495
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3769 - accuracy: 0.6864 - val_loss: 0.8728 - val_accuracy: 0.6355
Epoch 143/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3727 - accuracy: 0.6992 - val_loss: 0.8867 - val_accuracy: 0.6308
Epoch 144/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3877 - accuracy: 0.6812 - val_loss: 0.8900 - val_accuracy: 0.6402
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3248 - accuracy: 0.7044 - val_loss: 0.8621 - val_accuracy: 0.6449
Epoch 146/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3704 - accuracy: 0.6735 - val_loss: 0.9150 - val_accuracy: 0.6262
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3637 - accuracy: 0.6992 - val_loss: 0.8743 - val_accuracy: 0.6215
Epoch 148/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4105 - accuracy: 0.7198 - val_loss: 0.8155 - val_accuracy: 0.6262
Epoch 149/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4028 - accuracy: 0.7044 - val_loss: 0.8332 - val_accuracy: 0.6355
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2983 - accuracy: 0.7198 - val_loss: 0.8236 - val_accuracy: 0.6355
Epoch 151/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4397 - accuracy: 0.6967 - val_loss: 0.8286 - val_accuracy: 0.6308
Epoch 152/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3486 - accuracy: 0.6915 - val_loss: 0.8990 - val_accuracy: 0.6542
Epoch 153/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4129 - accuracy: 0.7224 - val_loss: 0.8707 - val_accuracy: 0.6636
Epoch 154/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3110 - accuracy: 0.7224 - val_loss: 0.8833 - val_accuracy: 0.6636
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3435 - accuracy: 0.7172 - val_loss: 0.8487 - val_accuracy: 0.6589
Epoch 156/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3895 - accuracy: 0.7172 - val_loss: 0.8102 - val_accuracy: 0.6589
Epoch 157/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3675 - accuracy: 0.7095 - val_loss: 0.8401 - val_accuracy: 0.6869
Epoch 158/1000
4/4 [=====] - 0s 18ms/step - loss: 0.3034 - accuracy: 0.7172 - val_loss: 0.9443 - val_accuracy: 0.6822
Epoch 159/1000
4/4 [=====] - 0s 18ms/step - loss: 0.3305 - accuracy: 0.7224 - val_loss: 0.9652 - val_accuracy: 0.6822
Epoch 160/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4271 - accuracy: 0.7275 - val_loss: 1.0235 - val_accuracy: 0.6822
Epoch 161/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4308 - accuracy: 0.7249 - val_loss: 0.9683 - val_accuracy: 0.6822
Epoch 162/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3096 - accuracy: 0.7275 - val_loss: 0.9752 - val_accuracy: 0.6869
Epoch 163/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3389 - accuracy: 0.7326 - val_loss: 0.9280 - val_accuracy: 0.6822
Epoch 164/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3704 - accuracy: 0.7404 - val_loss: 0.9431 - val_accuracy: 0.6822
Epoch 165/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3347 - accuracy: 0.7481 - val_loss: 0.9786 - val_accuracy: 0.6869
Epoch 166/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3164 - accuracy: 0.7095 - val_loss: 0.9247 - val_accuracy: 0.6916
Epoch 167/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2993 - accuracy: 0.7404 - val_loss: 1.0191 - val_accuracy: 0.6869
Epoch 168/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3587 - accuracy: 0.7326 - val_loss: 0.9016 - val_accuracy: 0.6822
Epoch 169/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3503 - accuracy: 0.7455 - val_loss: 0.9324 - val_accuracy: 0.6776
```

Epoch 170/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3345 - accuracy: 0.7275 - val_loss: 0.8974 - val_accuracy: 0.6869
Epoch 171/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3524 - accuracy: 0.7378 - val_loss: 0.8993 - val_accuracy: 0.6963
Epoch 172/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4051 - accuracy: 0.7224 - val_loss: 0.9092 - val_accuracy: 0.6869
Epoch 173/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3960 - accuracy: 0.7301 - val_loss: 1.0077 - val_accuracy: 0.6963
Epoch 174/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4213 - accuracy: 0.7147 - val_loss: 1.0199 - val_accuracy: 0.6822
Epoch 175/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4125 - accuracy: 0.7198 - val_loss: 0.9345 - val_accuracy: 0.6916
Epoch 176/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3461 - accuracy: 0.7352 - val_loss: 0.9322 - val_accuracy: 0.7009
Epoch 177/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3781 - accuracy: 0.7249 - val_loss: 0.9806 - val_accuracy: 0.6916
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3375 - accuracy: 0.7481 - val_loss: 1.0303 - val_accuracy: 0.6916
Epoch 179/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4063 - accuracy: 0.7404 - val_loss: 0.9289 - val_accuracy: 0.6869
Epoch 180/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3244 - accuracy: 0.7301 - val_loss: 0.9398 - val_accuracy: 0.6916
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3945 - accuracy: 0.7455 - val_loss: 0.9045 - val_accuracy: 0.6916
Epoch 182/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3481 - accuracy: 0.7481 - val_loss: 0.9308 - val_accuracy: 0.6869
Epoch 183/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3478 - accuracy: 0.7378 - val_loss: 0.9165 - val_accuracy: 0.6916
Epoch 184/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3632 - accuracy: 0.7224 - val_loss: 0.9409 - val_accuracy: 0.6963
Epoch 185/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3279 - accuracy: 0.7455 - val_loss: 0.9525 - val_accuracy: 0.6963
Epoch 186/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4273 - accuracy: 0.7429 - val_loss: 1.0717 - val_accuracy: 0.7009
Epoch 187/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4562 - accuracy: 0.7198 - val_loss: 0.9568 - val_accuracy: 0.7103
Epoch 188/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4298 - accuracy: 0.7429 - val_loss: 0.9214 - val_accuracy: 0.7056
Epoch 189/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3300 - accuracy: 0.7352 - val_loss: 0.9418 - val_accuracy: 0.6963
Epoch 190/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3782 - accuracy: 0.7584 - val_loss: 0.9048 - val_accuracy: 0.7009
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4664 - accuracy: 0.7352 - val_loss: 0.9489 - val_accuracy: 0.7103
Epoch 192/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4188 - accuracy: 0.7532 - val_loss: 0.9535 - val_accuracy: 0.7150
Epoch 193/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3087 - accuracy: 0.7532 - val_loss: 0.9490 - val_accuracy: 0.7150
Epoch 194/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3109 - accuracy: 0.7609 - val_loss: 0.9703 - val_accuracy: 0.7196
Epoch 195/1000
4/4 [=====] - 0s 22ms/step - loss: 0.2967 - accuracy: 0.7532 - val_loss: 0.9696 - val_accuracy: 0.7196
Epoch 196/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3145 - accuracy: 0.7532 - val_loss: 0.9432 - val_accuracy: 0.7150
Epoch 197/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2961 - accuracy: 0.7584 - val_loss: 0.9154 - val_accuracy: 0.7103
Epoch 198/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3634 - accuracy: 0.7558 - val_loss: 0.9116 - val_accuracy: 0.7150
Epoch 199/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3325 - accuracy: 0.7301 - val_loss: 0.9408 - val_accuracy: 0.7150

```
accuracy: 0.7103
Epoch 200/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3273 - accuracy: 0.7506 - val_loss: 0.9464 - val_accuracy: 0.7056
Epoch 201/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4179 - accuracy: 0.7224 - val_loss: 0.9537 - val_accuracy: 0.7056
Epoch 202/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3274 - accuracy: 0.7352 - val_loss: 0.9192 - val_accuracy: 0.7056
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2993 - accuracy: 0.7275 - val_loss: 0.9776 - val_accuracy: 0.7009
Epoch 204/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3906 - accuracy: 0.7429 - val_loss: 0.9211 - val_accuracy: 0.7056
Epoch 205/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3611 - accuracy: 0.7275 - val_loss: 0.9144 - val_accuracy: 0.7150
Epoch 206/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3699 - accuracy: 0.7172 - val_loss: 0.9977 - val_accuracy: 0.7056
Epoch 207/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4471 - accuracy: 0.7198 - val_loss: 0.9998 - val_accuracy: 0.7103
Epoch 208/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3144 - accuracy: 0.7326 - val_loss: 1.1773 - val_accuracy: 0.7150
Epoch 209/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3128 - accuracy: 0.7404 - val_loss: 0.9672 - val_accuracy: 0.6963
Epoch 210/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3538 - accuracy: 0.7224 - val_loss: 0.9618 - val_accuracy: 0.7103
Epoch 211/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3083 - accuracy: 0.7069 - val_loss: 1.0231 - val_accuracy: 0.6916
Epoch 212/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3739 - accuracy: 0.7275 - val_loss: 0.9719 - val_accuracy: 0.6963
Epoch 213/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3134 - accuracy: 0.7532 - val_loss: 1.2065 - val_accuracy: 0.7056
Epoch 214/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3636 - accuracy: 0.7532 - val_loss: 1.1185 - val_accuracy: 0.7103
Epoch 215/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3625 - accuracy: 0.7249 - val_loss: 1.2982 - val_accuracy: 0.7009
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3949 - accuracy: 0.7198 - val_loss: 1.3671 - val_accuracy: 0.7009
Epoch 217/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3112 - accuracy: 0.7172 - val_loss: 1.2080 - val_accuracy: 0.7009
Epoch 218/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2881 - accuracy: 0.7326 - val_loss: 1.1595 - val_accuracy: 0.7056
Epoch 219/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3489 - accuracy: 0.7609 - val_loss: 1.0709 - val_accuracy: 0.7150
Epoch 220/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3347 - accuracy: 0.7301 - val_loss: 1.1204 - val_accuracy: 0.7150
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3008 - accuracy: 0.7404 - val_loss: 1.1520 - val_accuracy: 0.7196
Epoch 222/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3125 - accuracy: 0.7429 - val_loss: 1.2033 - val_accuracy: 0.7196
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4790 - accuracy: 0.7481 - val_loss: 1.0858 - val_accuracy: 0.7103
Epoch 224/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2880 - accuracy: 0.7481 - val_loss: 1.2181 - val_accuracy: 0.6869
Epoch 225/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4024 - accuracy: 0.7532 - val_loss: 1.2005 - val_accuracy: 0.6168
Epoch 226/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3738 - accuracy: 0.6889 - val_loss: 1.1258 - val_accuracy: 0.5888
Epoch 227/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3158 - accuracy: 0.6478 - val_loss: 1.4743 - val_accuracy: 0.6028
Epoch 228/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3500 - accuracy: 0.5681 - val_loss: 1.4234 - val_accuracy: 0.5841
Epoch 229/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 0.2851 - accuracy: 0.5758 - val_loss: 1.4445 - val_accuracy: 0.5794
Epoch 230/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3046 - accuracy: 0.5347 - val_loss: 1.4465 - val_accuracy: 0.5607
Epoch 231/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2876 - accuracy: 0.5450 - val_loss: 1.3648 - val_accuracy: 0.5561
Epoch 232/1000
4/4 [=====] - 0s 19ms/step - loss: 0.3953 - accuracy: 0.5501 - val_loss: 1.2831 - val_accuracy: 0.5421
Epoch 233/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3494 - accuracy: 0.5450 - val_loss: 1.2515 - val_accuracy: 0.5374
Epoch 234/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2825 - accuracy: 0.5578 - val_loss: 1.3144 - val_accuracy: 0.5654
Epoch 235/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3338 - accuracy: 0.6015 - val_loss: 1.2979 - val_accuracy: 0.5374
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4155 - accuracy: 0.5553 - val_loss: 1.1754 - val_accuracy: 0.5327
Epoch 237/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2999 - accuracy: 0.5604 - val_loss: 1.1158 - val_accuracy: 0.5327
Epoch 238/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2989 - accuracy: 0.5733 - val_loss: 1.1584 - val_accuracy: 0.5421
Epoch 239/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2762 - accuracy: 0.5604 - val_loss: 1.0598 - val_accuracy: 0.5514
Epoch 240/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2988 - accuracy: 0.5784 - val_loss: 1.1685 - val_accuracy: 0.5374
Epoch 241/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3412 - accuracy: 0.5527 - val_loss: 1.3087 - val_accuracy: 0.5234
Epoch 242/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2966 - accuracy: 0.5398 - val_loss: 1.3353 - val_accuracy: 0.5607
Epoch 243/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2949 - accuracy: 0.5373 - val_loss: 1.1981 - val_accuracy: 0.5514
Epoch 244/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3175 - accuracy: 0.5270 - val_loss: 1.3379 - val_accuracy: 0.5467
Epoch 245/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2878 - accuracy: 0.5604 - val_loss: 1.2119 - val_accuracy: 0.5421
Epoch 246/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3180 - accuracy: 0.5244 - val_loss: 1.2174 - val_accuracy: 0.5467
Epoch 247/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4221 - accuracy: 0.5758 - val_loss: 1.0682 - val_accuracy: 0.5467
Epoch 248/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3962 - accuracy: 0.5270 - val_loss: 1.1013 - val_accuracy: 0.5421
Epoch 249/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2797 - accuracy: 0.5604 - val_loss: 1.0115 - val_accuracy: 0.5467
Epoch 250/1000
4/4 [=====] - 0s 34ms/step - loss: 0.3356 - accuracy: 0.5656 - val_loss: 1.2701 - val_accuracy: 0.5654
Epoch 251/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4821 - accuracy: 0.5347 - val_loss: 1.3404 - val_accuracy: 0.5701
Epoch 252/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4220 - accuracy: 0.5553 - val_loss: 1.3102 - val_accuracy: 0.5607
Epoch 253/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3357 - accuracy: 0.5347 - val_loss: 1.2828 - val_accuracy: 0.5514
Epoch 254/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3113 - accuracy: 0.5476 - val_loss: 1.1666 - val_accuracy: 0.5374
Epoch 255/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3175 - accuracy: 0.5347 - val_loss: 1.1626 - val_accuracy: 0.5421
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2697 - accuracy: 0.5450 - val_loss: 1.1011 - val_accuracy: 0.5234
Epoch 257/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2880 - accuracy: 0.5398 - val_loss: 1.1601 - val_accuracy: 0.5234
Epoch 258/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3028 - accuracy: 0.5244 - val_loss: 1.1601 - val_accuracy: 0.5280
```

Epoch 259/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3084 - accuracy: 0.5270 - val_loss: 1.1328 - val_accuracy: 0.5374
Epoch 260/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3121 - accuracy: 0.5321 - val_loss: 1.1323 - val_accuracy: 0.5514
Epoch 261/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3009 - accuracy: 0.5296 - val_loss: 1.0928 - val_accuracy: 0.5467
Epoch 262/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4648 - accuracy: 0.5296 - val_loss: 1.1319 - val_accuracy: 0.5841
Epoch 263/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2943 - accuracy: 0.5398 - val_loss: 1.0782 - val_accuracy: 0.5467
Epoch 264/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3376 - accuracy: 0.5244 - val_loss: 1.0187 - val_accuracy: 0.5561
Epoch 265/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3434 - accuracy: 0.5141 - val_loss: 1.0460 - val_accuracy: 0.5514
Epoch 266/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2956 - accuracy: 0.5347 - val_loss: 1.1056 - val_accuracy: 0.5327
Epoch 267/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2670 - accuracy: 0.5424 - val_loss: 1.3898 - val_accuracy: 0.5981
Epoch 268/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3211 - accuracy: 0.5758 - val_loss: 1.3940 - val_accuracy: 0.6028
Epoch 269/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2943 - accuracy: 0.6298 - val_loss: 1.4066 - val_accuracy: 0.7103
Epoch 270/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2936 - accuracy: 0.7326 - val_loss: 1.4664 - val_accuracy: 0.7009
Epoch 271/1000
4/4 [=====] - 0s 19ms/step - loss: 0.3350 - accuracy: 0.7224 - val_loss: 1.5462 - val_accuracy: 0.7056
Epoch 272/1000
4/4 [=====] - 0s 25ms/step - loss: 0.2754 - accuracy: 0.7249 - val_loss: 1.5200 - val_accuracy: 0.7103
Epoch 273/1000
4/4 [=====] - 0s 19ms/step - loss: 0.3011 - accuracy: 0.7224 - val_loss: 1.4751 - val_accuracy: 0.7056
Epoch 274/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3312 - accuracy: 0.7481 - val_loss: 1.4038 - val_accuracy: 0.7056
Epoch 275/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3548 - accuracy: 0.7455 - val_loss: 1.3906 - val_accuracy: 0.7103
Epoch 276/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2533 - accuracy: 0.7429 - val_loss: 1.3060 - val_accuracy: 0.7103
Epoch 277/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3587 - accuracy: 0.7326 - val_loss: 1.3685 - val_accuracy: 0.6963
Epoch 278/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3290 - accuracy: 0.7326 - val_loss: 1.3945 - val_accuracy: 0.7009
Epoch 279/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2693 - accuracy: 0.7404 - val_loss: 1.3462 - val_accuracy: 0.7009
Epoch 280/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3349 - accuracy: 0.7301 - val_loss: 1.3109 - val_accuracy: 0.6682
Epoch 281/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2930 - accuracy: 0.7352 - val_loss: 1.2820 - val_accuracy: 0.6542
Epoch 282/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2752 - accuracy: 0.6555 - val_loss: 1.1835 - val_accuracy: 0.6262
Epoch 283/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2826 - accuracy: 0.6221 - val_loss: 1.3037 - val_accuracy: 0.6308
Epoch 284/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2770 - accuracy: 0.6787 - val_loss: 1.1619 - val_accuracy: 0.6682
Epoch 285/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3597 - accuracy: 0.6581 - val_loss: 1.1892 - val_accuracy: 0.6168
Epoch 286/1000
4/4 [=====] - 0s 17ms/step - loss: 0.3313 - accuracy: 0.6452 - val_loss: 1.2837 - val_accuracy: 0.6168
Epoch 287/1000
4/4 [=====] - 0s 19ms/step - loss: 0.2685 - accuracy: 0.6170 - val_loss: 1.2240 - val_accuracy: 0.6308
Epoch 288/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3345 - accuracy: 0.6144 - val_loss: 1.1651 - val_accuracy: 0.6168

```
accuracy: 0.6449
Epoch 289/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2814 - accuracy: 0.6015 - val_loss: 1.2587 - val_
accuracy: 0.6495
Epoch 290/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3123 - accuracy: 0.5758 - val_loss: 1.2011 - val_
accuracy: 0.6262
Epoch 291/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3294 - accuracy: 0.5964 - val_loss: 1.1560 - val_
accuracy: 0.6355
Epoch 292/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3092 - accuracy: 0.5553 - val_loss: 1.1595 - val_
accuracy: 0.5981
Epoch 293/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3265 - accuracy: 0.5681 - val_loss: 1.3591 - val_
accuracy: 0.6262
Epoch 294/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3562 - accuracy: 0.5604 - val_loss: 1.2947 - val_
accuracy: 0.6402
Epoch 295/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2972 - accuracy: 0.5424 - val_loss: 1.2461 - val_
accuracy: 0.6168
Epoch 296/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3250 - accuracy: 0.5167 - val_loss: 1.3390 - val_
accuracy: 0.6121
Epoch 297/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2990 - accuracy: 0.5553 - val_loss: 1.2902 - val_
accuracy: 0.6542
Epoch 298/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3840 - accuracy: 0.6118 - val_loss: 1.2599 - val_
accuracy: 0.6168
Epoch 299/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3715 - accuracy: 0.5964 - val_loss: 1.2198 - val_
accuracy: 0.5748
Epoch 300/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3404 - accuracy: 0.5578 - val_loss: 1.2371 - val_
accuracy: 0.5748
Epoch 301/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4031 - accuracy: 0.5810 - val_loss: 1.2072 - val_
accuracy: 0.5981
Epoch 302/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3063 - accuracy: 0.5810 - val_loss: 1.1998 - val_
accuracy: 0.6028
Epoch 303/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2621 - accuracy: 0.5681 - val_loss: 1.1736 - val_
accuracy: 0.5888
Epoch 304/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3639 - accuracy: 0.5630 - val_loss: 1.3058 - val_
accuracy: 0.5981
Epoch 305/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2811 - accuracy: 0.5733 - val_loss: 1.3160 - val_
accuracy: 0.5981
Epoch 306/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2830 - accuracy: 0.5553 - val_loss: 1.2134 - val_
accuracy: 0.5654
Epoch 307/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3890 - accuracy: 0.5835 - val_loss: 1.1999 - val_
accuracy: 0.6028
Epoch 308/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3685 - accuracy: 0.6247 - val_loss: 1.1966 - val_
accuracy: 0.5888
Epoch 309/1000
4/4 [=====] - 0s 17ms/step - loss: 0.2946 - accuracy: 0.6350 - val_loss: 1.2501 - val_
accuracy: 0.5234
Epoch 310/1000
4/4 [=====] - 0s 17ms/step - loss: 0.2618 - accuracy: 0.6247 - val_loss: 1.2384 - val_
accuracy: 0.5327
Epoch 311/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2842 - accuracy: 0.5861 - val_loss: 1.1626 - val_
accuracy: 0.5187
Epoch 312/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3254 - accuracy: 0.5758 - val_loss: 1.2665 - val_
accuracy: 0.5607
Epoch 313/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3259 - accuracy: 0.5938 - val_loss: 1.2210 - val_
accuracy: 0.5701
Epoch 314/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3739 - accuracy: 0.5938 - val_loss: 1.2805 - val_
accuracy: 0.5327
Epoch 315/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2484 - accuracy: 0.5733 - val_loss: 1.2704 - val_
accuracy: 0.5234
Epoch 316/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3576 - accuracy: 0.6015 - val_loss: 1.2475 - val_
accuracy: 0.5841
Epoch 317/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3279 - accuracy: 0.6607 - val_loss: 1.1562 - val_
accuracy: 0.5748
Epoch 318/1000
```

```

4/4 [=====] - 0s 25ms/step - loss: 0.3583 - accuracy: 0.6427 - val_loss: 1.1546 - val_accuracy: 0.5607
Epoch 319/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3067 - accuracy: 0.6093 - val_loss: 1.2104 - val_accuracy: 0.5841
Epoch 320/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3489 - accuracy: 0.6067 - val_loss: 1.1943 - val_accuracy: 0.5654
Epoch 321/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2483 - accuracy: 0.6067 - val_loss: 1.1988 - val_accuracy: 0.5421
Epoch 322/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2571 - accuracy: 0.6247 - val_loss: 1.1900 - val_accuracy: 0.5467
Epoch 323/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3550 - accuracy: 0.6272 - val_loss: 1.1548 - val_accuracy: 0.5421
Epoch 324/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2875 - accuracy: 0.6195 - val_loss: 1.1854 - val_accuracy: 0.5561
Epoch 325/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2819 - accuracy: 0.6324 - val_loss: 1.1860 - val_accuracy: 0.5607
Epoch 326/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3234 - accuracy: 0.6195 - val_loss: 1.1134 - val_accuracy: 0.5654
Epoch 327/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3302 - accuracy: 0.6221 - val_loss: 1.2052 - val_accuracy: 0.5561
Epoch 328/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3228 - accuracy: 0.6427 - val_loss: 1.1893 - val_accuracy: 0.5607
Epoch 329/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2839 - accuracy: 0.6272 - val_loss: 1.1397 - val_accuracy: 0.5467
Epoch 330/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2940 - accuracy: 0.6427 - val_loss: 1.1230 - val_accuracy: 0.5374
Epoch 331/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2699 - accuracy: 0.6298 - val_loss: 1.1060 - val_accuracy: 0.5374
Epoch 332/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3837 - accuracy: 0.6350 - val_loss: 1.1505 - val_accuracy: 0.5374
Epoch 333/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4958 - accuracy: 0.6170 - val_loss: 1.2324 - val_accuracy: 0.5374
Epoch 334/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3450 - accuracy: 0.6195 - val_loss: 1.2074 - val_accuracy: 0.5514
Epoch 335/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2816 - accuracy: 0.6170 - val_loss: 1.2459 - val_accuracy: 0.5561
Epoch 336/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2778 - accuracy: 0.6144 - val_loss: 1.1793 - val_accuracy: 0.5561
Epoch 337/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3085 - accuracy: 0.6324 - val_loss: 1.1659 - val_accuracy: 0.5841
Epoch 338/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3504 - accuracy: 0.6221 - val_loss: 1.1919 - val_accuracy: 0.5701
Epoch 339/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3205 - accuracy: 0.6221 - val_loss: 1.1808 - val_accuracy: 0.5701
Epoch 340/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3153 - accuracy: 0.6401 - val_loss: 1.1556 - val_accuracy: 0.5748
Epoch 341/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2395 - accuracy: 0.6375 - val_loss: 1.2155 - val_accuracy: 0.5701
Epoch 342/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3453 - accuracy: 0.5861 - val_loss: 1.2620 - val_accuracy: 0.5187
Epoch 343/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3664 - accuracy: 0.5578 - val_loss: 1.2277 - val_accuracy: 0.5421
Epoch 344/1000
1/4 [====>.....] - ETA: 0s - loss: 0.4726 - accuracy: 0.5234Restoring model weights from th
e end of the best epoch: 194.
4/4 [=====] - 0s 16ms/step - loss: 0.3218 - accuracy: 0.5810 - val_loss: 1.1281 - val_accuracy: 0.5421
Epoch 344: early stopping
2/2 [=====] - 0s 4ms/step - loss: 0.2425 - accuracy: 0.8372
[CV] END .....Dense1=100, Dense2=50; total time= 19.4s
Model: "sequential_96"

```

Layer (type)	Output Shape	Param #

dense_384 (Dense)	(None, 100)	700
batch_normalization_288 (BatchNormalization)	(None, 100)	400
activation_288 (Activation)	(None, 100)	0
dense_385 (Dense)	(None, 50)	5050
batch_normalization_289 (BatchNormalization)	(None, 50)	200
activation_289 (Activation)	(None, 50)	0
dense_386 (Dense)	(None, 10)	510
batch_normalization_290 (BatchNormalization)	(None, 10)	40
activation_290 (Activation)	(None, 10)	0
dense_387 (Dense)	(None, 2)	22

Total params: 6,922
Trainable params: 6,602
Non-trainable params: 320

Epoch 1/1000
4/4 [=====] - 2s 62ms/step - loss: 4.8073 - accuracy: 0.4216 - val_loss: 4.4223 - val_accuracy: 0.4720
Epoch 2/1000
4/4 [=====] - 0s 16ms/step - loss: 3.2770 - accuracy: 0.4319 - val_loss: 4.4657 - val_accuracy: 0.4953
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 3.0162 - accuracy: 0.4422 - val_loss: 3.8692 - val_accuracy: 0.4720
Epoch 4/1000
4/4 [=====] - 0s 15ms/step - loss: 2.2746 - accuracy: 0.4653 - val_loss: 3.1151 - val_accuracy: 0.4393
Epoch 5/1000
4/4 [=====] - 0s 16ms/step - loss: 2.2698 - accuracy: 0.4781 - val_loss: 2.6723 - val_accuracy: 0.4019
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2887 - accuracy: 0.5296 - val_loss: 2.4084 - val_accuracy: 0.3692
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3081 - accuracy: 0.5167 - val_loss: 2.2985 - val_accuracy: 0.3785
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9454 - accuracy: 0.4910 - val_loss: 2.3032 - val_accuracy: 0.4112
Epoch 9/1000
4/4 [=====] - 0s 15ms/step - loss: 1.8482 - accuracy: 0.5219 - val_loss: 2.2801 - val_accuracy: 0.4252
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5744 - accuracy: 0.5039 - val_loss: 2.3158 - val_accuracy: 0.4252
Epoch 11/1000
4/4 [=====] - 0s 16ms/step - loss: 1.2845 - accuracy: 0.5296 - val_loss: 2.2892 - val_accuracy: 0.4346
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3722 - accuracy: 0.5347 - val_loss: 2.3110 - val_accuracy: 0.4393
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3402 - accuracy: 0.5450 - val_loss: 2.2712 - val_accuracy: 0.4439
Epoch 14/1000
4/4 [=====] - 0s 16ms/step - loss: 1.2240 - accuracy: 0.5553 - val_loss: 2.2669 - val_accuracy: 0.4579
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1606 - accuracy: 0.5424 - val_loss: 2.2644 - val_accuracy: 0.4533
Epoch 16/1000
4/4 [=====] - 0s 20ms/step - loss: 1.0996 - accuracy: 0.5681 - val_loss: 2.2650 - val_accuracy: 0.4533
Epoch 17/1000
4/4 [=====] - 0s 19ms/step - loss: 1.0650 - accuracy: 0.5835 - val_loss: 2.2615 - val_accuracy: 0.4673
Epoch 18/1000
4/4 [=====] - 0s 16ms/step - loss: 1.1000 - accuracy: 0.5553 - val_loss: 2.2502 - val_accuracy: 0.4813
Epoch 19/1000
4/4 [=====] - 0s 16ms/step - loss: 1.0682 - accuracy: 0.5990 - val_loss: 2.2316 - val_accuracy: 0.4766
Epoch 20/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8618 - accuracy: 0.5938 - val_loss: 2.2175 - val_accuracy: 0.4813
Epoch 21/1000

```
4/4 [=====] - 0s 16ms/step - loss: 0.9238 - accuracy: 0.5861 - val_loss: 2.2019 - val_accuracy: 0.4860
Epoch 22/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8531 - accuracy: 0.5707 - val_loss: 2.1872 - val_accuracy: 0.4860
Epoch 23/1000
4/4 [=====] - 0s 17ms/step - loss: 0.8516 - accuracy: 0.6170 - val_loss: 2.1424 - val_accuracy: 0.4766
Epoch 24/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8220 - accuracy: 0.6041 - val_loss: 2.1175 - val_accuracy: 0.4813
Epoch 25/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7789 - accuracy: 0.5733 - val_loss: 2.0993 - val_accuracy: 0.4673
Epoch 26/1000
4/4 [=====] - 0s 19ms/step - loss: 0.8996 - accuracy: 0.5219 - val_loss: 2.0878 - val_accuracy: 0.4766
Epoch 27/1000
4/4 [=====] - 0s 20ms/step - loss: 0.7084 - accuracy: 0.5835 - val_loss: 2.0817 - val_accuracy: 0.4766
Epoch 28/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7349 - accuracy: 0.5681 - val_loss: 2.0695 - val_accuracy: 0.4766
Epoch 29/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6959 - accuracy: 0.5964 - val_loss: 2.0641 - val_accuracy: 0.4813
Epoch 30/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7351 - accuracy: 0.5913 - val_loss: 2.0475 - val_accuracy: 0.4813
Epoch 31/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6120 - accuracy: 0.6170 - val_loss: 2.0390 - val_accuracy: 0.4813
Epoch 32/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7638 - accuracy: 0.6272 - val_loss: 2.0128 - val_accuracy: 0.4813
Epoch 33/1000
4/4 [=====] - 0s 16ms/step - loss: 0.6123 - accuracy: 0.6555 - val_loss: 1.9995 - val_accuracy: 0.4813
Epoch 34/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5846 - accuracy: 0.6324 - val_loss: 1.9910 - val_accuracy: 0.4813
Epoch 35/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7996 - accuracy: 0.6298 - val_loss: 1.9741 - val_accuracy: 0.4860
Epoch 36/1000
4/4 [=====] - 0s 16ms/step - loss: 0.6811 - accuracy: 0.6272 - val_loss: 1.8766 - val_accuracy: 0.4720
Epoch 37/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5603 - accuracy: 0.6452 - val_loss: 1.8662 - val_accuracy: 0.4720
Epoch 38/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6769 - accuracy: 0.6375 - val_loss: 1.8379 - val_accuracy: 0.4766
Epoch 39/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5947 - accuracy: 0.6272 - val_loss: 1.8329 - val_accuracy: 0.4953
Epoch 40/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4884 - accuracy: 0.6170 - val_loss: 1.8132 - val_accuracy: 0.5047
Epoch 41/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4770 - accuracy: 0.6401 - val_loss: 1.7987 - val_accuracy: 0.5047
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5121 - accuracy: 0.6350 - val_loss: 1.7733 - val_accuracy: 0.5047
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6168 - accuracy: 0.6324 - val_loss: 1.7938 - val_accuracy: 0.4907
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4631 - accuracy: 0.6530 - val_loss: 1.7796 - val_accuracy: 0.5000
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4376 - accuracy: 0.6555 - val_loss: 1.7583 - val_accuracy: 0.5047
Epoch 46/1000
4/4 [=====] - 0s 26ms/step - loss: 0.4622 - accuracy: 0.6658 - val_loss: 1.7215 - val_accuracy: 0.5000
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4736 - accuracy: 0.6607 - val_loss: 1.7059 - val_accuracy: 0.4953
Epoch 48/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4210 - accuracy: 0.6812 - val_loss: 1.6906 - val_accuracy: 0.4953
Epoch 49/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4181 - accuracy: 0.6889 - val_loss: 1.6580 - val_accuracy: 0.4953
Epoch 50/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4239 - accuracy: 0.6581 - val_loss: 1.6216 - val_accuracy: 0.4579
```

Epoch 51/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3472 - accuracy: 0.6530 - val_loss: 1.5876 - val_accuracy: 0.4626
Epoch 52/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3660 - accuracy: 0.6684 - val_loss: 1.5813 - val_accuracy: 0.4673
Epoch 53/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4432 - accuracy: 0.6658 - val_loss: 1.5415 - val_accuracy: 0.4860
Epoch 54/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4516 - accuracy: 0.6401 - val_loss: 1.5234 - val_accuracy: 0.4860
Epoch 55/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4391 - accuracy: 0.6787 - val_loss: 1.5143 - val_accuracy: 0.4860
Epoch 56/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3764 - accuracy: 0.6607 - val_loss: 1.4845 - val_accuracy: 0.4907
Epoch 57/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3926 - accuracy: 0.6658 - val_loss: 1.4506 - val_accuracy: 0.4953
Epoch 58/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4130 - accuracy: 0.6504 - val_loss: 1.4461 - val_accuracy: 0.5187
Epoch 59/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5519 - accuracy: 0.6710 - val_loss: 1.4161 - val_accuracy: 0.5187
Epoch 60/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4302 - accuracy: 0.6658 - val_loss: 1.3947 - val_accuracy: 0.5140
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3382 - accuracy: 0.6787 - val_loss: 1.3888 - val_accuracy: 0.5187
Epoch 62/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3924 - accuracy: 0.6581 - val_loss: 1.3470 - val_accuracy: 0.5140
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4106 - accuracy: 0.6838 - val_loss: 1.3706 - val_accuracy: 0.5093
Epoch 64/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3970 - accuracy: 0.6735 - val_loss: 1.3973 - val_accuracy: 0.5327
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3607 - accuracy: 0.6684 - val_loss: 1.4377 - val_accuracy: 0.5187
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4279 - accuracy: 0.6735 - val_loss: 1.3470 - val_accuracy: 0.5187
Epoch 67/1000
4/4 [=====] - 0s 18ms/step - loss: 0.4122 - accuracy: 0.6632 - val_loss: 1.3405 - val_accuracy: 0.5187
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4002 - accuracy: 0.6787 - val_loss: 1.3507 - val_accuracy: 0.5280
Epoch 69/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4023 - accuracy: 0.6864 - val_loss: 1.2685 - val_accuracy: 0.5374
Epoch 70/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3894 - accuracy: 0.7069 - val_loss: 1.2582 - val_accuracy: 0.5514
Epoch 71/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3328 - accuracy: 0.6915 - val_loss: 1.1645 - val_accuracy: 0.5981
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3680 - accuracy: 0.6941 - val_loss: 1.2339 - val_accuracy: 0.5654
Epoch 73/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4377 - accuracy: 0.6915 - val_loss: 1.1802 - val_accuracy: 0.5561
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3670 - accuracy: 0.6787 - val_loss: 1.1779 - val_accuracy: 0.5514
Epoch 75/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3644 - accuracy: 0.7095 - val_loss: 1.2042 - val_accuracy: 0.5701
Epoch 76/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3711 - accuracy: 0.6684 - val_loss: 1.2083 - val_accuracy: 0.5701
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4172 - accuracy: 0.7095 - val_loss: 1.2119 - val_accuracy: 0.5888
Epoch 78/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3758 - accuracy: 0.6787 - val_loss: 1.1977 - val_accuracy: 0.5841
Epoch 79/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4304 - accuracy: 0.6992 - val_loss: 1.1326 - val_accuracy: 0.5748
Epoch 80/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5197 - accuracy: 0.6889 - val_loss: 1.0727 - val_accuracy: 0.5841

accuracy: 0.5888
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3579 - accuracy: 0.6710 - val_loss: 1.0436 - val_accuracy: 0.5888
Epoch 82/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3895 - accuracy: 0.6915 - val_loss: 1.0072 - val_accuracy: 0.5794
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2994 - accuracy: 0.6992 - val_loss: 0.9705 - val_accuracy: 0.5748
Epoch 84/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4033 - accuracy: 0.6992 - val_loss: 0.9746 - val_accuracy: 0.5748
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3262 - accuracy: 0.6658 - val_loss: 0.9270 - val_accuracy: 0.5841
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3078 - accuracy: 0.7275 - val_loss: 0.9597 - val_accuracy: 0.5794
Epoch 87/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3202 - accuracy: 0.6889 - val_loss: 0.9239 - val_accuracy: 0.5654
Epoch 88/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2896 - accuracy: 0.7147 - val_loss: 0.8660 - val_accuracy: 0.6028
Epoch 89/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3034 - accuracy: 0.7198 - val_loss: 0.8041 - val_accuracy: 0.5981
Epoch 90/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4109 - accuracy: 0.7172 - val_loss: 0.7894 - val_accuracy: 0.6215
Epoch 91/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3101 - accuracy: 0.7224 - val_loss: 0.8147 - val_accuracy: 0.5888
Epoch 92/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3435 - accuracy: 0.7069 - val_loss: 0.8119 - val_accuracy: 0.5935
Epoch 93/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3952 - accuracy: 0.7121 - val_loss: 0.8168 - val_accuracy: 0.5888
Epoch 94/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3308 - accuracy: 0.7198 - val_loss: 0.8155 - val_accuracy: 0.5888
Epoch 95/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3009 - accuracy: 0.7069 - val_loss: 0.7865 - val_accuracy: 0.5888
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2654 - accuracy: 0.7121 - val_loss: 0.8366 - val_accuracy: 0.6168
Epoch 97/1000
4/4 [=====] - 0s 28ms/step - loss: 0.3329 - accuracy: 0.7326 - val_loss: 0.8531 - val_accuracy: 0.5888
Epoch 98/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3106 - accuracy: 0.7172 - val_loss: 0.8490 - val_accuracy: 0.5327
Epoch 99/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3376 - accuracy: 0.6967 - val_loss: 0.8502 - val_accuracy: 0.5467
Epoch 100/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2942 - accuracy: 0.7378 - val_loss: 0.8169 - val_accuracy: 0.5888
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2625 - accuracy: 0.7301 - val_loss: 0.8410 - val_accuracy: 0.5748
Epoch 102/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3726 - accuracy: 0.7224 - val_loss: 0.8634 - val_accuracy: 0.5514
Epoch 103/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2880 - accuracy: 0.7249 - val_loss: 0.8839 - val_accuracy: 0.5514
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3800 - accuracy: 0.7044 - val_loss: 0.8552 - val_accuracy: 0.5794
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2845 - accuracy: 0.7044 - val_loss: 0.7964 - val_accuracy: 0.5981
Epoch 106/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3488 - accuracy: 0.7275 - val_loss: 0.8009 - val_accuracy: 0.6028
Epoch 107/1000
4/4 [=====] - 0s 17ms/step - loss: 0.3438 - accuracy: 0.7121 - val_loss: 0.8139 - val_accuracy: 0.6262
Epoch 108/1000
4/4 [=====] - 0s 19ms/step - loss: 0.3026 - accuracy: 0.7404 - val_loss: 0.8390 - val_accuracy: 0.6121
Epoch 109/1000
4/4 [=====] - 0s 17ms/step - loss: 0.3211 - accuracy: 0.7224 - val_loss: 0.8701 - val_accuracy: 0.6215
Epoch 110/1000

```
4/4 [=====] - 0s 16ms/step - loss: 0.3561 - accuracy: 0.7352 - val_loss: 0.8588 - val_accuracy: 0.6028
Epoch 111/1000
4/4 [=====] - 0s 25ms/step - loss: 0.2957 - accuracy: 0.7147 - val_loss: 0.7999 - val_accuracy: 0.6215
Epoch 112/1000
4/4 [=====] - 0s 24ms/step - loss: 0.2885 - accuracy: 0.7095 - val_loss: 0.8535 - val_accuracy: 0.6215
Epoch 113/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3560 - accuracy: 0.7224 - val_loss: 0.8823 - val_accuracy: 0.6308
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3501 - accuracy: 0.7121 - val_loss: 0.9166 - val_accuracy: 0.6262
Epoch 115/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4080 - accuracy: 0.7147 - val_loss: 0.9286 - val_accuracy: 0.5607
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4400 - accuracy: 0.6864 - val_loss: 0.9194 - val_accuracy: 0.5748
Epoch 117/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3874 - accuracy: 0.6761 - val_loss: 0.8895 - val_accuracy: 0.5981
Epoch 118/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3518 - accuracy: 0.7121 - val_loss: 0.9036 - val_accuracy: 0.6121
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3988 - accuracy: 0.7198 - val_loss: 0.8941 - val_accuracy: 0.6308
Epoch 120/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3852 - accuracy: 0.7326 - val_loss: 0.9166 - val_accuracy: 0.6121
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2868 - accuracy: 0.7147 - val_loss: 0.9339 - val_accuracy: 0.6121
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3000 - accuracy: 0.7378 - val_loss: 0.9630 - val_accuracy: 0.6075
Epoch 123/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3634 - accuracy: 0.6941 - val_loss: 0.9380 - val_accuracy: 0.5748
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3401 - accuracy: 0.7069 - val_loss: 1.0041 - val_accuracy: 0.5327
Epoch 125/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3368 - accuracy: 0.7378 - val_loss: 0.9595 - val_accuracy: 0.5701
Epoch 126/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3708 - accuracy: 0.7121 - val_loss: 0.9770 - val_accuracy: 0.5841
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3537 - accuracy: 0.7172 - val_loss: 1.0047 - val_accuracy: 0.5981
Epoch 128/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3115 - accuracy: 0.7301 - val_loss: 0.9798 - val_accuracy: 0.6028
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2744 - accuracy: 0.7378 - val_loss: 0.8889 - val_accuracy: 0.5935
Epoch 130/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3755 - accuracy: 0.7224 - val_loss: 0.9340 - val_accuracy: 0.6028
Epoch 131/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3782 - accuracy: 0.7455 - val_loss: 0.9340 - val_accuracy: 0.5935
Epoch 132/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2646 - accuracy: 0.7481 - val_loss: 0.9820 - val_accuracy: 0.6075
Epoch 133/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2248 - accuracy: 0.7712 - val_loss: 0.9554 - val_accuracy: 0.5935
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3354 - accuracy: 0.7712 - val_loss: 0.9871 - val_accuracy: 0.5654
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2811 - accuracy: 0.7404 - val_loss: 0.9448 - val_accuracy: 0.5841
Epoch 136/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2355 - accuracy: 0.7712 - val_loss: 1.1255 - val_accuracy: 0.5701
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3546 - accuracy: 0.7224 - val_loss: 1.0788 - val_accuracy: 0.5187
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3137 - accuracy: 0.7018 - val_loss: 1.0274 - val_accuracy: 0.5421
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3905 - accuracy: 0.7455 - val_loss: 1.0534 - val_accuracy: 0.5467
```

Epoch 140/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3474 - accuracy: 0.7198 - val_loss: 1.0689 - val_accuracy: 0.5607
Epoch 141/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2732 - accuracy: 0.7635 - val_loss: 1.0513 - val_accuracy: 0.6075
Epoch 142/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2824 - accuracy: 0.7609 - val_loss: 1.0279 - val_accuracy: 0.5981
Epoch 143/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3137 - accuracy: 0.7584 - val_loss: 1.1093 - val_accuracy: 0.6121
Epoch 144/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2450 - accuracy: 0.7609 - val_loss: 1.1872 - val_accuracy: 0.6075
Epoch 145/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2862 - accuracy: 0.7661 - val_loss: 1.1409 - val_accuracy: 0.6355
Epoch 146/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2524 - accuracy: 0.7558 - val_loss: 1.0945 - val_accuracy: 0.6168
Epoch 147/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3880 - accuracy: 0.7481 - val_loss: 1.2112 - val_accuracy: 0.6121
Epoch 148/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2631 - accuracy: 0.7635 - val_loss: 1.1675 - val_accuracy: 0.6215
Epoch 149/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5009 - accuracy: 0.7506 - val_loss: 1.2445 - val_accuracy: 0.6308
Epoch 150/1000
4/4 [=====] - 0s 19ms/step - loss: 0.3318 - accuracy: 0.7455 - val_loss: 1.1902 - val_accuracy: 0.6308
Epoch 151/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2427 - accuracy: 0.7455 - val_loss: 1.4086 - val_accuracy: 0.6495
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4094 - accuracy: 0.7532 - val_loss: 1.4479 - val_accuracy: 0.6355
Epoch 153/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3565 - accuracy: 0.7558 - val_loss: 1.3840 - val_accuracy: 0.6168
Epoch 154/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2624 - accuracy: 0.7686 - val_loss: 1.1979 - val_accuracy: 0.6262
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2905 - accuracy: 0.7635 - val_loss: 1.2401 - val_accuracy: 0.6215
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2372 - accuracy: 0.7712 - val_loss: 1.5749 - val_accuracy: 0.6308
Epoch 157/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3588 - accuracy: 0.7455 - val_loss: 1.4387 - val_accuracy: 0.6262
Epoch 158/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2230 - accuracy: 0.7506 - val_loss: 1.3913 - val_accuracy: 0.6215
Epoch 159/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3115 - accuracy: 0.7249 - val_loss: 1.4255 - val_accuracy: 0.6215
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2297 - accuracy: 0.7609 - val_loss: 1.3824 - val_accuracy: 0.6355
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4089 - accuracy: 0.7481 - val_loss: 1.3499 - val_accuracy: 0.6215
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2317 - accuracy: 0.7789 - val_loss: 1.5267 - val_accuracy: 0.6262
Epoch 163/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4046 - accuracy: 0.7506 - val_loss: 1.3467 - val_accuracy: 0.6449
Epoch 164/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2993 - accuracy: 0.7635 - val_loss: 1.3928 - val_accuracy: 0.6402
Epoch 165/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3407 - accuracy: 0.7943 - val_loss: 1.5734 - val_accuracy: 0.6168
Epoch 166/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2539 - accuracy: 0.7609 - val_loss: 1.4436 - val_accuracy: 0.6215
Epoch 167/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2625 - accuracy: 0.7609 - val_loss: 1.3100 - val_accuracy: 0.6121
Epoch 168/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3155 - accuracy: 0.7661 - val_loss: 1.3217 - val_accuracy: 0.6075
Epoch 169/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1872 - accuracy: 0.7841 - val_loss: 1.2444 - val_accuracy: 0.6121

```
accuracy: 0.6308
Epoch 170/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2280 - accuracy: 0.7738 - val_loss: 1.2848 - val_
accuracy: 0.6121
Epoch 171/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2311 - accuracy: 0.7584 - val_loss: 1.3360 - val_
accuracy: 0.6168
Epoch 172/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2358 - accuracy: 0.7738 - val_loss: 1.2352 - val_
accuracy: 0.6215
Epoch 173/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1918 - accuracy: 0.7738 - val_loss: 1.2529 - val_
accuracy: 0.6075
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1953 - accuracy: 0.7841 - val_loss: 1.3970 - val_
accuracy: 0.5981
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1970 - accuracy: 0.7609 - val_loss: 1.2854 - val_
accuracy: 0.6168
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2083 - accuracy: 0.7532 - val_loss: 1.1942 - val_
accuracy: 0.5841
Epoch 177/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2571 - accuracy: 0.7378 - val_loss: 1.3372 - val_
accuracy: 0.5654
Epoch 178/1000
4/4 [=====] - 0s 17ms/step - loss: 0.3239 - accuracy: 0.7095 - val_loss: 1.4459 - val_
accuracy: 0.5748
Epoch 179/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2685 - accuracy: 0.7481 - val_loss: 1.5937 - val_
accuracy: 0.5981
Epoch 180/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2790 - accuracy: 0.7532 - val_loss: 1.5908 - val_
accuracy: 0.5701
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1917 - accuracy: 0.7481 - val_loss: 1.6058 - val_
accuracy: 0.6215
Epoch 182/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3360 - accuracy: 0.7198 - val_loss: 1.4219 - val_
accuracy: 0.5748
Epoch 183/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2280 - accuracy: 0.7224 - val_loss: 1.3974 - val_
accuracy: 0.5654
Epoch 184/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2315 - accuracy: 0.7275 - val_loss: 1.4850 - val_
accuracy: 0.5654
Epoch 185/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2969 - accuracy: 0.7481 - val_loss: 1.3937 - val_
accuracy: 0.5981
Epoch 186/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3117 - accuracy: 0.7584 - val_loss: 1.4549 - val_
accuracy: 0.6168
Epoch 187/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2082 - accuracy: 0.7455 - val_loss: 1.4589 - val_
accuracy: 0.6215
Epoch 188/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2393 - accuracy: 0.7558 - val_loss: 1.5057 - val_
accuracy: 0.5981
Epoch 189/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2509 - accuracy: 0.7326 - val_loss: 1.4784 - val_
accuracy: 0.6075
Epoch 190/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3166 - accuracy: 0.7404 - val_loss: 1.3556 - val_
accuracy: 0.6075
Epoch 191/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2946 - accuracy: 0.7455 - val_loss: 1.4234 - val_
accuracy: 0.5514
Epoch 192/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2377 - accuracy: 0.7352 - val_loss: 1.4528 - val_
accuracy: 0.5561
Epoch 193/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2881 - accuracy: 0.7609 - val_loss: 1.4364 - val_
accuracy: 0.5561
Epoch 194/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2096 - accuracy: 0.7224 - val_loss: 1.3975 - val_
accuracy: 0.5981
Epoch 195/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1791 - accuracy: 0.7378 - val_loss: 1.5011 - val_
accuracy: 0.5981
Epoch 196/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1985 - accuracy: 0.7429 - val_loss: 1.4721 - val_
accuracy: 0.5701
Epoch 197/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3037 - accuracy: 0.7352 - val_loss: 1.4204 - val_
accuracy: 0.5607
Epoch 198/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2896 - accuracy: 0.7352 - val_loss: 1.4895 - val_
accuracy: 0.5607
Epoch 199/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.2454 - accuracy: 0.7224 - val_loss: 1.4277 - val_accuracy: 0.5607
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2668 - accuracy: 0.7481 - val_loss: 1.5287 - val_accuracy: 0.5701
Epoch 201/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2199 - accuracy: 0.7224 - val_loss: 1.4504 - val_accuracy: 0.5981
Epoch 202/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2703 - accuracy: 0.6941 - val_loss: 1.5244 - val_accuracy: 0.6121
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2953 - accuracy: 0.7429 - val_loss: 1.4573 - val_accuracy: 0.6075
Epoch 204/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2615 - accuracy: 0.7378 - val_loss: 1.4677 - val_accuracy: 0.6075
Epoch 205/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2644 - accuracy: 0.7249 - val_loss: 1.4775 - val_accuracy: 0.6262
Epoch 206/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2283 - accuracy: 0.7095 - val_loss: 1.4723 - val_accuracy: 0.6121
Epoch 207/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1844 - accuracy: 0.7481 - val_loss: 1.4758 - val_accuracy: 0.6075
Epoch 208/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1973 - accuracy: 0.7301 - val_loss: 1.5040 - val_accuracy: 0.6075
Epoch 209/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2339 - accuracy: 0.7224 - val_loss: 1.5129 - val_accuracy: 0.6075
Epoch 210/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2725 - accuracy: 0.7224 - val_loss: 1.6243 - val_accuracy: 0.6168
Epoch 211/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2724 - accuracy: 0.7249 - val_loss: 1.7164 - val_accuracy: 0.6028
Epoch 212/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2643 - accuracy: 0.7121 - val_loss: 1.6689 - val_accuracy: 0.6215
Epoch 213/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3416 - accuracy: 0.7018 - val_loss: 1.6502 - val_accuracy: 0.6168
Epoch 214/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3611 - accuracy: 0.7147 - val_loss: 1.6410 - val_accuracy: 0.6215
Epoch 215/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2592 - accuracy: 0.7301 - val_loss: 1.6616 - val_accuracy: 0.6168
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2207 - accuracy: 0.7352 - val_loss: 1.6601 - val_accuracy: 0.6121
Epoch 217/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2603 - accuracy: 0.7584 - val_loss: 1.6422 - val_accuracy: 0.6121
Epoch 218/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2263 - accuracy: 0.7481 - val_loss: 1.6012 - val_accuracy: 0.5981
Epoch 219/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2507 - accuracy: 0.7018 - val_loss: 1.7066 - val_accuracy: 0.5841
Epoch 220/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2326 - accuracy: 0.7121 - val_loss: 1.6238 - val_accuracy: 0.6168
Epoch 221/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2191 - accuracy: 0.7455 - val_loss: 1.6074 - val_accuracy: 0.6028
Epoch 222/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1792 - accuracy: 0.7352 - val_loss: 1.6040 - val_accuracy: 0.6308
Epoch 223/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2106 - accuracy: 0.7558 - val_loss: 1.6564 - val_accuracy: 0.6449
Epoch 224/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1949 - accuracy: 0.7352 - val_loss: 1.5537 - val_accuracy: 0.5935
Epoch 225/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1763 - accuracy: 0.7506 - val_loss: 1.6069 - val_accuracy: 0.6121
Epoch 226/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2222 - accuracy: 0.7455 - val_loss: 1.6053 - val_accuracy: 0.5981
Epoch 227/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2842 - accuracy: 0.7661 - val_loss: 1.5797 - val_accuracy: 0.5794
Epoch 228/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2733 - accuracy: 0.7738 - val_loss: 1.6268 - val_accuracy: 0.6121
```

Epoch 229/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2270 - accuracy: 0.7686 - val_loss: 1.6060 - val_accuracy: 0.5794
Epoch 230/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3050 - accuracy: 0.7686 - val_loss: 1.5765 - val_accuracy: 0.5467
Epoch 231/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2790 - accuracy: 0.7532 - val_loss: 1.5171 - val_accuracy: 0.5561
Epoch 232/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2839 - accuracy: 0.7661 - val_loss: 1.6559 - val_accuracy: 0.5701
Epoch 233/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2021 - accuracy: 0.7609 - val_loss: 1.5989 - val_accuracy: 0.5888
Epoch 234/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2637 - accuracy: 0.7455 - val_loss: 1.5546 - val_accuracy: 0.5654
Epoch 235/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2436 - accuracy: 0.7558 - val_loss: 1.5291 - val_accuracy: 0.5935
Epoch 236/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3689 - accuracy: 0.7301 - val_loss: 1.8066 - val_accuracy: 0.6121
Epoch 237/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2168 - accuracy: 0.7275 - val_loss: 1.7359 - val_accuracy: 0.6262
Epoch 238/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1719 - accuracy: 0.7275 - val_loss: 1.8359 - val_accuracy: 0.6075
Epoch 239/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2406 - accuracy: 0.7429 - val_loss: 1.8943 - val_accuracy: 0.5981
Epoch 240/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2545 - accuracy: 0.7147 - val_loss: 1.9220 - val_accuracy: 0.6215
Epoch 241/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2738 - accuracy: 0.7378 - val_loss: 1.8427 - val_accuracy: 0.6636
Epoch 242/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2804 - accuracy: 0.7249 - val_loss: 1.8376 - val_accuracy: 0.6495
Epoch 243/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2912 - accuracy: 0.7326 - val_loss: 1.8771 - val_accuracy: 0.6355
Epoch 244/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2592 - accuracy: 0.7249 - val_loss: 1.8731 - val_accuracy: 0.6355
Epoch 245/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2199 - accuracy: 0.7249 - val_loss: 1.8419 - val_accuracy: 0.6355
Epoch 246/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2746 - accuracy: 0.7198 - val_loss: 1.8077 - val_accuracy: 0.6262
Epoch 247/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2482 - accuracy: 0.7198 - val_loss: 1.8416 - val_accuracy: 0.6262
Epoch 248/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3548 - accuracy: 0.7198 - val_loss: 1.7753 - val_accuracy: 0.6402
Epoch 249/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2227 - accuracy: 0.7352 - val_loss: 1.7950 - val_accuracy: 0.6402
Epoch 250/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1731 - accuracy: 0.7121 - val_loss: 1.7411 - val_accuracy: 0.6355
Epoch 251/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2560 - accuracy: 0.7352 - val_loss: 1.7395 - val_accuracy: 0.6215
Epoch 252/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2241 - accuracy: 0.7275 - val_loss: 1.6442 - val_accuracy: 0.6028
Epoch 253/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1812 - accuracy: 0.7301 - val_loss: 1.6196 - val_accuracy: 0.6075
Epoch 254/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2499 - accuracy: 0.7378 - val_loss: 1.6813 - val_accuracy: 0.5981
Epoch 255/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2630 - accuracy: 0.7147 - val_loss: 1.7142 - val_accuracy: 0.5935
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1742 - accuracy: 0.7044 - val_loss: 1.7209 - val_accuracy: 0.5794
Epoch 257/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1930 - accuracy: 0.7121 - val_loss: 1.6530 - val_accuracy: 0.5888
Epoch 258/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2116 - accuracy: 0.7018 - val_loss: 1.6985 - val_accuracy: 0.5888

```
accuracy: 0.5841
Epoch 259/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2232 - accuracy: 0.7018 - val_loss: 1.6863 - val_
accuracy: 0.5654
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1996 - accuracy: 0.6889 - val_loss: 1.6396 - val_
accuracy: 0.5794
Epoch 261/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1977 - accuracy: 0.7069 - val_loss: 1.6769 - val_
accuracy: 0.5654
Epoch 262/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2014 - accuracy: 0.6787 - val_loss: 1.6728 - val_
accuracy: 0.5561
Epoch 263/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1978 - accuracy: 0.6889 - val_loss: 1.6687 - val_
accuracy: 0.5701
Epoch 264/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2433 - accuracy: 0.6658 - val_loss: 1.6888 - val_
accuracy: 0.5701
Epoch 265/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1779 - accuracy: 0.6761 - val_loss: 1.6595 - val_
accuracy: 0.5467
Epoch 266/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2037 - accuracy: 0.6607 - val_loss: 1.6313 - val_
accuracy: 0.5514
Epoch 267/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1966 - accuracy: 0.6761 - val_loss: 1.6094 - val_
accuracy: 0.5561
Epoch 268/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1433 - accuracy: 0.7147 - val_loss: 1.5550 - val_
accuracy: 0.5327
Epoch 269/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2192 - accuracy: 0.6838 - val_loss: 1.5999 - val_
accuracy: 0.5234
Epoch 270/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1932 - accuracy: 0.7069 - val_loss: 1.5991 - val_
accuracy: 0.5467
Epoch 271/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1584 - accuracy: 0.6889 - val_loss: 1.5661 - val_
accuracy: 0.5374
Epoch 272/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1773 - accuracy: 0.7018 - val_loss: 1.6024 - val_
accuracy: 0.5187
Epoch 273/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2092 - accuracy: 0.6658 - val_loss: 1.6278 - val_
accuracy: 0.5234
Epoch 274/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1939 - accuracy: 0.6787 - val_loss: 1.6303 - val_
accuracy: 0.5374
Epoch 275/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2550 - accuracy: 0.7121 - val_loss: 1.8014 - val_
accuracy: 0.5607
Epoch 276/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1403 - accuracy: 0.7069 - val_loss: 1.7954 - val_
accuracy: 0.5467
Epoch 277/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1886 - accuracy: 0.7224 - val_loss: 1.7421 - val_
accuracy: 0.5280
Epoch 278/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1598 - accuracy: 0.7147 - val_loss: 1.7157 - val_
accuracy: 0.5234
Epoch 279/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1500 - accuracy: 0.6812 - val_loss: 1.7394 - val_
accuracy: 0.5187
Epoch 280/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2070 - accuracy: 0.6915 - val_loss: 1.7306 - val_
accuracy: 0.5327
Epoch 281/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2556 - accuracy: 0.7275 - val_loss: 1.7949 - val_
accuracy: 0.5234
Epoch 282/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2155 - accuracy: 0.7198 - val_loss: 1.7359 - val_
accuracy: 0.5234
Epoch 283/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2475 - accuracy: 0.6915 - val_loss: 1.7951 - val_
accuracy: 0.5234
Epoch 284/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1969 - accuracy: 0.7301 - val_loss: 1.6032 - val_
accuracy: 0.5187
Epoch 285/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1776 - accuracy: 0.7069 - val_loss: 1.6790 - val_
accuracy: 0.5140
Epoch 286/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2765 - accuracy: 0.6967 - val_loss: 1.6454 - val_
accuracy: 0.5140
Epoch 287/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1698 - accuracy: 0.6967 - val_loss: 1.5784 - val_
accuracy: 0.5140
Epoch 288/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 0.1562 - accuracy: 0.7018 - val_loss: 1.6138 - val_accuracy: 0.5093
Epoch 289/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2031 - accuracy: 0.7018 - val_loss: 1.5176 - val_accuracy: 0.5047
Epoch 290/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1520 - accuracy: 0.7095 - val_loss: 1.5133 - val_accuracy: 0.5000
Epoch 291/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1691 - accuracy: 0.7095 - val_loss: 1.6691 - val_accuracy: 0.4907
Epoch 292/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2545 - accuracy: 0.7018 - val_loss: 1.6229 - val_accuracy: 0.4813
Epoch 293/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2614 - accuracy: 0.7275 - val_loss: 1.4921 - val_accuracy: 0.4766
Epoch 294/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2549 - accuracy: 0.7044 - val_loss: 1.5797 - val_accuracy: 0.4860
Epoch 295/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3143 - accuracy: 0.7275 - val_loss: 1.6426 - val_accuracy: 0.4860
Epoch 296/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1894 - accuracy: 0.7455 - val_loss: 1.6469 - val_accuracy: 0.4907
Epoch 297/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1626 - accuracy: 0.7584 - val_loss: 1.6426 - val_accuracy: 0.5000
Epoch 298/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1916 - accuracy: 0.7275 - val_loss: 1.7550 - val_accuracy: 0.5327
Epoch 299/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2361 - accuracy: 0.7352 - val_loss: 1.6382 - val_accuracy: 0.5327
Epoch 300/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1723 - accuracy: 0.7404 - val_loss: 1.6231 - val_accuracy: 0.5187
Epoch 301/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2023 - accuracy: 0.7404 - val_loss: 1.7623 - val_accuracy: 0.5280
Epoch 302/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2034 - accuracy: 0.7018 - val_loss: 1.7539 - val_accuracy: 0.5374
Epoch 303/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1493 - accuracy: 0.7198 - val_loss: 1.7504 - val_accuracy: 0.5234
Epoch 304/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2044 - accuracy: 0.7224 - val_loss: 1.9062 - val_accuracy: 0.5140
Epoch 305/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2041 - accuracy: 0.6941 - val_loss: 1.7547 - val_accuracy: 0.5140
Epoch 306/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1760 - accuracy: 0.7044 - val_loss: 1.6966 - val_accuracy: 0.4953
Epoch 307/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1598 - accuracy: 0.6915 - val_loss: 1.8270 - val_accuracy: 0.4953
Epoch 308/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2689 - accuracy: 0.7018 - val_loss: 1.7202 - val_accuracy: 0.5000
Epoch 309/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1391 - accuracy: 0.7198 - val_loss: 1.8511 - val_accuracy: 0.5000
Epoch 310/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1433 - accuracy: 0.7121 - val_loss: 1.9228 - val_accuracy: 0.4953
Epoch 311/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1331 - accuracy: 0.7095 - val_loss: 1.8606 - val_accuracy: 0.4953
Epoch 312/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1318 - accuracy: 0.6941 - val_loss: 1.9468 - val_accuracy: 0.5000
Epoch 313/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2589 - accuracy: 0.7147 - val_loss: 1.9528 - val_accuracy: 0.5000
Epoch 314/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1273 - accuracy: 0.6941 - val_loss: 1.9421 - val_accuracy: 0.5047
Epoch 315/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2131 - accuracy: 0.7018 - val_loss: 1.9919 - val_accuracy: 0.5093
Epoch 316/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1799 - accuracy: 0.7147 - val_loss: 2.0342 - val_accuracy: 0.5093
Epoch 317/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2320 - accuracy: 0.6864 - val_loss: 2.0267 - val_accuracy: 0.5280
```

Epoch 318/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1248 - accuracy: 0.7275 - val_loss: 2.0005 - val_accuracy: 0.5140
Epoch 319/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2129 - accuracy: 0.7095 - val_loss: 1.9594 - val_accuracy: 0.5327
Epoch 320/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2185 - accuracy: 0.6889 - val_loss: 1.7602 - val_accuracy: 0.5280
Epoch 321/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1758 - accuracy: 0.7069 - val_loss: 1.9277 - val_accuracy: 0.5421
Epoch 322/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2533 - accuracy: 0.7095 - val_loss: 1.9005 - val_accuracy: 0.5374
Epoch 323/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3357 - accuracy: 0.6812 - val_loss: 1.9426 - val_accuracy: 0.5467
Epoch 324/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2896 - accuracy: 0.7172 - val_loss: 1.9166 - val_accuracy: 0.5374
Epoch 325/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1845 - accuracy: 0.7044 - val_loss: 1.9283 - val_accuracy: 0.5327
Epoch 326/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2088 - accuracy: 0.6967 - val_loss: 1.9249 - val_accuracy: 0.5374
Epoch 327/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2644 - accuracy: 0.6967 - val_loss: 1.8857 - val_accuracy: 0.5374
Epoch 328/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1831 - accuracy: 0.7044 - val_loss: 1.6925 - val_accuracy: 0.5467
Epoch 329/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2055 - accuracy: 0.7198 - val_loss: 1.7195 - val_accuracy: 0.5140
Epoch 330/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1838 - accuracy: 0.6992 - val_loss: 1.7849 - val_accuracy: 0.5093
Epoch 331/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3423 - accuracy: 0.6941 - val_loss: 1.9070 - val_accuracy: 0.5421
Epoch 332/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2828 - accuracy: 0.6967 - val_loss: 1.8710 - val_accuracy: 0.5607
Epoch 333/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1452 - accuracy: 0.7095 - val_loss: 1.7246 - val_accuracy: 0.5093
Epoch 334/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1320 - accuracy: 0.7069 - val_loss: 1.6023 - val_accuracy: 0.4813
Epoch 335/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2546 - accuracy: 0.7044 - val_loss: 1.6133 - val_accuracy: 0.4813
Epoch 336/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2336 - accuracy: 0.6761 - val_loss: 1.5825 - val_accuracy: 0.4907
Epoch 337/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1527 - accuracy: 0.6658 - val_loss: 1.6948 - val_accuracy: 0.5000
Epoch 338/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1535 - accuracy: 0.6812 - val_loss: 1.7407 - val_accuracy: 0.4953
Epoch 339/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2291 - accuracy: 0.6915 - val_loss: 1.7799 - val_accuracy: 0.5234
Epoch 340/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2837 - accuracy: 0.7069 - val_loss: 1.7783 - val_accuracy: 0.5280
Epoch 341/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2237 - accuracy: 0.7018 - val_loss: 1.7111 - val_accuracy: 0.5327
Epoch 342/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1956 - accuracy: 0.6658 - val_loss: 1.7480 - val_accuracy: 0.5374
Epoch 343/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2293 - accuracy: 0.6864 - val_loss: 2.0109 - val_accuracy: 0.5467
Epoch 344/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1412 - accuracy: 0.6915 - val_loss: 2.0009 - val_accuracy: 0.5421
Epoch 345/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1590 - accuracy: 0.7018 - val_loss: 1.9545 - val_accuracy: 0.5280
Epoch 346/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1234 - accuracy: 0.6761 - val_loss: 1.8581 - val_accuracy: 0.5421
Epoch 347/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1736 - accuracy: 0.7069 - val_loss: 1.8081 - val_accuracy: 0.5421

```
accuracy: 0.5421
Epoch 348/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2050 - accuracy: 0.6967 - val_loss: 1.7749 - val_
accuracy: 0.5421
Epoch 349/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1391 - accuracy: 0.7147 - val_loss: 1.9492 - val_
accuracy: 0.5374
Epoch 350/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1643 - accuracy: 0.6761 - val_loss: 1.8808 - val_
accuracy: 0.5607
Epoch 351/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1656 - accuracy: 0.7044 - val_loss: 1.8577 - val_
accuracy: 0.5748
Epoch 352/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1187 - accuracy: 0.7044 - val_loss: 1.9254 - val_
accuracy: 0.5654
Epoch 353/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1764 - accuracy: 0.6735 - val_loss: 1.8524 - val_
accuracy: 0.5561
Epoch 354/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1559 - accuracy: 0.6941 - val_loss: 1.7516 - val_
accuracy: 0.5514
Epoch 355/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1428 - accuracy: 0.6992 - val_loss: 1.7264 - val_
accuracy: 0.5280
Epoch 356/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1881 - accuracy: 0.7018 - val_loss: 1.7757 - val_
accuracy: 0.5374
Epoch 357/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1123 - accuracy: 0.7044 - val_loss: 1.6786 - val_
accuracy: 0.5374
Epoch 358/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2559 - accuracy: 0.7095 - val_loss: 1.6767 - val_
accuracy: 0.5421
Epoch 359/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2866 - accuracy: 0.7224 - val_loss: 1.7115 - val_
accuracy: 0.5421
Epoch 360/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2649 - accuracy: 0.7069 - val_loss: 1.7002 - val_
accuracy: 0.5467
Epoch 361/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1587 - accuracy: 0.7095 - val_loss: 1.7245 - val_
accuracy: 0.5561
Epoch 362/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1483 - accuracy: 0.7095 - val_loss: 1.7512 - val_
accuracy: 0.5748
Epoch 363/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2299 - accuracy: 0.7147 - val_loss: 1.6840 - val_
accuracy: 0.5327
Epoch 364/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2310 - accuracy: 0.7095 - val_loss: 1.7351 - val_
accuracy: 0.5327
Epoch 365/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1450 - accuracy: 0.7249 - val_loss: 1.7867 - val_
accuracy: 0.5421
Epoch 366/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1586 - accuracy: 0.6710 - val_loss: 1.8442 - val_
accuracy: 0.5654
Epoch 367/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1624 - accuracy: 0.7506 - val_loss: 1.8773 - val_
accuracy: 0.5794
Epoch 368/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2044 - accuracy: 0.7044 - val_loss: 1.9045 - val_
accuracy: 0.5981
Epoch 369/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1903 - accuracy: 0.7172 - val_loss: 1.8012 - val_
accuracy: 0.5748
Epoch 370/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1307 - accuracy: 0.7172 - val_loss: 1.7558 - val_
accuracy: 0.5514
Epoch 371/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1188 - accuracy: 0.7532 - val_loss: 1.9292 - val_
accuracy: 0.5607
Epoch 372/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2163 - accuracy: 0.7147 - val_loss: 1.8124 - val_
accuracy: 0.5654
Epoch 373/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2570 - accuracy: 0.7044 - val_loss: 1.8665 - val_
accuracy: 0.5467
Epoch 374/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1666 - accuracy: 0.7095 - val_loss: 1.9786 - val_
accuracy: 0.5234
Epoch 375/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1221 - accuracy: 0.7018 - val_loss: 1.9698 - val_
accuracy: 0.5374
Epoch 376/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1264 - accuracy: 0.6992 - val_loss: 2.0162 - val_
accuracy: 0.5607
Epoch 377/1000
```

```

4/4 [=====] - 0s 13ms/step - loss: 0.1699 - accuracy: 0.7198 - val_loss: 1.8539 - val_accuracy: 0.5607
Epoch 378/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1255 - accuracy: 0.6889 - val_loss: 1.8389 - val_accuracy: 0.5607
Epoch 379/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2749 - accuracy: 0.6967 - val_loss: 1.7636 - val_accuracy: 0.5374
Epoch 380/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1775 - accuracy: 0.7147 - val_loss: 1.7688 - val_accuracy: 0.5467
Epoch 381/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2543 - accuracy: 0.6992 - val_loss: 2.0124 - val_accuracy: 0.5701
Epoch 382/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1578 - accuracy: 0.6915 - val_loss: 1.8404 - val_accuracy: 0.5421
Epoch 383/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1180 - accuracy: 0.7095 - val_loss: 1.8976 - val_accuracy: 0.6028
Epoch 384/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1810 - accuracy: 0.6710 - val_loss: 1.8786 - val_accuracy: 0.6028
Epoch 385/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1716 - accuracy: 0.7095 - val_loss: 1.9897 - val_accuracy: 0.6075
Epoch 386/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1916 - accuracy: 0.6889 - val_loss: 1.9624 - val_accuracy: 0.6028
Epoch 387/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1421 - accuracy: 0.7275 - val_loss: 1.8366 - val_accuracy: 0.5888
Epoch 388/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1200 - accuracy: 0.7172 - val_loss: 1.8434 - val_accuracy: 0.5888
Epoch 389/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1305 - accuracy: 0.6812 - val_loss: 1.8320 - val_accuracy: 0.5794
Epoch 390/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1734 - accuracy: 0.6889 - val_loss: 2.1291 - val_accuracy: 0.5935
Epoch 391/1000
1/4 [====>.....] - ETA: 0s - loss: 0.2197 - accuracy: 0.7109Restoring model weights from th
e end of the best epoch: 241.
4/4 [=====] - 0s 13ms/step - loss: 0.3133 - accuracy: 0.6787 - val_loss: 2.1555 - val_accuracy: 0.5888
Epoch 391: early stopping
2/2 [=====] - 0s 4ms/step - loss: 1.3543 - accuracy: 0.6977
[CV] END .....Dense1=100, Dense2=50; total time= 21.9s
Model: "sequential_97"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_388 (Dense)	(None, 100)	700
batch_normalization_291 (BatchNormalization)	(None, 100)	400
activation_291 (Activation)	(None, 100)	0
dense_389 (Dense)	(None, 50)	5050
batch_normalization_292 (BatchNormalization)	(None, 50)	200
activation_292 (Activation)	(None, 50)	0
dense_390 (Dense)	(None, 10)	510
batch_normalization_293 (BatchNormalization)	(None, 10)	40
activation_293 (Activation)	(None, 10)	0
dense_391 (Dense)	(None, 2)	22
<hr/>		

Total params: 6,922
Trainable params: 6,602
Non-trainable params: 320

Epoch 1/1000
4/4 [=====] - 1s 66ms/step - loss: 4.5735 - accuracy: 0.4216 - val_loss: 6.5823 - val_accuracy: 0.3972
Epoch 2/1000
4/4 [=====] - 0s 16ms/step - loss: 3.2854 - accuracy: 0.4550 - val_loss: 6.3061 - val_accuracy: 0.3832
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 2.5568 - accuracy: 0.4704 - val_loss: 4.3201 - val_accuracy: 0.4000

```
accuracy: 0.3271
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2662 - accuracy: 0.5013 - val_loss: 2.9162 - val_
accuracy: 0.3224
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1428 - accuracy: 0.5193 - val_loss: 2.5140 - val_
accuracy: 0.3037
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9964 - accuracy: 0.5476 - val_loss: 2.4106 - val_
accuracy: 0.3131
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0613 - accuracy: 0.5501 - val_loss: 2.3094 - val_
accuracy: 0.3505
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8237 - accuracy: 0.5758 - val_loss: 2.3006 - val_
accuracy: 0.3738
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6718 - accuracy: 0.5861 - val_loss: 2.2207 - val_
accuracy: 0.4019
Epoch 10/1000
4/4 [=====] - 0s 17ms/step - loss: 1.6617 - accuracy: 0.5630 - val_loss: 2.1921 - val_
accuracy: 0.4252
Epoch 11/1000
4/4 [=====] - 0s 15ms/step - loss: 1.5366 - accuracy: 0.6350 - val_loss: 2.1738 - val_
accuracy: 0.4299
Epoch 12/1000
4/4 [=====] - 0s 15ms/step - loss: 1.3634 - accuracy: 0.6375 - val_loss: 2.0642 - val_
accuracy: 0.4439
Epoch 13/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2744 - accuracy: 0.6375 - val_loss: 2.0189 - val_
accuracy: 0.4626
Epoch 14/1000
4/4 [=====] - 0s 16ms/step - loss: 1.3921 - accuracy: 0.6504 - val_loss: 2.0113 - val_
accuracy: 0.4626
Epoch 15/1000
4/4 [=====] - 0s 15ms/step - loss: 1.2890 - accuracy: 0.6658 - val_loss: 1.9413 - val_
accuracy: 0.4579
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2264 - accuracy: 0.6607 - val_loss: 1.9000 - val_
accuracy: 0.4579
Epoch 17/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1781 - accuracy: 0.6735 - val_loss: 1.7634 - val_
accuracy: 0.4626
Epoch 18/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0958 - accuracy: 0.6889 - val_loss: 1.7783 - val_
accuracy: 0.4626
Epoch 19/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1603 - accuracy: 0.6889 - val_loss: 1.7837 - val_
accuracy: 0.4626
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0940 - accuracy: 0.6915 - val_loss: 1.7562 - val_
accuracy: 0.4626
Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1532 - accuracy: 0.7172 - val_loss: 1.7252 - val_
accuracy: 0.4626
Epoch 22/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9542 - accuracy: 0.7249 - val_loss: 1.7076 - val_
accuracy: 0.4626
Epoch 23/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0593 - accuracy: 0.6992 - val_loss: 1.7016 - val_
accuracy: 0.4673
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0443 - accuracy: 0.6915 - val_loss: 1.6957 - val_
accuracy: 0.4626
Epoch 25/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9555 - accuracy: 0.6710 - val_loss: 1.7416 - val_
accuracy: 0.4626
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0232 - accuracy: 0.6787 - val_loss: 1.6586 - val_
accuracy: 0.4626
Epoch 27/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9959 - accuracy: 0.7198 - val_loss: 1.6594 - val_
accuracy: 0.4626
Epoch 28/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9993 - accuracy: 0.7044 - val_loss: 1.6724 - val_
accuracy: 0.4626
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9173 - accuracy: 0.7147 - val_loss: 1.6885 - val_
accuracy: 0.4579
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9049 - accuracy: 0.6864 - val_loss: 1.6651 - val_
accuracy: 0.4626
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8513 - accuracy: 0.7249 - val_loss: 1.6157 - val_
accuracy: 0.4673
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9699 - accuracy: 0.7224 - val_loss: 1.5726 - val_
accuracy: 0.4673
Epoch 33/1000
```

```
4/4 [=====] - 0s 16ms/step - loss: 0.8095 - accuracy: 0.7429 - val_loss: 1.5285 - val_accuracy: 0.4720
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8567 - accuracy: 0.7249 - val_loss: 1.5025 - val_accuracy: 0.4673
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8596 - accuracy: 0.7404 - val_loss: 1.4764 - val_accuracy: 0.4720
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8243 - accuracy: 0.7121 - val_loss: 1.4724 - val_accuracy: 0.4673
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8611 - accuracy: 0.7121 - val_loss: 1.4508 - val_accuracy: 0.4673
Epoch 38/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8318 - accuracy: 0.7661 - val_loss: 1.4551 - val_accuracy: 0.4673
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8083 - accuracy: 0.7481 - val_loss: 1.4253 - val_accuracy: 0.4673
Epoch 40/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8213 - accuracy: 0.7789 - val_loss: 1.3979 - val_accuracy: 0.4720
Epoch 41/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7861 - accuracy: 0.7404 - val_loss: 1.3865 - val_accuracy: 0.4720
Epoch 42/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7389 - accuracy: 0.7789 - val_loss: 1.3591 - val_accuracy: 0.4766
Epoch 43/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6991 - accuracy: 0.7532 - val_loss: 1.3608 - val_accuracy: 0.4813
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9442 - accuracy: 0.7455 - val_loss: 1.3107 - val_accuracy: 0.4766
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8338 - accuracy: 0.7301 - val_loss: 1.2920 - val_accuracy: 0.4813
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6847 - accuracy: 0.7326 - val_loss: 1.2356 - val_accuracy: 0.4813
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9756 - accuracy: 0.7378 - val_loss: 1.2157 - val_accuracy: 0.4860
Epoch 48/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8437 - accuracy: 0.7558 - val_loss: 1.2024 - val_accuracy: 0.4813
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8922 - accuracy: 0.7198 - val_loss: 1.2306 - val_accuracy: 0.4813
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7168 - accuracy: 0.7481 - val_loss: 1.2194 - val_accuracy: 0.4813
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9160 - accuracy: 0.7275 - val_loss: 1.1590 - val_accuracy: 0.4860
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7842 - accuracy: 0.7609 - val_loss: 1.1770 - val_accuracy: 0.4813
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6776 - accuracy: 0.7558 - val_loss: 1.2049 - val_accuracy: 0.4766
Epoch 54/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6747 - accuracy: 0.7584 - val_loss: 1.2076 - val_accuracy: 0.4860
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7935 - accuracy: 0.7661 - val_loss: 1.1058 - val_accuracy: 0.5000
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5236 - accuracy: 0.7609 - val_loss: 1.1189 - val_accuracy: 0.4860
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7126 - accuracy: 0.7326 - val_loss: 1.1103 - val_accuracy: 0.4860
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7226 - accuracy: 0.7121 - val_loss: 1.0951 - val_accuracy: 0.4860
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7292 - accuracy: 0.7275 - val_loss: 1.0429 - val_accuracy: 0.4860
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5678 - accuracy: 0.7609 - val_loss: 1.0541 - val_accuracy: 0.4860
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5585 - accuracy: 0.7609 - val_loss: 1.0867 - val_accuracy: 0.4860
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5720 - accuracy: 0.7661 - val_loss: 1.0849 - val_accuracy: 0.4907
```

Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5414 - accuracy: 0.7635 - val_loss: 1.0981 - val_accuracy: 0.4907
Epoch 64/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5693 - accuracy: 0.7738 - val_loss: 1.1081 - val_accuracy: 0.4766
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5462 - accuracy: 0.7789 - val_loss: 1.1196 - val_accuracy: 0.4766
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6815 - accuracy: 0.7352 - val_loss: 1.1033 - val_accuracy: 0.4813
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7048 - accuracy: 0.7224 - val_loss: 1.1068 - val_accuracy: 0.4813
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6344 - accuracy: 0.7301 - val_loss: 1.0719 - val_accuracy: 0.4813
Epoch 69/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5985 - accuracy: 0.7738 - val_loss: 1.0729 - val_accuracy: 0.4813
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5388 - accuracy: 0.7712 - val_loss: 1.0912 - val_accuracy: 0.4813
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6269 - accuracy: 0.7532 - val_loss: 1.0819 - val_accuracy: 0.4813
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6366 - accuracy: 0.7584 - val_loss: 1.0492 - val_accuracy: 0.4813
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4831 - accuracy: 0.7506 - val_loss: 1.0729 - val_accuracy: 0.4813
Epoch 74/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6256 - accuracy: 0.7455 - val_loss: 1.0525 - val_accuracy: 0.4860
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5548 - accuracy: 0.7506 - val_loss: 1.0622 - val_accuracy: 0.4860
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5359 - accuracy: 0.7404 - val_loss: 1.0515 - val_accuracy: 0.4860
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5892 - accuracy: 0.7352 - val_loss: 1.0010 - val_accuracy: 0.4953
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4555 - accuracy: 0.7301 - val_loss: 0.9809 - val_accuracy: 0.5000
Epoch 79/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5092 - accuracy: 0.7301 - val_loss: 0.9470 - val_accuracy: 0.5093
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5796 - accuracy: 0.7404 - val_loss: 0.9621 - val_accuracy: 0.5093
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5596 - accuracy: 0.7275 - val_loss: 0.9205 - val_accuracy: 0.5234
Epoch 82/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6317 - accuracy: 0.7249 - val_loss: 0.9618 - val_accuracy: 0.5327
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6726 - accuracy: 0.7532 - val_loss: 0.9265 - val_accuracy: 0.5327
Epoch 84/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4796 - accuracy: 0.7532 - val_loss: 0.9177 - val_accuracy: 0.5187
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5716 - accuracy: 0.7429 - val_loss: 0.8887 - val_accuracy: 0.5327
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6657 - accuracy: 0.7404 - val_loss: 0.8801 - val_accuracy: 0.5374
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5009 - accuracy: 0.7404 - val_loss: 0.9180 - val_accuracy: 0.5234
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5279 - accuracy: 0.7455 - val_loss: 0.9141 - val_accuracy: 0.5093
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5214 - accuracy: 0.7352 - val_loss: 0.9001 - val_accuracy: 0.5140
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5555 - accuracy: 0.7712 - val_loss: 0.8479 - val_accuracy: 0.5140
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4353 - accuracy: 0.7404 - val_loss: 0.8090 - val_accuracy: 0.5280
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5766 - accuracy: 0.7326 - val_loss: 0.7786 - val_accuracy: 0.5280

```
accuracy: 0.5421
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4953 - accuracy: 0.7275 - val_loss: 0.7724 - val_accuracy: 0.5327
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4499 - accuracy: 0.7172 - val_loss: 0.9015 - val_accuracy: 0.5327
Epoch 95/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3463 - accuracy: 0.7558 - val_loss: 0.8478 - val_accuracy: 0.5327
Epoch 96/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4287 - accuracy: 0.7481 - val_loss: 0.8194 - val_accuracy: 0.5607
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4073 - accuracy: 0.7378 - val_loss: 0.8128 - val_accuracy: 0.5561
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3429 - accuracy: 0.7532 - val_loss: 0.9160 - val_accuracy: 0.5327
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2831 - accuracy: 0.7455 - val_loss: 0.9160 - val_accuracy: 0.5421
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3616 - accuracy: 0.7224 - val_loss: 0.8981 - val_accuracy: 0.5374
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3119 - accuracy: 0.7584 - val_loss: 0.8350 - val_accuracy: 0.5467
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3672 - accuracy: 0.7095 - val_loss: 0.8357 - val_accuracy: 0.5748
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4135 - accuracy: 0.7301 - val_loss: 0.8468 - val_accuracy: 0.5794
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3279 - accuracy: 0.7584 - val_loss: 0.8190 - val_accuracy: 0.5794
Epoch 105/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2611 - accuracy: 0.7378 - val_loss: 0.7812 - val_accuracy: 0.5701
Epoch 106/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3187 - accuracy: 0.7738 - val_loss: 0.7551 - val_accuracy: 0.5701
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3896 - accuracy: 0.7404 - val_loss: 0.7404 - val_accuracy: 0.5654
Epoch 108/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3869 - accuracy: 0.7584 - val_loss: 0.8090 - val_accuracy: 0.5748
Epoch 109/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3041 - accuracy: 0.7429 - val_loss: 0.8713 - val_accuracy: 0.5794
Epoch 110/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2853 - accuracy: 0.7661 - val_loss: 0.7967 - val_accuracy: 0.5280
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2416 - accuracy: 0.7661 - val_loss: 0.8357 - val_accuracy: 0.5374
Epoch 112/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3296 - accuracy: 0.7584 - val_loss: 0.8473 - val_accuracy: 0.5327
Epoch 113/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2253 - accuracy: 0.7712 - val_loss: 0.8614 - val_accuracy: 0.5374
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3829 - accuracy: 0.7198 - val_loss: 0.8826 - val_accuracy: 0.5280
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3103 - accuracy: 0.7609 - val_loss: 0.8929 - val_accuracy: 0.5187
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2852 - accuracy: 0.7918 - val_loss: 0.8926 - val_accuracy: 0.5467
Epoch 117/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2513 - accuracy: 0.7686 - val_loss: 0.8966 - val_accuracy: 0.5561
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2865 - accuracy: 0.7661 - val_loss: 0.8364 - val_accuracy: 0.5514
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4227 - accuracy: 0.7738 - val_loss: 0.7958 - val_accuracy: 0.5467
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2953 - accuracy: 0.7455 - val_loss: 0.7696 - val_accuracy: 0.5374
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1948 - accuracy: 0.7686 - val_loss: 0.7550 - val_accuracy: 0.5607
Epoch 122/1000
```

```
4/4 [=====] - 0s 16ms/step - loss: 0.3070 - accuracy: 0.7686 - val_loss: 0.8085 - val_accuracy: 0.5935
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3104 - accuracy: 0.7738 - val_loss: 0.8364 - val_accuracy: 0.5888
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3674 - accuracy: 0.7224 - val_loss: 0.7484 - val_accuracy: 0.5935
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3406 - accuracy: 0.7404 - val_loss: 0.8634 - val_accuracy: 0.6215
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2315 - accuracy: 0.7455 - val_loss: 0.8073 - val_accuracy: 0.5935
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3366 - accuracy: 0.7378 - val_loss: 0.8385 - val_accuracy: 0.5888
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2405 - accuracy: 0.7121 - val_loss: 0.8219 - val_accuracy: 0.5981
Epoch 129/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2127 - accuracy: 0.7506 - val_loss: 0.8099 - val_accuracy: 0.5841
Epoch 130/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3417 - accuracy: 0.7224 - val_loss: 0.8339 - val_accuracy: 0.5748
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2850 - accuracy: 0.7609 - val_loss: 0.7754 - val_accuracy: 0.5701
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2808 - accuracy: 0.7326 - val_loss: 0.7703 - val_accuracy: 0.5748
Epoch 133/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3064 - accuracy: 0.7224 - val_loss: 0.8262 - val_accuracy: 0.5748
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4093 - accuracy: 0.6787 - val_loss: 0.8076 - val_accuracy: 0.6028
Epoch 135/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2785 - accuracy: 0.7147 - val_loss: 0.8549 - val_accuracy: 0.6168
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3124 - accuracy: 0.7404 - val_loss: 0.7975 - val_accuracy: 0.6215
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2800 - accuracy: 0.7224 - val_loss: 0.7886 - val_accuracy: 0.6028
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2578 - accuracy: 0.7506 - val_loss: 0.8491 - val_accuracy: 0.5981
Epoch 139/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2889 - accuracy: 0.7506 - val_loss: 0.8946 - val_accuracy: 0.6215
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2285 - accuracy: 0.7481 - val_loss: 0.9158 - val_accuracy: 0.6121
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2902 - accuracy: 0.7121 - val_loss: 0.9262 - val_accuracy: 0.6028
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2494 - accuracy: 0.7429 - val_loss: 0.9269 - val_accuracy: 0.5888
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3432 - accuracy: 0.7198 - val_loss: 0.9527 - val_accuracy: 0.5794
Epoch 144/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2642 - accuracy: 0.7121 - val_loss: 0.9395 - val_accuracy: 0.5888
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2297 - accuracy: 0.7172 - val_loss: 0.9410 - val_accuracy: 0.6028
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2274 - accuracy: 0.7352 - val_loss: 0.9772 - val_accuracy: 0.6075
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2476 - accuracy: 0.7275 - val_loss: 1.0103 - val_accuracy: 0.6075
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2348 - accuracy: 0.7249 - val_loss: 0.9939 - val_accuracy: 0.6168
Epoch 149/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2848 - accuracy: 0.7352 - val_loss: 0.9130 - val_accuracy: 0.6308
Epoch 150/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3561 - accuracy: 0.7198 - val_loss: 0.9924 - val_accuracy: 0.6308
Epoch 151/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2459 - accuracy: 0.7378 - val_loss: 1.1790 - val_accuracy: 0.6215
```

Epoch 152/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3655 - accuracy: 0.7301 - val_loss: 1.0718 - val_accuracy: 0.6308
Epoch 153/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2952 - accuracy: 0.7481 - val_loss: 1.0704 - val_accuracy: 0.6215
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2832 - accuracy: 0.7275 - val_loss: 0.9721 - val_accuracy: 0.6215
Epoch 155/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4015 - accuracy: 0.7584 - val_loss: 1.0962 - val_accuracy: 0.6402
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2414 - accuracy: 0.7301 - val_loss: 0.9579 - val_accuracy: 0.6542
Epoch 157/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4689 - accuracy: 0.7326 - val_loss: 1.1072 - val_accuracy: 0.6449
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2248 - accuracy: 0.7481 - val_loss: 1.1053 - val_accuracy: 0.6402
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2187 - accuracy: 0.7429 - val_loss: 1.0878 - val_accuracy: 0.6776
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2259 - accuracy: 0.7481 - val_loss: 1.0923 - val_accuracy: 0.6636
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2507 - accuracy: 0.7455 - val_loss: 1.1091 - val_accuracy: 0.6542
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2615 - accuracy: 0.7224 - val_loss: 1.1359 - val_accuracy: 0.6542
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2278 - accuracy: 0.7404 - val_loss: 1.0254 - val_accuracy: 0.6215
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2841 - accuracy: 0.7481 - val_loss: 1.0372 - val_accuracy: 0.6262
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2308 - accuracy: 0.7198 - val_loss: 1.0768 - val_accuracy: 0.6402
Epoch 166/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1719 - accuracy: 0.7198 - val_loss: 1.0554 - val_accuracy: 0.6449
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2445 - accuracy: 0.7301 - val_loss: 1.0345 - val_accuracy: 0.6636
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1468 - accuracy: 0.7584 - val_loss: 1.1030 - val_accuracy: 0.6449
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2386 - accuracy: 0.7455 - val_loss: 1.0712 - val_accuracy: 0.6542
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2841 - accuracy: 0.7404 - val_loss: 1.1135 - val_accuracy: 0.6495
Epoch 171/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2584 - accuracy: 0.7635 - val_loss: 1.2164 - val_accuracy: 0.6495
Epoch 172/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3526 - accuracy: 0.7352 - val_loss: 1.1232 - val_accuracy: 0.6636
Epoch 173/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2967 - accuracy: 0.7198 - val_loss: 1.5722 - val_accuracy: 0.6589
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3456 - accuracy: 0.7121 - val_loss: 1.3347 - val_accuracy: 0.6963
Epoch 175/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2869 - accuracy: 0.6864 - val_loss: 1.3605 - val_accuracy: 0.6776
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2519 - accuracy: 0.7378 - val_loss: 1.3762 - val_accuracy: 0.7009
Epoch 177/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2021 - accuracy: 0.7172 - val_loss: 1.3649 - val_accuracy: 0.7196
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2384 - accuracy: 0.7249 - val_loss: 1.1890 - val_accuracy: 0.7103
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2082 - accuracy: 0.7172 - val_loss: 1.2758 - val_accuracy: 0.7243
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3259 - accuracy: 0.7506 - val_loss: 1.4230 - val_accuracy: 0.7290
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2389 - accuracy: 0.7095 - val_loss: 1.1035 - val_accuracy: 0.7290

```
accuracy: 0.7150
Epoch 182/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3518 - accuracy: 0.7275 - val_loss: 1.2097 - val_accuracy: 0.7009
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2933 - accuracy: 0.7147 - val_loss: 1.2753 - val_accuracy: 0.7056
Epoch 184/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2883 - accuracy: 0.7429 - val_loss: 1.3413 - val_accuracy: 0.7430
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2253 - accuracy: 0.7558 - val_loss: 1.3001 - val_accuracy: 0.7196
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2018 - accuracy: 0.7481 - val_loss: 1.2182 - val_accuracy: 0.7056
Epoch 187/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3178 - accuracy: 0.7378 - val_loss: 1.3780 - val_accuracy: 0.7243
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2485 - accuracy: 0.7249 - val_loss: 1.2786 - val_accuracy: 0.7103
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2322 - accuracy: 0.7378 - val_loss: 1.3110 - val_accuracy: 0.7196
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3268 - accuracy: 0.7044 - val_loss: 1.4071 - val_accuracy: 0.7243
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2880 - accuracy: 0.7121 - val_loss: 1.2416 - val_accuracy: 0.7383
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2303 - accuracy: 0.7378 - val_loss: 1.3379 - val_accuracy: 0.7009
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2537 - accuracy: 0.7481 - val_loss: 1.2580 - val_accuracy: 0.7150
Epoch 194/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2483 - accuracy: 0.7378 - val_loss: 1.2914 - val_accuracy: 0.7009
Epoch 195/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2019 - accuracy: 0.7841 - val_loss: 1.2137 - val_accuracy: 0.6869
Epoch 196/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2190 - accuracy: 0.7841 - val_loss: 1.2198 - val_accuracy: 0.6916
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2261 - accuracy: 0.7943 - val_loss: 1.1606 - val_accuracy: 0.7103
Epoch 198/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2420 - accuracy: 0.7378 - val_loss: 1.3318 - val_accuracy: 0.6869
Epoch 199/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1953 - accuracy: 0.7481 - val_loss: 1.3666 - val_accuracy: 0.6916
Epoch 200/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3690 - accuracy: 0.7661 - val_loss: 1.2715 - val_accuracy: 0.6822
Epoch 201/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1695 - accuracy: 0.7789 - val_loss: 1.3308 - val_accuracy: 0.6869
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2419 - accuracy: 0.7738 - val_loss: 1.3614 - val_accuracy: 0.7243
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2687 - accuracy: 0.7763 - val_loss: 1.4678 - val_accuracy: 0.7103
Epoch 204/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2647 - accuracy: 0.7815 - val_loss: 1.4502 - val_accuracy: 0.6963
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3055 - accuracy: 0.7532 - val_loss: 1.3882 - val_accuracy: 0.6963
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2665 - accuracy: 0.7712 - val_loss: 1.4010 - val_accuracy: 0.6916
Epoch 207/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1970 - accuracy: 0.7815 - val_loss: 1.4428 - val_accuracy: 0.6636
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1538 - accuracy: 0.7841 - val_loss: 1.5036 - val_accuracy: 0.6776
Epoch 209/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1637 - accuracy: 0.7866 - val_loss: 1.3639 - val_accuracy: 0.6682
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1984 - accuracy: 0.7789 - val_loss: 1.5383 - val_accuracy: 0.6729
Epoch 211/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 0.2592 - accuracy: 0.7712 - val_loss: 1.4993 - val_accuracy: 0.6542
Epoch 212/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1774 - accuracy: 0.7866 - val_loss: 1.4120 - val_accuracy: 0.6776
Epoch 213/1000
4/4 [=====] - 0s 18ms/step - loss: 0.2322 - accuracy: 0.7738 - val_loss: 1.5381 - val_accuracy: 0.6636
Epoch 214/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1891 - accuracy: 0.7506 - val_loss: 1.4029 - val_accuracy: 0.6636
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1860 - accuracy: 0.7481 - val_loss: 1.4000 - val_accuracy: 0.6402
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1388 - accuracy: 0.7455 - val_loss: 1.3488 - val_accuracy: 0.6308
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1668 - accuracy: 0.7532 - val_loss: 1.3618 - val_accuracy: 0.6542
Epoch 218/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1748 - accuracy: 0.7404 - val_loss: 1.3602 - val_accuracy: 0.6168
Epoch 219/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2201 - accuracy: 0.7506 - val_loss: 1.5710 - val_accuracy: 0.6075
Epoch 220/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1690 - accuracy: 0.7635 - val_loss: 1.5325 - val_accuracy: 0.6121
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1529 - accuracy: 0.7686 - val_loss: 1.4756 - val_accuracy: 0.5888
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1857 - accuracy: 0.7352 - val_loss: 1.5720 - val_accuracy: 0.6121
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2715 - accuracy: 0.7378 - val_loss: 1.4947 - val_accuracy: 0.6028
Epoch 224/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1742 - accuracy: 0.7326 - val_loss: 1.5208 - val_accuracy: 0.6729
Epoch 225/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3344 - accuracy: 0.7275 - val_loss: 1.5583 - val_accuracy: 0.6589
Epoch 226/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3452 - accuracy: 0.7404 - val_loss: 1.5174 - val_accuracy: 0.6355
Epoch 227/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2852 - accuracy: 0.7275 - val_loss: 1.6801 - val_accuracy: 0.6075
Epoch 228/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1950 - accuracy: 0.7224 - val_loss: 1.6866 - val_accuracy: 0.6028
Epoch 229/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1787 - accuracy: 0.7301 - val_loss: 1.4917 - val_accuracy: 0.5841
Epoch 230/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2646 - accuracy: 0.7224 - val_loss: 1.4657 - val_accuracy: 0.5888
Epoch 231/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2808 - accuracy: 0.7172 - val_loss: 1.6084 - val_accuracy: 0.6028
Epoch 232/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2571 - accuracy: 0.7018 - val_loss: 1.5796 - val_accuracy: 0.6028
Epoch 233/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1768 - accuracy: 0.6992 - val_loss: 1.5814 - val_accuracy: 0.5794
Epoch 234/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1911 - accuracy: 0.7069 - val_loss: 1.5528 - val_accuracy: 0.6028
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2054 - accuracy: 0.7249 - val_loss: 1.5900 - val_accuracy: 0.6121
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1716 - accuracy: 0.7172 - val_loss: 1.5324 - val_accuracy: 0.6028
Epoch 237/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1344 - accuracy: 0.7301 - val_loss: 1.5157 - val_accuracy: 0.5561
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2845 - accuracy: 0.7352 - val_loss: 1.6256 - val_accuracy: 0.5748
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2069 - accuracy: 0.7455 - val_loss: 1.5398 - val_accuracy: 0.6075
Epoch 240/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2437 - accuracy: 0.7198 - val_loss: 1.5287 - val_accuracy: 0.6262
```

Epoch 241/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2077 - accuracy: 0.7404 - val_loss: 1.5537 - val_accuracy: 0.6075
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1715 - accuracy: 0.7429 - val_loss: 1.4113 - val_accuracy: 0.6075
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2767 - accuracy: 0.7224 - val_loss: 1.4413 - val_accuracy: 0.6402
Epoch 244/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3648 - accuracy: 0.7301 - val_loss: 1.4441 - val_accuracy: 0.6262
Epoch 245/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1867 - accuracy: 0.7301 - val_loss: 1.4682 - val_accuracy: 0.6402
Epoch 246/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2582 - accuracy: 0.7326 - val_loss: 1.4499 - val_accuracy: 0.6262
Epoch 247/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1924 - accuracy: 0.7584 - val_loss: 1.4646 - val_accuracy: 0.6355
Epoch 248/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1649 - accuracy: 0.7558 - val_loss: 1.4878 - val_accuracy: 0.6308
Epoch 249/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2884 - accuracy: 0.7584 - val_loss: 1.4588 - val_accuracy: 0.6449
Epoch 250/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2599 - accuracy: 0.7429 - val_loss: 1.5881 - val_accuracy: 0.5841
Epoch 251/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2248 - accuracy: 0.7661 - val_loss: 1.6304 - val_accuracy: 0.5701
Epoch 252/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1752 - accuracy: 0.7275 - val_loss: 1.6073 - val_accuracy: 0.5748
Epoch 253/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2142 - accuracy: 0.7455 - val_loss: 1.6521 - val_accuracy: 0.5701
Epoch 254/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1686 - accuracy: 0.7275 - val_loss: 1.5864 - val_accuracy: 0.5467
Epoch 255/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2983 - accuracy: 0.7301 - val_loss: 1.5087 - val_accuracy: 0.5888
Epoch 256/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3851 - accuracy: 0.7249 - val_loss: 1.5343 - val_accuracy: 0.5841
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1663 - accuracy: 0.7172 - val_loss: 1.4796 - val_accuracy: 0.5935
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2099 - accuracy: 0.6967 - val_loss: 1.4051 - val_accuracy: 0.6215
Epoch 259/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2964 - accuracy: 0.7044 - val_loss: 1.4623 - val_accuracy: 0.5981
Epoch 260/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2020 - accuracy: 0.7172 - val_loss: 1.4340 - val_accuracy: 0.6355
Epoch 261/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2049 - accuracy: 0.7224 - val_loss: 1.5753 - val_accuracy: 0.5841
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2473 - accuracy: 0.7147 - val_loss: 1.4490 - val_accuracy: 0.5981
Epoch 263/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1796 - accuracy: 0.7224 - val_loss: 1.3088 - val_accuracy: 0.5935
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2067 - accuracy: 0.7147 - val_loss: 1.5525 - val_accuracy: 0.6121
Epoch 265/1000
4/4 [=====] - 0s 17ms/step - loss: 0.2226 - accuracy: 0.7044 - val_loss: 1.6522 - val_accuracy: 0.6168
Epoch 266/1000
4/4 [=====] - 0s 18ms/step - loss: 0.1790 - accuracy: 0.7455 - val_loss: 1.4973 - val_accuracy: 0.6075
Epoch 267/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1995 - accuracy: 0.7352 - val_loss: 1.5107 - val_accuracy: 0.6075
Epoch 268/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1953 - accuracy: 0.7481 - val_loss: 1.5369 - val_accuracy: 0.6121
Epoch 269/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2102 - accuracy: 0.7481 - val_loss: 1.4368 - val_accuracy: 0.6215
Epoch 270/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2084 - accuracy: 0.7558 - val_loss: 1.5831 - val_accuracy: 0.6215

```
accuracy: 0.6075
Epoch 271/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2389 - accuracy: 0.7378 - val_loss: 1.6412 - val_
accuracy: 0.6262
Epoch 272/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1590 - accuracy: 0.7532 - val_loss: 1.7250 - val_
accuracy: 0.6262
Epoch 273/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1667 - accuracy: 0.7686 - val_loss: 1.6360 - val_
accuracy: 0.6168
Epoch 274/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2436 - accuracy: 0.7584 - val_loss: 1.5734 - val_
accuracy: 0.6215
Epoch 275/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2500 - accuracy: 0.7609 - val_loss: 1.5131 - val_
accuracy: 0.6355
Epoch 276/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2077 - accuracy: 0.7378 - val_loss: 1.6683 - val_
accuracy: 0.6355
Epoch 277/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1171 - accuracy: 0.7301 - val_loss: 1.4926 - val_
accuracy: 0.6168
Epoch 278/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1355 - accuracy: 0.7584 - val_loss: 1.5906 - val_
accuracy: 0.6168
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1802 - accuracy: 0.7429 - val_loss: 1.6332 - val_
accuracy: 0.6308
Epoch 280/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1507 - accuracy: 0.7326 - val_loss: 1.5247 - val_
accuracy: 0.6215
Epoch 281/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2256 - accuracy: 0.7506 - val_loss: 1.5760 - val_
accuracy: 0.6262
Epoch 282/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1530 - accuracy: 0.7378 - val_loss: 1.6971 - val_
accuracy: 0.6495
Epoch 283/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2252 - accuracy: 0.7224 - val_loss: 1.5168 - val_
accuracy: 0.6495
Epoch 284/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1301 - accuracy: 0.7429 - val_loss: 1.5814 - val_
accuracy: 0.6495
Epoch 285/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1425 - accuracy: 0.7635 - val_loss: 1.4707 - val_
accuracy: 0.6402
Epoch 286/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2366 - accuracy: 0.7429 - val_loss: 1.5612 - val_
accuracy: 0.6215
Epoch 287/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2680 - accuracy: 0.7584 - val_loss: 1.5224 - val_
accuracy: 0.6636
Epoch 288/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2454 - accuracy: 0.7635 - val_loss: 1.6230 - val_
accuracy: 0.6776
Epoch 289/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1922 - accuracy: 0.7763 - val_loss: 1.6485 - val_
accuracy: 0.6729
Epoch 290/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3120 - accuracy: 0.7404 - val_loss: 1.7245 - val_
accuracy: 0.6869
Epoch 291/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1918 - accuracy: 0.7301 - val_loss: 1.8200 - val_
accuracy: 0.6682
Epoch 292/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2343 - accuracy: 0.7275 - val_loss: 1.6593 - val_
accuracy: 0.6682
Epoch 293/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1849 - accuracy: 0.7506 - val_loss: 1.7060 - val_
accuracy: 0.6495
Epoch 294/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2475 - accuracy: 0.7532 - val_loss: 1.7910 - val_
accuracy: 0.6682
Epoch 295/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1847 - accuracy: 0.7789 - val_loss: 1.9252 - val_
accuracy: 0.6636
Epoch 296/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1959 - accuracy: 0.7326 - val_loss: 1.9563 - val_
accuracy: 0.6822
Epoch 297/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1820 - accuracy: 0.7352 - val_loss: 1.8887 - val_
accuracy: 0.6776
Epoch 298/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2120 - accuracy: 0.7224 - val_loss: 1.9789 - val_
accuracy: 0.6822
Epoch 299/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2060 - accuracy: 0.7378 - val_loss: 1.9864 - val_
accuracy: 0.6822
Epoch 300/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.1255 - accuracy: 0.7481 - val_loss: 1.8315 - val_accuracy: 0.6449
Epoch 301/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2109 - accuracy: 0.7352 - val_loss: 1.5411 - val_accuracy: 0.6262
Epoch 302/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1533 - accuracy: 0.7224 - val_loss: 1.8114 - val_accuracy: 0.6262
Epoch 303/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2116 - accuracy: 0.7301 - val_loss: 1.8376 - val_accuracy: 0.6402
Epoch 304/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1420 - accuracy: 0.7095 - val_loss: 1.6331 - val_accuracy: 0.6075
Epoch 305/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1955 - accuracy: 0.7481 - val_loss: 1.4889 - val_accuracy: 0.5888
Epoch 306/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1913 - accuracy: 0.7378 - val_loss: 1.5034 - val_accuracy: 0.5794
Epoch 307/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1108 - accuracy: 0.7686 - val_loss: 1.5309 - val_accuracy: 0.5935
Epoch 308/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1517 - accuracy: 0.7224 - val_loss: 1.5397 - val_accuracy: 0.5935
Epoch 309/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3971 - accuracy: 0.7224 - val_loss: 1.5294 - val_accuracy: 0.6028
Epoch 310/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1632 - accuracy: 0.7584 - val_loss: 1.6145 - val_accuracy: 0.6215
Epoch 311/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2280 - accuracy: 0.7532 - val_loss: 1.7410 - val_accuracy: 0.6589
Epoch 312/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2509 - accuracy: 0.7429 - val_loss: 1.8948 - val_accuracy: 0.6028
Epoch 313/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1910 - accuracy: 0.7558 - val_loss: 1.6879 - val_accuracy: 0.6121
Epoch 314/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3577 - accuracy: 0.7172 - val_loss: 1.6783 - val_accuracy: 0.6075
Epoch 315/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1628 - accuracy: 0.7301 - val_loss: 1.6591 - val_accuracy: 0.5935
Epoch 316/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1216 - accuracy: 0.7275 - val_loss: 1.6696 - val_accuracy: 0.5841
Epoch 317/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1909 - accuracy: 0.7455 - val_loss: 1.6224 - val_accuracy: 0.6028
Epoch 318/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2283 - accuracy: 0.7506 - val_loss: 1.6854 - val_accuracy: 0.6075
Epoch 319/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2046 - accuracy: 0.7249 - val_loss: 1.7854 - val_accuracy: 0.6075
Epoch 320/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1653 - accuracy: 0.7224 - val_loss: 1.6787 - val_accuracy: 0.6075
Epoch 321/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1330 - accuracy: 0.7352 - val_loss: 1.6691 - val_accuracy: 0.5935
Epoch 322/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1894 - accuracy: 0.7789 - val_loss: 1.6533 - val_accuracy: 0.5794
Epoch 323/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1897 - accuracy: 0.7558 - val_loss: 1.5611 - val_accuracy: 0.5888
Epoch 324/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2542 - accuracy: 0.7249 - val_loss: 1.6336 - val_accuracy: 0.5794
Epoch 325/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2372 - accuracy: 0.7378 - val_loss: 1.8934 - val_accuracy: 0.5935
Epoch 326/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1887 - accuracy: 0.7352 - val_loss: 1.5977 - val_accuracy: 0.6075
Epoch 327/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2673 - accuracy: 0.7301 - val_loss: 1.7230 - val_accuracy: 0.6028
Epoch 328/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1805 - accuracy: 0.7275 - val_loss: 1.6893 - val_accuracy: 0.6075
Epoch 329/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1688 - accuracy: 0.7378 - val_loss: 1.5999 - val_accuracy: 0.6262
```

```

Epoch 330/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1957 - accuracy: 0.7455 - val_loss: 1.6822 - val_accuracy: 0.6075
Epoch 331/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2476 - accuracy: 0.7172 - val_loss: 1.8036 - val_accuracy: 0.6262
Epoch 332/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2752 - accuracy: 0.7275 - val_loss: 1.8039 - val_accuracy: 0.6355
Epoch 333/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2725 - accuracy: 0.7301 - val_loss: 1.6748 - val_accuracy: 0.6495
Epoch 334/1000
1/4 [====>.....] - ETA: 0s - loss: 0.0620 - accuracy: 0.7812Restoring model weights from the end of the best epoch: 184.
4/4 [=====] - 0s 16ms/step - loss: 0.1927 - accuracy: 0.7378 - val_loss: 1.8293 - val_accuracy: 0.6308
Epoch 334: early stopping
2/2 [=====] - 0s 3ms/step - loss: 1.3960 - accuracy: 0.5349
[CV] END .....Dense1=100, Dense2=50; total time= 17.7s
Model: "sequential_98"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_392 (Dense)	(None, 100)	700
batch_normalization_294 (BatchNormalization)	(None, 100)	400
activation_294 (Activation)	(None, 100)	0
dense_393 (Dense)	(None, 50)	5050
batch_normalization_295 (BatchNormalization)	(None, 50)	200
activation_295 (Activation)	(None, 50)	0
dense_394 (Dense)	(None, 10)	510
batch_normalization_296 (BatchNormalization)	(None, 10)	40
activation_296 (Activation)	(None, 10)	0
dense_395 (Dense)	(None, 2)	22
<hr/>		
Total params:	6,922	
Trainable params:	6,602	
Non-trainable params:	320	

```

Epoch 1/1000
4/4 [=====] - 1s 59ms/step - loss: 4.9503 - accuracy: 0.5398 - val_loss: 1.9143 - val_accuracy: 0.4439
Epoch 2/1000
4/4 [=====] - 0s 16ms/step - loss: 4.1532 - accuracy: 0.5810 - val_loss: 2.1460 - val_accuracy: 0.5000
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8204 - accuracy: 0.5578 - val_loss: 2.3408 - val_accuracy: 0.4486
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4482 - accuracy: 0.6041 - val_loss: 2.4980 - val_accuracy: 0.3879
Epoch 5/1000
4/4 [=====] - 0s 16ms/step - loss: 3.0998 - accuracy: 0.5527 - val_loss: 2.0695 - val_accuracy: 0.5047
Epoch 6/1000
4/4 [=====] - 0s 16ms/step - loss: 2.9257 - accuracy: 0.6015 - val_loss: 2.0244 - val_accuracy: 0.5794
Epoch 7/1000
4/4 [=====] - 0s 15ms/step - loss: 2.8002 - accuracy: 0.6401 - val_loss: 2.0013 - val_accuracy: 0.6121
Epoch 8/1000
4/4 [=====] - 0s 15ms/step - loss: 2.6896 - accuracy: 0.6452 - val_loss: 1.9530 - val_accuracy: 0.5280
Epoch 9/1000
4/4 [=====] - 0s 15ms/step - loss: 2.5704 - accuracy: 0.6478 - val_loss: 1.8261 - val_accuracy: 0.5421
Epoch 10/1000
4/4 [=====] - 0s 17ms/step - loss: 2.4264 - accuracy: 0.6761 - val_loss: 1.7487 - val_accuracy: 0.4533
Epoch 11/1000
4/4 [=====] - 0s 16ms/step - loss: 2.2268 - accuracy: 0.6761 - val_loss: 1.7181 - val_accuracy: 0.4813
Epoch 12/1000
4/4 [=====] - 0s 15ms/step - loss: 2.3408 - accuracy: 0.6504 - val_loss: 1.7475 - val_accuracy: 0.4346
Epoch 13/1000

```

```
4/4 [=====] - 0s 15ms/step - loss: 2.2797 - accuracy: 0.6247 - val_loss: 1.7226 - val_accuracy: 0.4907
Epoch 14/1000
4/4 [=====] - 0s 16ms/step - loss: 2.0886 - accuracy: 0.6581 - val_loss: 1.6978 - val_accuracy: 0.4673
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3222 - accuracy: 0.6041 - val_loss: 1.6862 - val_accuracy: 0.6729
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1803 - accuracy: 0.6015 - val_loss: 1.6717 - val_accuracy: 0.6729
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9630 - accuracy: 0.6093 - val_loss: 1.6395 - val_accuracy: 0.6776
Epoch 18/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9562 - accuracy: 0.6350 - val_loss: 1.6195 - val_accuracy: 0.6589
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7525 - accuracy: 0.6581 - val_loss: 1.6032 - val_accuracy: 0.6449
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6709 - accuracy: 0.6401 - val_loss: 1.5919 - val_accuracy: 0.6449
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8228 - accuracy: 0.5938 - val_loss: 1.5764 - val_accuracy: 0.6262
Epoch 22/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5867 - accuracy: 0.6555 - val_loss: 1.5621 - val_accuracy: 0.6308
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5985 - accuracy: 0.6170 - val_loss: 1.5368 - val_accuracy: 0.6308
Epoch 24/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6466 - accuracy: 0.6247 - val_loss: 1.5294 - val_accuracy: 0.6355
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5187 - accuracy: 0.6067 - val_loss: 1.5198 - val_accuracy: 0.6355
Epoch 26/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4608 - accuracy: 0.6247 - val_loss: 1.5076 - val_accuracy: 0.6542
Epoch 27/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6482 - accuracy: 0.6093 - val_loss: 1.4964 - val_accuracy: 0.6542
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4544 - accuracy: 0.6350 - val_loss: 1.4922 - val_accuracy: 0.6636
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5063 - accuracy: 0.6632 - val_loss: 1.4677 - val_accuracy: 0.6589
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4681 - accuracy: 0.6530 - val_loss: 1.4626 - val_accuracy: 0.6636
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6120 - accuracy: 0.6838 - val_loss: 1.4742 - val_accuracy: 0.4720
Epoch 32/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2324 - accuracy: 0.6710 - val_loss: 1.4757 - val_accuracy: 0.6636
Epoch 33/1000
4/4 [=====] - 0s 16ms/step - loss: 1.2957 - accuracy: 0.6478 - val_loss: 1.4633 - val_accuracy: 0.4720
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2397 - accuracy: 0.6324 - val_loss: 1.4537 - val_accuracy: 0.4766
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3665 - accuracy: 0.6427 - val_loss: 1.4722 - val_accuracy: 0.6402
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2506 - accuracy: 0.6093 - val_loss: 1.4393 - val_accuracy: 0.6402
Epoch 37/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1631 - accuracy: 0.5707 - val_loss: 1.4225 - val_accuracy: 0.6402
Epoch 38/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1066 - accuracy: 0.6093 - val_loss: 1.4046 - val_accuracy: 0.6355
Epoch 39/1000
4/4 [=====] - 0s 16ms/step - loss: 1.0099 - accuracy: 0.6195 - val_loss: 1.3911 - val_accuracy: 0.6449
Epoch 40/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0842 - accuracy: 0.5938 - val_loss: 1.3332 - val_accuracy: 0.6822
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0228 - accuracy: 0.6350 - val_loss: 1.3276 - val_accuracy: 0.6776
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0843 - accuracy: 0.6298 - val_loss: 1.3082 - val_accuracy: 0.6729
```

Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0176 - accuracy: 0.6195 - val_loss: 1.3004 - val_accuracy: 0.6729
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8738 - accuracy: 0.6324 - val_loss: 1.3032 - val_accuracy: 0.6682
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8128 - accuracy: 0.6324 - val_loss: 1.2936 - val_accuracy: 0.6495
Epoch 46/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8027 - accuracy: 0.6093 - val_loss: 1.3433 - val_accuracy: 0.6449
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9648 - accuracy: 0.5604 - val_loss: 1.2925 - val_accuracy: 0.6402
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8769 - accuracy: 0.5758 - val_loss: 1.2830 - val_accuracy: 0.6449
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9140 - accuracy: 0.5733 - val_loss: 1.2985 - val_accuracy: 0.6355
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8547 - accuracy: 0.5810 - val_loss: 1.2849 - val_accuracy: 0.6308
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7677 - accuracy: 0.5810 - val_loss: 1.2743 - val_accuracy: 0.6262
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7091 - accuracy: 0.5733 - val_loss: 1.2547 - val_accuracy: 0.6308
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6471 - accuracy: 0.5553 - val_loss: 1.2070 - val_accuracy: 0.6308
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6406 - accuracy: 0.5578 - val_loss: 1.2221 - val_accuracy: 0.6121
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5914 - accuracy: 0.5476 - val_loss: 1.2060 - val_accuracy: 0.6168
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6937 - accuracy: 0.5578 - val_loss: 1.1933 - val_accuracy: 0.6121
Epoch 57/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5122 - accuracy: 0.5784 - val_loss: 1.1783 - val_accuracy: 0.6168
Epoch 58/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5666 - accuracy: 0.5784 - val_loss: 1.1502 - val_accuracy: 0.6262
Epoch 59/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5168 - accuracy: 0.6041 - val_loss: 1.1364 - val_accuracy: 0.6075
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5648 - accuracy: 0.5810 - val_loss: 1.1528 - val_accuracy: 0.6121
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5410 - accuracy: 0.6298 - val_loss: 1.0937 - val_accuracy: 0.6075
Epoch 62/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6155 - accuracy: 0.6375 - val_loss: 1.0923 - val_accuracy: 0.6075
Epoch 63/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5730 - accuracy: 0.6067 - val_loss: 1.0766 - val_accuracy: 0.6402
Epoch 64/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5625 - accuracy: 0.6452 - val_loss: 1.0604 - val_accuracy: 0.6262
Epoch 65/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5611 - accuracy: 0.6555 - val_loss: 1.0098 - val_accuracy: 0.6308
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5681 - accuracy: 0.6221 - val_loss: 0.9953 - val_accuracy: 0.6355
Epoch 67/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5265 - accuracy: 0.6427 - val_loss: 0.9979 - val_accuracy: 0.6308
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5530 - accuracy: 0.6195 - val_loss: 0.9995 - val_accuracy: 0.6542
Epoch 69/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5173 - accuracy: 0.6221 - val_loss: 0.9943 - val_accuracy: 0.6542
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4734 - accuracy: 0.6324 - val_loss: 0.9686 - val_accuracy: 0.6542
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4669 - accuracy: 0.5913 - val_loss: 0.9553 - val_accuracy: 0.6542
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4447 - accuracy: 0.5990 - val_loss: 0.9547 - val_accuracy: 0.6542

```
accuracy: 0.6542
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4245 - accuracy: 0.6041 - val_loss: 0.9455 - val_accuracy: 0.6682
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4884 - accuracy: 0.6041 - val_loss: 0.8979 - val_accuracy: 0.6402
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4871 - accuracy: 0.5835 - val_loss: 0.8895 - val_accuracy: 0.6542
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4565 - accuracy: 0.6195 - val_loss: 0.8820 - val_accuracy: 0.6495
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4657 - accuracy: 0.6272 - val_loss: 0.9039 - val_accuracy: 0.6495
Epoch 78/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4263 - accuracy: 0.6144 - val_loss: 0.8880 - val_accuracy: 0.6449
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4627 - accuracy: 0.6298 - val_loss: 0.8760 - val_accuracy: 0.6402
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4406 - accuracy: 0.6170 - val_loss: 0.8639 - val_accuracy: 0.6215
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4625 - accuracy: 0.6118 - val_loss: 0.8109 - val_accuracy: 0.6542
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4967 - accuracy: 0.5913 - val_loss: 0.7737 - val_accuracy: 0.6589
Epoch 83/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4204 - accuracy: 0.6015 - val_loss: 0.7814 - val_accuracy: 0.6542
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4084 - accuracy: 0.6093 - val_loss: 0.8013 - val_accuracy: 0.6449
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4246 - accuracy: 0.6298 - val_loss: 0.7790 - val_accuracy: 0.6308
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5966 - accuracy: 0.6093 - val_loss: 0.7921 - val_accuracy: 0.6402
Epoch 87/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4272 - accuracy: 0.6170 - val_loss: 0.7481 - val_accuracy: 0.6495
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4498 - accuracy: 0.6607 - val_loss: 0.7395 - val_accuracy: 0.6308
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4916 - accuracy: 0.6298 - val_loss: 0.7289 - val_accuracy: 0.6355
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3695 - accuracy: 0.6350 - val_loss: 0.7073 - val_accuracy: 0.6355
Epoch 91/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3804 - accuracy: 0.6350 - val_loss: 0.7044 - val_accuracy: 0.6215
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4459 - accuracy: 0.6504 - val_loss: 0.6709 - val_accuracy: 0.6308
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4260 - accuracy: 0.6041 - val_loss: 0.6657 - val_accuracy: 0.6121
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3566 - accuracy: 0.5964 - val_loss: 0.6600 - val_accuracy: 0.5888
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3295 - accuracy: 0.6015 - val_loss: 0.6697 - val_accuracy: 0.5607
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4248 - accuracy: 0.5707 - val_loss: 0.6700 - val_accuracy: 0.5841
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3900 - accuracy: 0.6067 - val_loss: 0.6819 - val_accuracy: 0.5654
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3908 - accuracy: 0.6298 - val_loss: 0.6713 - val_accuracy: 0.5748
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3861 - accuracy: 0.6221 - val_loss: 0.6483 - val_accuracy: 0.5981
Epoch 100/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3542 - accuracy: 0.6144 - val_loss: 0.6373 - val_accuracy: 0.5888
Epoch 101/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3468 - accuracy: 0.5964 - val_loss: 0.6355 - val_accuracy: 0.5888
Epoch 102/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3382 - accuracy: 0.6195 - val_loss: 0.6400 - val_accuracy: 0.5841
Epoch 103/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3357 - accuracy: 0.6067 - val_loss: 0.6369 - val_accuracy: 0.5748
Epoch 104/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3005 - accuracy: 0.5964 - val_loss: 0.6488 - val_accuracy: 0.5841
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3496 - accuracy: 0.6478 - val_loss: 0.6598 - val_accuracy: 0.5794
Epoch 106/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3323 - accuracy: 0.6272 - val_loss: 0.6221 - val_accuracy: 0.5748
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4026 - accuracy: 0.5938 - val_loss: 0.6156 - val_accuracy: 0.5701
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3295 - accuracy: 0.6401 - val_loss: 0.5930 - val_accuracy: 0.5748
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3777 - accuracy: 0.6581 - val_loss: 0.5954 - val_accuracy: 0.6075
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3153 - accuracy: 0.6221 - val_loss: 0.6208 - val_accuracy: 0.6028
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3237 - accuracy: 0.6247 - val_loss: 0.6842 - val_accuracy: 0.5935
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3901 - accuracy: 0.6118 - val_loss: 0.5916 - val_accuracy: 0.6308
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3063 - accuracy: 0.6272 - val_loss: 0.6470 - val_accuracy: 0.6402
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2858 - accuracy: 0.6375 - val_loss: 0.7669 - val_accuracy: 0.6075
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3414 - accuracy: 0.6144 - val_loss: 0.7154 - val_accuracy: 0.5935
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3272 - accuracy: 0.6247 - val_loss: 0.8875 - val_accuracy: 0.5467
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3295 - accuracy: 0.6144 - val_loss: 0.7285 - val_accuracy: 0.5748
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3480 - accuracy: 0.6170 - val_loss: 0.7681 - val_accuracy: 0.5748
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3575 - accuracy: 0.5707 - val_loss: 0.7609 - val_accuracy: 0.5701
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3250 - accuracy: 0.5835 - val_loss: 0.7954 - val_accuracy: 0.5841
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3545 - accuracy: 0.5990 - val_loss: 0.8000 - val_accuracy: 0.5935
Epoch 122/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3148 - accuracy: 0.6015 - val_loss: 0.7767 - val_accuracy: 0.5888
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3271 - accuracy: 0.6144 - val_loss: 0.7651 - val_accuracy: 0.5888
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3024 - accuracy: 0.5990 - val_loss: 0.7925 - val_accuracy: 0.5888
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3305 - accuracy: 0.5913 - val_loss: 0.8917 - val_accuracy: 0.5981
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3004 - accuracy: 0.6041 - val_loss: 0.7953 - val_accuracy: 0.5935
Epoch 127/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3027 - accuracy: 0.5810 - val_loss: 0.8721 - val_accuracy: 0.6075
Epoch 128/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2827 - accuracy: 0.5733 - val_loss: 0.8311 - val_accuracy: 0.6075
Epoch 129/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2908 - accuracy: 0.5887 - val_loss: 0.8590 - val_accuracy: 0.6028
Epoch 130/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2936 - accuracy: 0.5810 - val_loss: 0.9100 - val_accuracy: 0.6168
Epoch 131/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2999 - accuracy: 0.5861 - val_loss: 0.8928 - val_accuracy: 0.6168
```

Epoch 132/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3347 - accuracy: 0.5861 - val_loss: 0.8608 - val_accuracy: 0.6262
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2372 - accuracy: 0.5990 - val_loss: 0.8717 - val_accuracy: 0.6308
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2534 - accuracy: 0.5835 - val_loss: 0.8596 - val_accuracy: 0.6168
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3038 - accuracy: 0.5964 - val_loss: 0.8392 - val_accuracy: 0.6168
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4017 - accuracy: 0.5887 - val_loss: 0.8399 - val_accuracy: 0.6308
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3154 - accuracy: 0.5784 - val_loss: 0.8380 - val_accuracy: 0.6308
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2885 - accuracy: 0.5964 - val_loss: 0.8424 - val_accuracy: 0.6168
Epoch 139/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2329 - accuracy: 0.5835 - val_loss: 0.8698 - val_accuracy: 0.6075
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2369 - accuracy: 0.5861 - val_loss: 0.9023 - val_accuracy: 0.6028
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2639 - accuracy: 0.5913 - val_loss: 0.8959 - val_accuracy: 0.5935
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3070 - accuracy: 0.5758 - val_loss: 0.9104 - val_accuracy: 0.6075
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2996 - accuracy: 0.5733 - val_loss: 0.8936 - val_accuracy: 0.6168
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2949 - accuracy: 0.5578 - val_loss: 0.9206 - val_accuracy: 0.6308
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2992 - accuracy: 0.5733 - val_loss: 0.8534 - val_accuracy: 0.6075
Epoch 146/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2548 - accuracy: 0.5887 - val_loss: 0.8450 - val_accuracy: 0.5935
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2390 - accuracy: 0.5656 - val_loss: 0.8707 - val_accuracy: 0.5748
Epoch 148/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2688 - accuracy: 0.5733 - val_loss: 0.8724 - val_accuracy: 0.5888
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3053 - accuracy: 0.5835 - val_loss: 0.8880 - val_accuracy: 0.5935
Epoch 150/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2814 - accuracy: 0.5707 - val_loss: 0.8827 - val_accuracy: 0.5935
Epoch 151/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2684 - accuracy: 0.6041 - val_loss: 0.8587 - val_accuracy: 0.6028
Epoch 152/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2294 - accuracy: 0.5681 - val_loss: 0.8811 - val_accuracy: 0.6075
Epoch 153/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3182 - accuracy: 0.5835 - val_loss: 0.9630 - val_accuracy: 0.6075
Epoch 154/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3245 - accuracy: 0.5758 - val_loss: 0.8553 - val_accuracy: 0.5981
Epoch 155/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2212 - accuracy: 0.5681 - val_loss: 0.9613 - val_accuracy: 0.5607
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2058 - accuracy: 0.5758 - val_loss: 0.9247 - val_accuracy: 0.5748
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2899 - accuracy: 0.5578 - val_loss: 0.9587 - val_accuracy: 0.5841
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2850 - accuracy: 0.5424 - val_loss: 0.9519 - val_accuracy: 0.6168
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3592 - accuracy: 0.5733 - val_loss: 0.9930 - val_accuracy: 0.6075
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2940 - accuracy: 0.5501 - val_loss: 0.9607 - val_accuracy: 0.6168
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3030 - accuracy: 0.5913 - val_loss: 1.0360 - val_accuracy: 0.6075

```
accuracy: 0.5841
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2672 - accuracy: 0.5424 - val_loss: 0.9755 - val_accuracy: 0.5935
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2113 - accuracy: 0.5604 - val_loss: 0.9300 - val_accuracy: 0.6028
Epoch 164/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3014 - accuracy: 0.5604 - val_loss: 0.9477 - val_accuracy: 0.5981
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1880 - accuracy: 0.5733 - val_loss: 0.9735 - val_accuracy: 0.5888
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2290 - accuracy: 0.5501 - val_loss: 1.0236 - val_accuracy: 0.5841
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4159 - accuracy: 0.5604 - val_loss: 1.0244 - val_accuracy: 0.5888
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2484 - accuracy: 0.5450 - val_loss: 1.2377 - val_accuracy: 0.5748
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2707 - accuracy: 0.5501 - val_loss: 1.1444 - val_accuracy: 0.5935
Epoch 170/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2184 - accuracy: 0.5861 - val_loss: 1.0407 - val_accuracy: 0.6028
Epoch 171/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3688 - accuracy: 0.5656 - val_loss: 0.9823 - val_accuracy: 0.5888
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2831 - accuracy: 0.5630 - val_loss: 0.9788 - val_accuracy: 0.6075
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1865 - accuracy: 0.5630 - val_loss: 0.9987 - val_accuracy: 0.6215
Epoch 174/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1889 - accuracy: 0.5835 - val_loss: 0.9031 - val_accuracy: 0.6215
Epoch 175/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2544 - accuracy: 0.5527 - val_loss: 0.8945 - val_accuracy: 0.6215
Epoch 176/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2856 - accuracy: 0.5656 - val_loss: 0.9254 - val_accuracy: 0.6168
Epoch 177/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2984 - accuracy: 0.5784 - val_loss: 0.9500 - val_accuracy: 0.6215
Epoch 178/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2059 - accuracy: 0.5861 - val_loss: 0.8956 - val_accuracy: 0.6402
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2469 - accuracy: 0.5733 - val_loss: 0.9267 - val_accuracy: 0.6355
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2852 - accuracy: 0.5835 - val_loss: 0.9304 - val_accuracy: 0.6215
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2118 - accuracy: 0.5861 - val_loss: 0.9142 - val_accuracy: 0.6542
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2756 - accuracy: 0.6093 - val_loss: 1.1176 - val_accuracy: 0.6355
Epoch 183/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1862 - accuracy: 0.6015 - val_loss: 1.1382 - val_accuracy: 0.6402
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2217 - accuracy: 0.6272 - val_loss: 1.1363 - val_accuracy: 0.6495
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2082 - accuracy: 0.6041 - val_loss: 1.2434 - val_accuracy: 0.6262
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2028 - accuracy: 0.6170 - val_loss: 1.1240 - val_accuracy: 0.6355
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2131 - accuracy: 0.6298 - val_loss: 1.1595 - val_accuracy: 0.6308
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2867 - accuracy: 0.6221 - val_loss: 1.1560 - val_accuracy: 0.6682
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2097 - accuracy: 0.6118 - val_loss: 1.1760 - val_accuracy: 0.6542
Epoch 190/1000
1/4 [====>.....] - ETA: 0s - loss: 0.1723 - accuracy: 0.5781Restoring model weights from the end of the best epoch: 40.
4/4 [=====] - 0s 14ms/step - loss: 0.1940 - accuracy: 0.6221 - val_loss: 0.9906 - val_accuracy: 0.6221
```

```
accuracy: 0.6589
Epoch 190: early stopping
2/2 [=====] - 0s 3ms/step - loss: 1.4118 - accuracy: 0.6047
[CV] END .....Dense1=100, Dense2=50; total time= 10.1s
Model: "sequential_99"
```

Layer (type)	Output Shape	Param #
=====		
dense_396 (Dense)	(None, 50)	350
batch_normalization_297 (BatchNormalization)	(None, 50)	200
activation_297 (Activation)	(None, 50)	0
dense_397 (Dense)	(None, 50)	2550
batch_normalization_298 (BatchNormalization)	(None, 50)	200
activation_298 (Activation)	(None, 50)	0
dense_398 (Dense)	(None, 10)	510
batch_normalization_299 (BatchNormalization)	(None, 10)	40
activation_299 (Activation)	(None, 10)	0
dense_399 (Dense)	(None, 2)	22
=====		
Total params: 3,872		
Trainable params: 3,652		
Non-trainable params: 220		

```
Epoch 1/1000
4/4 [=====] - 2s 213ms/step - loss: 4.6865 - accuracy: 0.5440 - val_loss: 4.3347 - val_accuracy: 0.4907
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1856 - accuracy: 0.6019 - val_loss: 3.0123 - val_accuracy: 0.4439
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4333 - accuracy: 0.6273 - val_loss: 2.6224 - val_accuracy: 0.4112
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1109 - accuracy: 0.6204 - val_loss: 2.5257 - val_accuracy: 0.4346
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7174 - accuracy: 0.6597 - val_loss: 2.3560 - val_accuracy: 0.4393
Epoch 6/1000
4/4 [=====] - 0s 15ms/step - loss: 1.8717 - accuracy: 0.6458 - val_loss: 2.2445 - val_accuracy: 0.5748
Epoch 7/1000
4/4 [=====] - 0s 15ms/step - loss: 1.7536 - accuracy: 0.7106 - val_loss: 2.2079 - val_accuracy: 0.6121
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6701 - accuracy: 0.6736 - val_loss: 2.2475 - val_accuracy: 0.6449
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6441 - accuracy: 0.7037 - val_loss: 2.1796 - val_accuracy: 0.6589
Epoch 10/1000
4/4 [=====] - 0s 15ms/step - loss: 1.5798 - accuracy: 0.6991 - val_loss: 2.1211 - val_accuracy: 0.6589
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5728 - accuracy: 0.6944 - val_loss: 2.0685 - val_accuracy: 0.6682
Epoch 12/1000
4/4 [=====] - 0s 15ms/step - loss: 1.5415 - accuracy: 0.7106 - val_loss: 2.0144 - val_accuracy: 0.6729
Epoch 13/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2795 - accuracy: 0.7014 - val_loss: 2.0214 - val_accuracy: 0.6776
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3049 - accuracy: 0.7315 - val_loss: 2.1015 - val_accuracy: 0.6308
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1899 - accuracy: 0.7060 - val_loss: 2.0070 - val_accuracy: 0.6589
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1171 - accuracy: 0.7199 - val_loss: 1.9893 - val_accuracy: 0.6589
Epoch 17/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0679 - accuracy: 0.7523 - val_loss: 1.9513 - val_accuracy: 0.6589
Epoch 18/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1042 - accuracy: 0.7338 - val_loss: 1.9428 - val_accuracy: 0.6589
```

accuracy: 0.6636
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0771 - accuracy: 0.7014 - val_loss: 1.8911 - val_accuracy: 0.6682
Epoch 20/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0710 - accuracy: 0.7083 - val_loss: 1.8525 - val_accuracy: 0.6589
Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1569 - accuracy: 0.7176 - val_loss: 1.8133 - val_accuracy: 0.6636
Epoch 22/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0519 - accuracy: 0.7037 - val_loss: 1.7485 - val_accuracy: 0.6589
Epoch 23/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9876 - accuracy: 0.7037 - val_loss: 1.6826 - val_accuracy: 0.6589
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0356 - accuracy: 0.7130 - val_loss: 1.5939 - val_accuracy: 0.6636
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9623 - accuracy: 0.7431 - val_loss: 1.5572 - val_accuracy: 0.6028
Epoch 26/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9340 - accuracy: 0.6759 - val_loss: 1.5101 - val_accuracy: 0.6075
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8221 - accuracy: 0.6875 - val_loss: 1.5222 - val_accuracy: 0.6028
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7494 - accuracy: 0.6806 - val_loss: 1.4608 - val_accuracy: 0.5981
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7127 - accuracy: 0.6829 - val_loss: 1.4620 - val_accuracy: 0.5888
Epoch 30/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6893 - accuracy: 0.6806 - val_loss: 1.3980 - val_accuracy: 0.6215
Epoch 31/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7050 - accuracy: 0.7269 - val_loss: 1.4080 - val_accuracy: 0.6262
Epoch 32/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6358 - accuracy: 0.6806 - val_loss: 1.3923 - val_accuracy: 0.6402
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6631 - accuracy: 0.7106 - val_loss: 1.3824 - val_accuracy: 0.6308
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6145 - accuracy: 0.6875 - val_loss: 1.3425 - val_accuracy: 0.5935
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6759 - accuracy: 0.6620 - val_loss: 1.3273 - val_accuracy: 0.5841
Epoch 36/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5855 - accuracy: 0.6759 - val_loss: 1.2914 - val_accuracy: 0.5935
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5695 - accuracy: 0.6713 - val_loss: 1.2960 - val_accuracy: 0.5841
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6641 - accuracy: 0.6690 - val_loss: 1.2653 - val_accuracy: 0.5888
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5326 - accuracy: 0.6921 - val_loss: 1.2549 - val_accuracy: 0.5935
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5520 - accuracy: 0.6736 - val_loss: 1.2454 - val_accuracy: 0.5935
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5765 - accuracy: 0.6713 - val_loss: 1.2026 - val_accuracy: 0.5888
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5257 - accuracy: 0.6782 - val_loss: 1.1911 - val_accuracy: 0.6028
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5131 - accuracy: 0.6921 - val_loss: 1.1524 - val_accuracy: 0.5935
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5013 - accuracy: 0.6759 - val_loss: 1.1005 - val_accuracy: 0.5935
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5424 - accuracy: 0.7037 - val_loss: 1.0862 - val_accuracy: 0.5935
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5039 - accuracy: 0.7153 - val_loss: 1.0574 - val_accuracy: 0.5981
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4807 - accuracy: 0.7037 - val_loss: 1.0756 - val_accuracy: 0.6075
Epoch 48/1000

```
4/4 [=====] - 0s 13ms/step - loss: 0.4497 - accuracy: 0.6991 - val_loss: 1.0439 - val_accuracy: 0.6215
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4501 - accuracy: 0.6782 - val_loss: 1.0629 - val_accuracy: 0.6682
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5672 - accuracy: 0.7245 - val_loss: 1.0277 - val_accuracy: 0.6168
Epoch 51/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4402 - accuracy: 0.7037 - val_loss: 1.0013 - val_accuracy: 0.6168
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5802 - accuracy: 0.6736 - val_loss: 0.9900 - val_accuracy: 0.6262
Epoch 53/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4134 - accuracy: 0.6759 - val_loss: 0.9746 - val_accuracy: 0.6121
Epoch 54/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3624 - accuracy: 0.6829 - val_loss: 0.9706 - val_accuracy: 0.6308
Epoch 55/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5011 - accuracy: 0.6782 - val_loss: 0.9534 - val_accuracy: 0.6308
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4757 - accuracy: 0.6991 - val_loss: 0.9707 - val_accuracy: 0.6822
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3671 - accuracy: 0.7269 - val_loss: 0.9553 - val_accuracy: 0.6963
Epoch 58/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4112 - accuracy: 0.7106 - val_loss: 0.9466 - val_accuracy: 0.6916
Epoch 59/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4958 - accuracy: 0.7199 - val_loss: 0.9739 - val_accuracy: 0.6869
Epoch 60/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4017 - accuracy: 0.7130 - val_loss: 0.9365 - val_accuracy: 0.6916
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3775 - accuracy: 0.7269 - val_loss: 0.9301 - val_accuracy: 0.6822
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4355 - accuracy: 0.7083 - val_loss: 0.9194 - val_accuracy: 0.7009
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3666 - accuracy: 0.7477 - val_loss: 0.9113 - val_accuracy: 0.7009
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3391 - accuracy: 0.7014 - val_loss: 0.9350 - val_accuracy: 0.6589
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3213 - accuracy: 0.7315 - val_loss: 0.8873 - val_accuracy: 0.6822
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3400 - accuracy: 0.7222 - val_loss: 0.8572 - val_accuracy: 0.6822
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3895 - accuracy: 0.7500 - val_loss: 0.8261 - val_accuracy: 0.7009
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3403 - accuracy: 0.7407 - val_loss: 0.8213 - val_accuracy: 0.6729
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3387 - accuracy: 0.7593 - val_loss: 0.8231 - val_accuracy: 0.6589
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3136 - accuracy: 0.7315 - val_loss: 0.8366 - val_accuracy: 0.6449
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3360 - accuracy: 0.7384 - val_loss: 0.8294 - val_accuracy: 0.6308
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5204 - accuracy: 0.7454 - val_loss: 0.8273 - val_accuracy: 0.6215
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3136 - accuracy: 0.7500 - val_loss: 0.8137 - val_accuracy: 0.6168
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3732 - accuracy: 0.7407 - val_loss: 0.8057 - val_accuracy: 0.5981
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3499 - accuracy: 0.7639 - val_loss: 0.8196 - val_accuracy: 0.6121
Epoch 76/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3373 - accuracy: 0.7778 - val_loss: 0.8037 - val_accuracy: 0.6262
Epoch 77/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3907 - accuracy: 0.7384 - val_loss: 0.8141 - val_accuracy: 0.6449
```

Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3101 - accuracy: 0.7384 - val_loss: 0.8216 - val_accuracy: 0.6308
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3465 - accuracy: 0.7662 - val_loss: 0.8191 - val_accuracy: 0.6355
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5397 - accuracy: 0.7523 - val_loss: 0.7985 - val_accuracy: 0.6402
Epoch 81/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3737 - accuracy: 0.7731 - val_loss: 0.7824 - val_accuracy: 0.6589
Epoch 82/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3180 - accuracy: 0.7662 - val_loss: 0.7995 - val_accuracy: 0.6542
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3610 - accuracy: 0.7870 - val_loss: 0.7856 - val_accuracy: 0.6542
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2835 - accuracy: 0.7824 - val_loss: 0.7681 - val_accuracy: 0.6729
Epoch 85/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3631 - accuracy: 0.7431 - val_loss: 0.7772 - val_accuracy: 0.6776
Epoch 86/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4342 - accuracy: 0.7500 - val_loss: 0.7724 - val_accuracy: 0.6776
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4216 - accuracy: 0.7662 - val_loss: 0.7660 - val_accuracy: 0.6869
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4083 - accuracy: 0.7546 - val_loss: 0.7450 - val_accuracy: 0.6869
Epoch 89/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3047 - accuracy: 0.7593 - val_loss: 0.7371 - val_accuracy: 0.6916
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3921 - accuracy: 0.7546 - val_loss: 0.7237 - val_accuracy: 0.6963
Epoch 91/1000
4/4 [=====] - 0s 17ms/step - loss: 0.3290 - accuracy: 0.7338 - val_loss: 0.7155 - val_accuracy: 0.7056
Epoch 92/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3667 - accuracy: 0.7106 - val_loss: 0.7142 - val_accuracy: 0.6916
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3701 - accuracy: 0.7338 - val_loss: 0.7069 - val_accuracy: 0.6869
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3186 - accuracy: 0.7245 - val_loss: 0.7024 - val_accuracy: 0.6822
Epoch 95/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3139 - accuracy: 0.7431 - val_loss: 0.6896 - val_accuracy: 0.6963
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3833 - accuracy: 0.7245 - val_loss: 0.6920 - val_accuracy: 0.7009
Epoch 97/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3606 - accuracy: 0.7199 - val_loss: 0.6938 - val_accuracy: 0.6869
Epoch 98/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3093 - accuracy: 0.7222 - val_loss: 0.7023 - val_accuracy: 0.6682
Epoch 99/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3057 - accuracy: 0.7315 - val_loss: 0.7426 - val_accuracy: 0.6636
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2816 - accuracy: 0.7616 - val_loss: 0.7552 - val_accuracy: 0.6822
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2685 - accuracy: 0.7454 - val_loss: 0.7440 - val_accuracy: 0.6776
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2957 - accuracy: 0.7153 - val_loss: 0.7065 - val_accuracy: 0.6542
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2879 - accuracy: 0.7407 - val_loss: 0.7485 - val_accuracy: 0.6589
Epoch 104/1000
4/4 [=====] - 0s 19ms/step - loss: 0.2805 - accuracy: 0.7269 - val_loss: 0.7213 - val_accuracy: 0.6869
Epoch 105/1000
4/4 [=====] - 0s 20ms/step - loss: 0.2551 - accuracy: 0.7153 - val_loss: 0.7389 - val_accuracy: 0.6636
Epoch 106/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3061 - accuracy: 0.7176 - val_loss: 0.7268 - val_accuracy: 0.6589
Epoch 107/1000
4/4 [=====] - 0s 17ms/step - loss: 0.2829 - accuracy: 0.7222 - val_loss: 0.7622 - val_accuracy: 0.6636

```
accuracy: 0.6682
Epoch 108/1000
4/4 [=====] - 0s 17ms/step - loss: 0.2726 - accuracy: 0.7315 - val_loss: 0.7592 - val_accuracy: 0.6495
Epoch 109/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2886 - accuracy: 0.7569 - val_loss: 0.7551 - val_accuracy: 0.6495
Epoch 110/1000
4/4 [=====] - 0s 18ms/step - loss: 0.2667 - accuracy: 0.7500 - val_loss: 0.8074 - val_accuracy: 0.6449
Epoch 111/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2994 - accuracy: 0.7222 - val_loss: 0.7863 - val_accuracy: 0.6495
Epoch 112/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2717 - accuracy: 0.7500 - val_loss: 0.8034 - val_accuracy: 0.6776
Epoch 113/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3116 - accuracy: 0.7407 - val_loss: 0.8062 - val_accuracy: 0.6729
Epoch 114/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3064 - accuracy: 0.7454 - val_loss: 0.8823 - val_accuracy: 0.6776
Epoch 115/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4458 - accuracy: 0.7431 - val_loss: 0.8204 - val_accuracy: 0.6729
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3531 - accuracy: 0.7060 - val_loss: 0.7510 - val_accuracy: 0.6729
Epoch 117/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3012 - accuracy: 0.7083 - val_loss: 0.8275 - val_accuracy: 0.6963
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2697 - accuracy: 0.7292 - val_loss: 0.7581 - val_accuracy: 0.6963
Epoch 119/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2876 - accuracy: 0.7199 - val_loss: 0.8187 - val_accuracy: 0.7196
Epoch 120/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2643 - accuracy: 0.7477 - val_loss: 0.7588 - val_accuracy: 0.7056
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2151 - accuracy: 0.7685 - val_loss: 0.8154 - val_accuracy: 0.7056
Epoch 122/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2489 - accuracy: 0.7569 - val_loss: 0.8140 - val_accuracy: 0.6822
Epoch 123/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2759 - accuracy: 0.7500 - val_loss: 0.8562 - val_accuracy: 0.6822
Epoch 124/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2905 - accuracy: 0.7222 - val_loss: 0.8755 - val_accuracy: 0.6869
Epoch 125/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3020 - accuracy: 0.7361 - val_loss: 0.8552 - val_accuracy: 0.6822
Epoch 126/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3214 - accuracy: 0.7477 - val_loss: 0.8580 - val_accuracy: 0.7009
Epoch 127/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2719 - accuracy: 0.7454 - val_loss: 0.8782 - val_accuracy: 0.6729
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2618 - accuracy: 0.7477 - val_loss: 0.8576 - val_accuracy: 0.6822
Epoch 129/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3851 - accuracy: 0.7338 - val_loss: 0.9028 - val_accuracy: 0.7056
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2669 - accuracy: 0.7847 - val_loss: 0.9162 - val_accuracy: 0.7009
Epoch 131/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2540 - accuracy: 0.7685 - val_loss: 0.9196 - val_accuracy: 0.7150
Epoch 132/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2985 - accuracy: 0.7639 - val_loss: 0.9741 - val_accuracy: 0.7290
Epoch 133/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2400 - accuracy: 0.7708 - val_loss: 0.9204 - val_accuracy: 0.7383
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2917 - accuracy: 0.7639 - val_loss: 0.9180 - val_accuracy: 0.7243
Epoch 135/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2888 - accuracy: 0.7662 - val_loss: 0.8953 - val_accuracy: 0.7150
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2810 - accuracy: 0.7847 - val_loss: 0.8862 - val_accuracy: 0.7336
Epoch 137/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.2208 - accuracy: 0.7917 - val_loss: 0.8872 - val_accuracy: 0.7336
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2324 - accuracy: 0.7870 - val_loss: 0.9462 - val_accuracy: 0.7383
Epoch 139/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2913 - accuracy: 0.7731 - val_loss: 1.0016 - val_accuracy: 0.7383
Epoch 140/1000
4/4 [=====] - 0s 18ms/step - loss: 0.2946 - accuracy: 0.7593 - val_loss: 1.0325 - val_accuracy: 0.7477
Epoch 141/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2563 - accuracy: 0.7731 - val_loss: 0.9874 - val_accuracy: 0.7477
Epoch 142/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2599 - accuracy: 0.7778 - val_loss: 1.0984 - val_accuracy: 0.7430
Epoch 143/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2741 - accuracy: 0.7824 - val_loss: 1.0725 - val_accuracy: 0.7570
Epoch 144/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3020 - accuracy: 0.7870 - val_loss: 1.1243 - val_accuracy: 0.7336
Epoch 145/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2844 - accuracy: 0.7801 - val_loss: 1.1819 - val_accuracy: 0.7523
Epoch 146/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3016 - accuracy: 0.7940 - val_loss: 1.1332 - val_accuracy: 0.7570
Epoch 147/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2802 - accuracy: 0.7894 - val_loss: 1.1775 - val_accuracy: 0.7383
Epoch 148/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2503 - accuracy: 0.8009 - val_loss: 1.1402 - val_accuracy: 0.7290
Epoch 149/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2415 - accuracy: 0.7824 - val_loss: 1.1354 - val_accuracy: 0.7196
Epoch 150/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2347 - accuracy: 0.7662 - val_loss: 1.0828 - val_accuracy: 0.7243
Epoch 151/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2629 - accuracy: 0.7801 - val_loss: 1.1419 - val_accuracy: 0.6682
Epoch 152/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3312 - accuracy: 0.7500 - val_loss: 1.0972 - val_accuracy: 0.6495
Epoch 153/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2523 - accuracy: 0.7546 - val_loss: 1.0806 - val_accuracy: 0.6636
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3052 - accuracy: 0.7500 - val_loss: 1.1854 - val_accuracy: 0.6589
Epoch 155/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3796 - accuracy: 0.7500 - val_loss: 1.1108 - val_accuracy: 0.6636
Epoch 156/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2146 - accuracy: 0.7685 - val_loss: 1.0980 - val_accuracy: 0.7103
Epoch 157/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2079 - accuracy: 0.7500 - val_loss: 1.1416 - val_accuracy: 0.6776
Epoch 158/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2400 - accuracy: 0.7546 - val_loss: 1.1232 - val_accuracy: 0.6869
Epoch 159/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2585 - accuracy: 0.7361 - val_loss: 1.1305 - val_accuracy: 0.7056
Epoch 160/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2917 - accuracy: 0.7431 - val_loss: 1.1761 - val_accuracy: 0.6869
Epoch 161/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2105 - accuracy: 0.7407 - val_loss: 1.1988 - val_accuracy: 0.7103
Epoch 162/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3234 - accuracy: 0.7477 - val_loss: 1.1987 - val_accuracy: 0.7150
Epoch 163/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2604 - accuracy: 0.7407 - val_loss: 1.2638 - val_accuracy: 0.7056
Epoch 164/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2751 - accuracy: 0.7315 - val_loss: 1.2567 - val_accuracy: 0.7009
Epoch 165/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2466 - accuracy: 0.7269 - val_loss: 1.2945 - val_accuracy: 0.7243
Epoch 166/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2446 - accuracy: 0.7847 - val_loss: 1.3905 - val_accuracy: 0.7383
```

Epoch 167/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2152 - accuracy: 0.7523 - val_loss: 1.2401 - val_accuracy: 0.7056
Epoch 168/1000
4/4 [=====] - 0s 17ms/step - loss: 0.2477 - accuracy: 0.7639 - val_loss: 1.1904 - val_accuracy: 0.6869
Epoch 169/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2346 - accuracy: 0.7685 - val_loss: 1.1482 - val_accuracy: 0.6963
Epoch 170/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2538 - accuracy: 0.7755 - val_loss: 1.2150 - val_accuracy: 0.7056
Epoch 171/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2392 - accuracy: 0.7685 - val_loss: 1.4358 - val_accuracy: 0.7009
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3305 - accuracy: 0.7708 - val_loss: 1.2883 - val_accuracy: 0.6916
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2325 - accuracy: 0.7708 - val_loss: 1.2888 - val_accuracy: 0.7150
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3514 - accuracy: 0.7639 - val_loss: 1.2069 - val_accuracy: 0.7150
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3094 - accuracy: 0.7801 - val_loss: 1.3114 - val_accuracy: 0.6776
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3466 - accuracy: 0.7778 - val_loss: 1.2555 - val_accuracy: 0.7009
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2170 - accuracy: 0.7593 - val_loss: 1.3412 - val_accuracy: 0.7009
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2829 - accuracy: 0.7778 - val_loss: 1.3166 - val_accuracy: 0.7150
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2721 - accuracy: 0.7616 - val_loss: 1.3824 - val_accuracy: 0.7009
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2190 - accuracy: 0.7546 - val_loss: 1.3335 - val_accuracy: 0.7150
Epoch 181/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2861 - accuracy: 0.7384 - val_loss: 1.3488 - val_accuracy: 0.7103
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2511 - accuracy: 0.7685 - val_loss: 1.3592 - val_accuracy: 0.7056
Epoch 183/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2373 - accuracy: 0.7708 - val_loss: 1.2952 - val_accuracy: 0.7009
Epoch 184/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2370 - accuracy: 0.7917 - val_loss: 1.2145 - val_accuracy: 0.7196
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2370 - accuracy: 0.7986 - val_loss: 1.1855 - val_accuracy: 0.7243
Epoch 186/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2370 - accuracy: 0.7917 - val_loss: 1.1804 - val_accuracy: 0.6916
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2237 - accuracy: 0.7685 - val_loss: 1.2386 - val_accuracy: 0.6963
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2495 - accuracy: 0.7801 - val_loss: 1.2621 - val_accuracy: 0.7243
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2075 - accuracy: 0.7616 - val_loss: 1.2623 - val_accuracy: 0.7103
Epoch 190/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2850 - accuracy: 0.7778 - val_loss: 1.3544 - val_accuracy: 0.7056
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3056 - accuracy: 0.7662 - val_loss: 1.2150 - val_accuracy: 0.7056
Epoch 192/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2137 - accuracy: 0.7963 - val_loss: 1.2191 - val_accuracy: 0.6916
Epoch 193/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2610 - accuracy: 0.8009 - val_loss: 1.0964 - val_accuracy: 0.7243
Epoch 194/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2788 - accuracy: 0.7616 - val_loss: 1.0964 - val_accuracy: 0.7103
Epoch 195/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2329 - accuracy: 0.7685 - val_loss: 1.1461 - val_accuracy: 0.6963
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2397 - accuracy: 0.7546 - val_loss: 1.1198 - val_accuracy: 0.7009

```
accuracy: 0.7103
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2029 - accuracy: 0.7778 - val_loss: 1.1116 - val_
accuracy: 0.7150
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2556 - accuracy: 0.7731 - val_loss: 1.1074 - val_
accuracy: 0.7056
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1813 - accuracy: 0.7685 - val_loss: 1.0931 - val_
accuracy: 0.7009
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1991 - accuracy: 0.7847 - val_loss: 1.1278 - val_
accuracy: 0.6869
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2082 - accuracy: 0.7986 - val_loss: 1.1241 - val_
accuracy: 0.6776
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1824 - accuracy: 0.8102 - val_loss: 1.1457 - val_
accuracy: 0.6963
Epoch 203/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1891 - accuracy: 0.7940 - val_loss: 1.1028 - val_
accuracy: 0.7056
Epoch 204/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1801 - accuracy: 0.7824 - val_loss: 1.1318 - val_
accuracy: 0.7056
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2928 - accuracy: 0.8102 - val_loss: 1.2783 - val_
accuracy: 0.7056
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2767 - accuracy: 0.7731 - val_loss: 1.2143 - val_
accuracy: 0.7056
Epoch 207/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2018 - accuracy: 0.7685 - val_loss: 1.2437 - val_
accuracy: 0.7009
Epoch 208/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2094 - accuracy: 0.7546 - val_loss: 1.1438 - val_
accuracy: 0.6682
Epoch 209/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2816 - accuracy: 0.7639 - val_loss: 1.1438 - val_
accuracy: 0.6776
Epoch 210/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2608 - accuracy: 0.7685 - val_loss: 1.1646 - val_
accuracy: 0.6449
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2390 - accuracy: 0.7407 - val_loss: 1.1729 - val_
accuracy: 0.6495
Epoch 212/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3704 - accuracy: 0.7176 - val_loss: 1.2139 - val_
accuracy: 0.6542
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2069 - accuracy: 0.7616 - val_loss: 1.2037 - val_
accuracy: 0.6355
Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1966 - accuracy: 0.7685 - val_loss: 1.1950 - val_
accuracy: 0.6636
Epoch 215/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2302 - accuracy: 0.7847 - val_loss: 1.2019 - val_
accuracy: 0.6729
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1893 - accuracy: 0.7731 - val_loss: 1.2571 - val_
accuracy: 0.6402
Epoch 217/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2035 - accuracy: 0.7662 - val_loss: 1.2816 - val_
accuracy: 0.6682
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1774 - accuracy: 0.7662 - val_loss: 1.2710 - val_
accuracy: 0.6636
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2682 - accuracy: 0.7662 - val_loss: 1.3739 - val_
accuracy: 0.6729
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2273 - accuracy: 0.7477 - val_loss: 1.4615 - val_
accuracy: 0.6822
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3989 - accuracy: 0.7222 - val_loss: 1.4499 - val_
accuracy: 0.7009
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3088 - accuracy: 0.7384 - val_loss: 1.4320 - val_
accuracy: 0.7103
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2088 - accuracy: 0.7569 - val_loss: 1.4251 - val_
accuracy: 0.7150
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2458 - accuracy: 0.7616 - val_loss: 1.4039 - val_
accuracy: 0.7196
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2810 - accuracy: 0.7801 - val_loss: 1.3982 - val_
accuracy: 0.7196
Epoch 226/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.1982 - accuracy: 0.8079 - val_loss: 1.4272 - val_accuracy: 0.7056
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2401 - accuracy: 0.7755 - val_loss: 1.4492 - val_accuracy: 0.7383
Epoch 228/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2397 - accuracy: 0.7616 - val_loss: 1.4272 - val_accuracy: 0.7383
Epoch 229/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2944 - accuracy: 0.7477 - val_loss: 1.4552 - val_accuracy: 0.7477
Epoch 230/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1767 - accuracy: 0.7731 - val_loss: 1.4412 - val_accuracy: 0.7430
Epoch 231/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2364 - accuracy: 0.7569 - val_loss: 1.4911 - val_accuracy: 0.7336
Epoch 232/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2253 - accuracy: 0.7917 - val_loss: 1.4261 - val_accuracy: 0.7430
Epoch 233/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2366 - accuracy: 0.8241 - val_loss: 1.4015 - val_accuracy: 0.7523
Epoch 234/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2066 - accuracy: 0.8218 - val_loss: 1.3945 - val_accuracy: 0.7664
Epoch 235/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1958 - accuracy: 0.8009 - val_loss: 1.4868 - val_accuracy: 0.7477
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2863 - accuracy: 0.8241 - val_loss: 1.3852 - val_accuracy: 0.7570
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2084 - accuracy: 0.8148 - val_loss: 1.3782 - val_accuracy: 0.7523
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2309 - accuracy: 0.7685 - val_loss: 1.3511 - val_accuracy: 0.7664
Epoch 239/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2409 - accuracy: 0.8079 - val_loss: 1.2371 - val_accuracy: 0.7477
Epoch 240/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1657 - accuracy: 0.8218 - val_loss: 1.2508 - val_accuracy: 0.7290
Epoch 241/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3397 - accuracy: 0.8079 - val_loss: 1.4329 - val_accuracy: 0.7103
Epoch 242/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1634 - accuracy: 0.7963 - val_loss: 1.5093 - val_accuracy: 0.7243
Epoch 243/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1721 - accuracy: 0.7963 - val_loss: 1.4508 - val_accuracy: 0.7336
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2156 - accuracy: 0.7894 - val_loss: 1.4476 - val_accuracy: 0.7103
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2549 - accuracy: 0.7940 - val_loss: 1.3916 - val_accuracy: 0.7056
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1875 - accuracy: 0.7824 - val_loss: 1.3484 - val_accuracy: 0.7009
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1489 - accuracy: 0.7662 - val_loss: 1.3404 - val_accuracy: 0.7103
Epoch 248/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2513 - accuracy: 0.7731 - val_loss: 1.4118 - val_accuracy: 0.7103
Epoch 249/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1621 - accuracy: 0.7454 - val_loss: 1.4099 - val_accuracy: 0.6963
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1936 - accuracy: 0.7755 - val_loss: 1.3674 - val_accuracy: 0.7150
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2021 - accuracy: 0.7778 - val_loss: 1.3480 - val_accuracy: 0.7243
Epoch 252/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2711 - accuracy: 0.7894 - val_loss: 1.3769 - val_accuracy: 0.6776
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2125 - accuracy: 0.7639 - val_loss: 1.3074 - val_accuracy: 0.6776
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2465 - accuracy: 0.7662 - val_loss: 1.3537 - val_accuracy: 0.6729
Epoch 255/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2448 - accuracy: 0.7454 - val_loss: 1.3427 - val_accuracy: 0.6822
```

Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2117 - accuracy: 0.7755 - val_loss: 1.3039 - val_accuracy: 0.6916
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2362 - accuracy: 0.7639 - val_loss: 1.3836 - val_accuracy: 0.6822
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2026 - accuracy: 0.7546 - val_loss: 1.4365 - val_accuracy: 0.6776
Epoch 259/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1695 - accuracy: 0.7569 - val_loss: 1.3723 - val_accuracy: 0.6776
Epoch 260/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2076 - accuracy: 0.7477 - val_loss: 1.3382 - val_accuracy: 0.6963
Epoch 261/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2192 - accuracy: 0.7593 - val_loss: 1.3766 - val_accuracy: 0.6822
Epoch 262/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1954 - accuracy: 0.7755 - val_loss: 1.3859 - val_accuracy: 0.6869
Epoch 263/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1490 - accuracy: 0.7755 - val_loss: 1.3933 - val_accuracy: 0.6776
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2308 - accuracy: 0.7755 - val_loss: 1.4781 - val_accuracy: 0.6869
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2122 - accuracy: 0.7708 - val_loss: 1.3946 - val_accuracy: 0.6869
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1686 - accuracy: 0.7616 - val_loss: 1.4051 - val_accuracy: 0.7009
Epoch 267/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3574 - accuracy: 0.7245 - val_loss: 1.4191 - val_accuracy: 0.7009
Epoch 268/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2856 - accuracy: 0.7269 - val_loss: 1.4306 - val_accuracy: 0.7103
Epoch 269/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2949 - accuracy: 0.7593 - val_loss: 1.4620 - val_accuracy: 0.7243
Epoch 270/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1532 - accuracy: 0.7569 - val_loss: 1.4078 - val_accuracy: 0.7196
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1288 - accuracy: 0.7616 - val_loss: 1.4506 - val_accuracy: 0.7243
Epoch 272/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2137 - accuracy: 0.7454 - val_loss: 1.3695 - val_accuracy: 0.7383
Epoch 273/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1810 - accuracy: 0.7963 - val_loss: 1.3752 - val_accuracy: 0.7430
Epoch 274/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1731 - accuracy: 0.8009 - val_loss: 1.3663 - val_accuracy: 0.7290
Epoch 275/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1366 - accuracy: 0.7500 - val_loss: 1.3726 - val_accuracy: 0.7290
Epoch 276/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2179 - accuracy: 0.7963 - val_loss: 1.7500 - val_accuracy: 0.7056
Epoch 277/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1186 - accuracy: 0.7708 - val_loss: 1.5102 - val_accuracy: 0.7103
Epoch 278/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1778 - accuracy: 0.7847 - val_loss: 1.5662 - val_accuracy: 0.7196
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1080 - accuracy: 0.7824 - val_loss: 1.4541 - val_accuracy: 0.6869
Epoch 280/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1538 - accuracy: 0.7685 - val_loss: 1.4785 - val_accuracy: 0.6869
Epoch 281/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1466 - accuracy: 0.7662 - val_loss: 1.5173 - val_accuracy: 0.7009
Epoch 282/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2820 - accuracy: 0.7755 - val_loss: 1.5112 - val_accuracy: 0.7056
Epoch 283/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1858 - accuracy: 0.8009 - val_loss: 1.4630 - val_accuracy: 0.7056
Epoch 284/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1502 - accuracy: 0.7778 - val_loss: 1.5977 - val_accuracy: 0.7009
Epoch 285/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1815 - accuracy: 0.8079 - val_loss: 1.7476 - val_accuracy: 0.7009

```
accuracy: 0.6916
Epoch 286/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2258 - accuracy: 0.7847 - val_loss: 1.5488 - val_accuracy: 0.6963
Epoch 287/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1612 - accuracy: 0.8102 - val_loss: 1.4572 - val_accuracy: 0.6776
Epoch 288/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1398 - accuracy: 0.7708 - val_loss: 1.4214 - val_accuracy: 0.7009
Epoch 289/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1468 - accuracy: 0.7940 - val_loss: 1.4371 - val_accuracy: 0.7009
Epoch 290/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1517 - accuracy: 0.7894 - val_loss: 1.4705 - val_accuracy: 0.6963
Epoch 291/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2226 - accuracy: 0.7731 - val_loss: 1.5095 - val_accuracy: 0.6822
Epoch 292/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2194 - accuracy: 0.8148 - val_loss: 1.4235 - val_accuracy: 0.6869
Epoch 293/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2786 - accuracy: 0.8032 - val_loss: 1.4845 - val_accuracy: 0.6916
Epoch 294/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2383 - accuracy: 0.7616 - val_loss: 1.4648 - val_accuracy: 0.6916
Epoch 295/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3623 - accuracy: 0.7431 - val_loss: 1.4227 - val_accuracy: 0.6916
Epoch 296/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1817 - accuracy: 0.7708 - val_loss: 1.4188 - val_accuracy: 0.6963
Epoch 297/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2185 - accuracy: 0.7801 - val_loss: 1.5149 - val_accuracy: 0.6963
Epoch 298/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2052 - accuracy: 0.7824 - val_loss: 1.5062 - val_accuracy: 0.7009
Epoch 299/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2783 - accuracy: 0.8056 - val_loss: 1.7565 - val_accuracy: 0.6822
Epoch 300/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2198 - accuracy: 0.7894 - val_loss: 1.6082 - val_accuracy: 0.7056
Epoch 301/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1619 - accuracy: 0.7986 - val_loss: 1.4984 - val_accuracy: 0.6822
Epoch 302/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1469 - accuracy: 0.7847 - val_loss: 1.5326 - val_accuracy: 0.7009
Epoch 303/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1509 - accuracy: 0.7917 - val_loss: 1.4749 - val_accuracy: 0.7103
Epoch 304/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1649 - accuracy: 0.7801 - val_loss: 1.4352 - val_accuracy: 0.7009
Epoch 305/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1839 - accuracy: 0.7847 - val_loss: 1.4568 - val_accuracy: 0.7150
Epoch 306/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1634 - accuracy: 0.7801 - val_loss: 1.5365 - val_accuracy: 0.6963
Epoch 307/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1832 - accuracy: 0.8356 - val_loss: 1.4482 - val_accuracy: 0.7056
Epoch 308/1000
4/4 [=====] - 0s 20ms/step - loss: 0.1473 - accuracy: 0.7963 - val_loss: 1.5165 - val_accuracy: 0.7243
Epoch 309/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1494 - accuracy: 0.8032 - val_loss: 1.4731 - val_accuracy: 0.7243
Epoch 310/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1841 - accuracy: 0.8009 - val_loss: 1.4461 - val_accuracy: 0.7430
Epoch 311/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1896 - accuracy: 0.8032 - val_loss: 1.6305 - val_accuracy: 0.7056
Epoch 312/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1970 - accuracy: 0.7778 - val_loss: 1.6486 - val_accuracy: 0.7150
Epoch 313/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1737 - accuracy: 0.8125 - val_loss: 1.7341 - val_accuracy: 0.7056
Epoch 314/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1928 - accuracy: 0.8009 - val_loss: 1.6443 - val_accuracy: 0.7056
Epoch 315/1000
```

```
4/4 [=====] - 0s 17ms/step - loss: 0.2218 - accuracy: 0.7940 - val_loss: 1.7083 - val_accuracy: 0.7056
Epoch 316/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2209 - accuracy: 0.8009 - val_loss: 1.6145 - val_accuracy: 0.7150
Epoch 317/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1307 - accuracy: 0.7963 - val_loss: 1.5476 - val_accuracy: 0.6963
Epoch 318/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1064 - accuracy: 0.7986 - val_loss: 1.6595 - val_accuracy: 0.6869
Epoch 319/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1004 - accuracy: 0.8009 - val_loss: 1.6112 - val_accuracy: 0.7009
Epoch 320/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2886 - accuracy: 0.7963 - val_loss: 1.5914 - val_accuracy: 0.7103
Epoch 321/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2415 - accuracy: 0.7963 - val_loss: 1.5757 - val_accuracy: 0.7103
Epoch 322/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1718 - accuracy: 0.8079 - val_loss: 1.5781 - val_accuracy: 0.6916
Epoch 323/1000
4/4 [=====] - 0s 18ms/step - loss: 0.2098 - accuracy: 0.7917 - val_loss: 1.6103 - val_accuracy: 0.7056
Epoch 324/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1654 - accuracy: 0.7801 - val_loss: 1.5749 - val_accuracy: 0.7383
Epoch 325/1000
4/4 [=====] - 0s 22ms/step - loss: 0.1056 - accuracy: 0.7986 - val_loss: 1.6270 - val_accuracy: 0.7477
Epoch 326/1000
4/4 [=====] - 0s 18ms/step - loss: 0.1237 - accuracy: 0.8079 - val_loss: 1.6376 - val_accuracy: 0.7290
Epoch 327/1000
4/4 [=====] - 0s 17ms/step - loss: 0.1540 - accuracy: 0.7801 - val_loss: 1.6100 - val_accuracy: 0.7430
Epoch 328/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1088 - accuracy: 0.8032 - val_loss: 1.6721 - val_accuracy: 0.7336
Epoch 329/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1875 - accuracy: 0.7986 - val_loss: 1.5522 - val_accuracy: 0.7430
Epoch 330/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1539 - accuracy: 0.8009 - val_loss: 1.5652 - val_accuracy: 0.7243
Epoch 331/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1308 - accuracy: 0.8102 - val_loss: 1.4839 - val_accuracy: 0.7103
Epoch 332/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2109 - accuracy: 0.8079 - val_loss: 1.5896 - val_accuracy: 0.7290
Epoch 333/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1456 - accuracy: 0.8056 - val_loss: 1.6061 - val_accuracy: 0.7196
Epoch 334/1000
4/4 [=====] - 0s 18ms/step - loss: 0.2619 - accuracy: 0.8125 - val_loss: 1.5999 - val_accuracy: 0.6869
Epoch 335/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1290 - accuracy: 0.8310 - val_loss: 1.5482 - val_accuracy: 0.6963
Epoch 336/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2485 - accuracy: 0.7778 - val_loss: 1.5899 - val_accuracy: 0.7009
Epoch 337/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1624 - accuracy: 0.8287 - val_loss: 1.4659 - val_accuracy: 0.7009
Epoch 338/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1868 - accuracy: 0.8102 - val_loss: 1.5580 - val_accuracy: 0.7056
Epoch 339/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1579 - accuracy: 0.7778 - val_loss: 1.5655 - val_accuracy: 0.6869
Epoch 340/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1093 - accuracy: 0.8264 - val_loss: 1.6366 - val_accuracy: 0.7150
Epoch 341/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2019 - accuracy: 0.7870 - val_loss: 1.7158 - val_accuracy: 0.7430
Epoch 342/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1675 - accuracy: 0.8241 - val_loss: 1.5697 - val_accuracy: 0.7196
Epoch 343/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1455 - accuracy: 0.8310 - val_loss: 1.5213 - val_accuracy: 0.7336
Epoch 344/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1770 - accuracy: 0.8241 - val_loss: 1.4874 - val_accuracy: 0.7430
```

Epoch 345/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1728 - accuracy: 0.8009 - val_loss: 1.4944 - val_accuracy: 0.7150
Epoch 346/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1157 - accuracy: 0.8333 - val_loss: 1.5910 - val_accuracy: 0.7243
Epoch 347/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1796 - accuracy: 0.7894 - val_loss: 1.5697 - val_accuracy: 0.6916
Epoch 348/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1027 - accuracy: 0.8125 - val_loss: 1.4699 - val_accuracy: 0.7056
Epoch 349/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1022 - accuracy: 0.8009 - val_loss: 1.4510 - val_accuracy: 0.7290
Epoch 350/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2070 - accuracy: 0.8079 - val_loss: 1.4577 - val_accuracy: 0.7336
Epoch 351/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1577 - accuracy: 0.8310 - val_loss: 1.4579 - val_accuracy: 0.7477
Epoch 352/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0998 - accuracy: 0.8356 - val_loss: 1.6084 - val_accuracy: 0.7477
Epoch 353/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1866 - accuracy: 0.7847 - val_loss: 1.7479 - val_accuracy: 0.6916
Epoch 354/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1076 - accuracy: 0.7778 - val_loss: 1.5328 - val_accuracy: 0.7196
Epoch 355/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1078 - accuracy: 0.8171 - val_loss: 1.6261 - val_accuracy: 0.7290
Epoch 356/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1573 - accuracy: 0.8056 - val_loss: 1.5192 - val_accuracy: 0.7477
Epoch 357/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3008 - accuracy: 0.7894 - val_loss: 1.6345 - val_accuracy: 0.7243
Epoch 358/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2714 - accuracy: 0.8171 - val_loss: 1.6287 - val_accuracy: 0.7150
Epoch 359/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1322 - accuracy: 0.8148 - val_loss: 1.6207 - val_accuracy: 0.7150
Epoch 360/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1704 - accuracy: 0.8194 - val_loss: 1.5872 - val_accuracy: 0.7196
Epoch 361/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1951 - accuracy: 0.8079 - val_loss: 1.5832 - val_accuracy: 0.7196
Epoch 362/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1517 - accuracy: 0.8218 - val_loss: 1.5206 - val_accuracy: 0.7196
Epoch 363/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2446 - accuracy: 0.7963 - val_loss: 1.6193 - val_accuracy: 0.7570
Epoch 364/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1567 - accuracy: 0.8264 - val_loss: 1.5733 - val_accuracy: 0.7617
Epoch 365/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1209 - accuracy: 0.8218 - val_loss: 1.6952 - val_accuracy: 0.7477
Epoch 366/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1934 - accuracy: 0.7917 - val_loss: 1.6303 - val_accuracy: 0.7477
Epoch 367/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0935 - accuracy: 0.8125 - val_loss: 1.6075 - val_accuracy: 0.7383
Epoch 368/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1036 - accuracy: 0.7824 - val_loss: 1.6548 - val_accuracy: 0.7383
Epoch 369/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1189 - accuracy: 0.8194 - val_loss: 1.5853 - val_accuracy: 0.7336
Epoch 370/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1591 - accuracy: 0.8102 - val_loss: 1.6097 - val_accuracy: 0.7383
Epoch 371/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1812 - accuracy: 0.7870 - val_loss: 1.6585 - val_accuracy: 0.7336
Epoch 372/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0928 - accuracy: 0.8125 - val_loss: 1.6963 - val_accuracy: 0.7336
Epoch 373/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1253 - accuracy: 0.8079 - val_loss: 1.7415 - val_accuracy: 0.7430
Epoch 374/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1325 - accuracy: 0.7986 - val_loss: 1.7389 - val_accuracy: 0.7389

```

accuracy: 0.7150
Epoch 375/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1814 - accuracy: 0.7986 - val_loss: 1.7327 - val_
accuracy: 0.7103
Epoch 376/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1370 - accuracy: 0.7060 - val_loss: 1.6415 - val_
accuracy: 0.7150
Epoch 377/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2318 - accuracy: 0.7315 - val_loss: 1.7018 - val_
accuracy: 0.7056
Epoch 378/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1841 - accuracy: 0.7454 - val_loss: 1.7108 - val_
accuracy: 0.6916
Epoch 379/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2500 - accuracy: 0.7130 - val_loss: 1.7164 - val_
accuracy: 0.6776
Epoch 380/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1614 - accuracy: 0.7431 - val_loss: 1.7540 - val_
accuracy: 0.6869
Epoch 381/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1196 - accuracy: 0.7569 - val_loss: 1.6176 - val_
accuracy: 0.6822
Epoch 382/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2144 - accuracy: 0.7824 - val_loss: 1.6504 - val_
accuracy: 0.6916
Epoch 383/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1138 - accuracy: 0.7870 - val_loss: 1.5858 - val_
accuracy: 0.7196
Epoch 384/1000
1/4 [====> .....] - ETA: 0s - loss: 0.0785 - accuracy: 0.7500Restoring model weights from th
e end of the best epoch: 234.
4/4 [=====] - 0s 14ms/step - loss: 0.1067 - accuracy: 0.7662 - val_loss: 1.5223 - val_
accuracy: 0.6916
Epoch 384: early stopping

```

Out[43]:

```

> RandomizedSearchCV
> estimator: KerasClassifier
    > KerasClassifier

```

In [44]:

```

best_acc = 0.5

# Wykonywanie ileś razy, by mieć najlepszy podział
for i in range(10):
    history_Adam = History()
    Dense1, Dense2 = rnd_search_cv.best_params_['Dense1'], rnd_search_cv.best_params_['Dense2']

    model_cat = Sequential()
    model_cat.add(Dense(Dense1, activation="relu", input_shape=(X_train.shape[1],)))
    model_cat.add(BatchNormalization())
    model_cat.add(Activation("relu"))
    model_cat.add(Dense(Dense2, activation="relu"))
    model_cat.add(BatchNormalization())
    model_cat.add(Activation("relu"))

    model_cat.add(Dense(10, activation="relu"))
    model_cat.add(BatchNormalization())
    model_cat.add(Activation("relu"))
    model_cat.add(Dense(2, activation="relu"))
    model_cat.summary()

    model_cat.compile(loss="binary_crossentropy", optimizer="Rmsprop", metrics=["accuracy"])

    model_cat.fit(X_train, y_train, validation_data= (sc.transform(X_val), y_val), batch_size=128, epochs=1000,
wynik = model_cat.evaluate(sc.transform(X_val), y_val)
    if wynik[1] > best_acc:
        best_history = history_Adam
        best_model = model_cat
        best_acc = wynik[1]

```

Model: "sequential_100"

Layer (type)	Output Shape	Param #
<hr/>		
dense_400 (Dense)	(None, 50)	350
batch_normalization_300 (BatchNormalization)	(None, 50)	200
activation_300 (Activation)	(None, 50)	0
dense_401 (Dense)	(None, 50)	2550
batch_normalization_301 (BatchNormalization)	(None, 50)	200

activation_301 (Activation)	(None, 50)	0
dense_402 (Dense)	(None, 10)	510
batch_normalization_302 (BatchNormalization)	(None, 10)	40
activation_302 (Activation)	(None, 10)	0
dense_403 (Dense)	(None, 2)	22

=====

Total params: 3,872
Trainable params: 3,652
Non-trainable params: 220

Epoch 1/1000
4/4 [=====] - 1s 53ms/step - loss: 4.8178 - accuracy: 0.5139 - val_loss: 5.1767 - val_accuracy: 0.4439
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4828 - accuracy: 0.5139 - val_loss: 4.1641 - val_accuracy: 0.4626
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1016 - accuracy: 0.4931 - val_loss: 3.4831 - val_accuracy: 0.4766
Epoch 4/1000
4/4 [=====] - 0s 15ms/step - loss: 2.9171 - accuracy: 0.5370 - val_loss: 2.9456 - val_accuracy: 0.5000
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 2.5419 - accuracy: 0.5394 - val_loss: 2.3971 - val_accuracy: 0.5607
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1340 - accuracy: 0.5463 - val_loss: 2.2937 - val_accuracy: 0.5327
Epoch 7/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0704 - accuracy: 0.5301 - val_loss: 2.2165 - val_accuracy: 0.5561
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9970 - accuracy: 0.5417 - val_loss: 2.1064 - val_accuracy: 0.6308
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9388 - accuracy: 0.5440 - val_loss: 2.0690 - val_accuracy: 0.6215
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7573 - accuracy: 0.5440 - val_loss: 2.0262 - val_accuracy: 0.6262
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7191 - accuracy: 0.5486 - val_loss: 1.9362 - val_accuracy: 0.6215
Epoch 12/1000
4/4 [=====] - 0s 15ms/step - loss: 1.7343 - accuracy: 0.5486 - val_loss: 1.8229 - val_accuracy: 0.6449
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6527 - accuracy: 0.5440 - val_loss: 1.7845 - val_accuracy: 0.6402
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7114 - accuracy: 0.5231 - val_loss: 1.8041 - val_accuracy: 0.6215
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5766 - accuracy: 0.5486 - val_loss: 1.7888 - val_accuracy: 0.6168
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6105 - accuracy: 0.5255 - val_loss: 1.7396 - val_accuracy: 0.6168
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3989 - accuracy: 0.5463 - val_loss: 1.7166 - val_accuracy: 0.6262
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3011 - accuracy: 0.5671 - val_loss: 1.7206 - val_accuracy: 0.6168
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3844 - accuracy: 0.5625 - val_loss: 1.6956 - val_accuracy: 0.5981
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3616 - accuracy: 0.5463 - val_loss: 1.7020 - val_accuracy: 0.5935
Epoch 21/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2649 - accuracy: 0.5486 - val_loss: 1.6606 - val_accuracy: 0.5981
Epoch 22/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2091 - accuracy: 0.5602 - val_loss: 1.6644 - val_accuracy: 0.6822
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1776 - accuracy: 0.5949 - val_loss: 1.6374 - val_accuracy: 0.6729
Epoch 24/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1573 - accuracy: 0.5810 - val_loss: 1.5506 - val_accuracy: 0.6963
Epoch 25/1000

```
4/4 [=====] - 0s 14ms/step - loss: 1.1449 - accuracy: 0.5972 - val_loss: 1.5347 - val_accuracy: 0.6822
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0834 - accuracy: 0.5833 - val_loss: 1.5124 - val_accuracy: 0.6355
Epoch 27/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1400 - accuracy: 0.5718 - val_loss: 1.5559 - val_accuracy: 0.7103
Epoch 28/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9648 - accuracy: 0.5995 - val_loss: 1.5167 - val_accuracy: 0.6729
Epoch 29/1000
4/4 [=====] - 0s 15ms/step - loss: 1.0386 - accuracy: 0.6319 - val_loss: 1.4882 - val_accuracy: 0.7243
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0091 - accuracy: 0.6157 - val_loss: 1.4662 - val_accuracy: 0.7009
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0119 - accuracy: 0.6088 - val_loss: 1.4453 - val_accuracy: 0.5981
Epoch 32/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8435 - accuracy: 0.6181 - val_loss: 1.4369 - val_accuracy: 0.5748
Epoch 33/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9103 - accuracy: 0.6204 - val_loss: 1.3892 - val_accuracy: 0.5093
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8499 - accuracy: 0.6273 - val_loss: 1.3474 - val_accuracy: 0.5654
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8602 - accuracy: 0.6296 - val_loss: 1.2462 - val_accuracy: 0.4860
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8098 - accuracy: 0.6574 - val_loss: 1.2636 - val_accuracy: 0.5327
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7766 - accuracy: 0.6435 - val_loss: 1.2251 - val_accuracy: 0.4953
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6708 - accuracy: 0.6620 - val_loss: 1.2471 - val_accuracy: 0.5093
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6261 - accuracy: 0.6227 - val_loss: 1.2190 - val_accuracy: 0.4953
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7044 - accuracy: 0.6458 - val_loss: 1.1940 - val_accuracy: 0.4907
Epoch 41/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6697 - accuracy: 0.6343 - val_loss: 1.1653 - val_accuracy: 0.5093
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7795 - accuracy: 0.6366 - val_loss: 1.1458 - val_accuracy: 0.5093
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6625 - accuracy: 0.6319 - val_loss: 1.1511 - val_accuracy: 0.5467
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6858 - accuracy: 0.6505 - val_loss: 1.1027 - val_accuracy: 0.5981
Epoch 45/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6394 - accuracy: 0.6296 - val_loss: 1.0581 - val_accuracy: 0.6308
Epoch 46/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5742 - accuracy: 0.6597 - val_loss: 1.0448 - val_accuracy: 0.6589
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5418 - accuracy: 0.6620 - val_loss: 1.0354 - val_accuracy: 0.6869
Epoch 48/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5946 - accuracy: 0.6898 - val_loss: 1.0650 - val_accuracy: 0.7150
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4744 - accuracy: 0.6991 - val_loss: 1.0736 - val_accuracy: 0.7009
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4617 - accuracy: 0.6968 - val_loss: 1.0812 - val_accuracy: 0.7150
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5000 - accuracy: 0.6875 - val_loss: 1.0720 - val_accuracy: 0.7056
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4565 - accuracy: 0.6736 - val_loss: 1.0127 - val_accuracy: 0.7009
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5670 - accuracy: 0.6875 - val_loss: 0.9388 - val_accuracy: 0.6963
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5184 - accuracy: 0.6875 - val_loss: 0.9366 - val_accuracy: 0.6963
```

Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3924 - accuracy: 0.6921 - val_loss: 0.9930 - val_accuracy: 0.7103
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3990 - accuracy: 0.6991 - val_loss: 0.9901 - val_accuracy: 0.6869
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5029 - accuracy: 0.6829 - val_loss: 0.9363 - val_accuracy: 0.6776
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5415 - accuracy: 0.6690 - val_loss: 0.8883 - val_accuracy: 0.6636
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4397 - accuracy: 0.6782 - val_loss: 0.8970 - val_accuracy: 0.6776
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4307 - accuracy: 0.6944 - val_loss: 0.8935 - val_accuracy: 0.6963
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4031 - accuracy: 0.6875 - val_loss: 0.8710 - val_accuracy: 0.6449
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3957 - accuracy: 0.6343 - val_loss: 0.8801 - val_accuracy: 0.6308
Epoch 63/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4180 - accuracy: 0.6250 - val_loss: 0.8604 - val_accuracy: 0.6916
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4103 - accuracy: 0.6782 - val_loss: 0.8178 - val_accuracy: 0.6869
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4261 - accuracy: 0.6644 - val_loss: 0.7948 - val_accuracy: 0.6869
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3887 - accuracy: 0.6736 - val_loss: 0.7629 - val_accuracy: 0.7056
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3679 - accuracy: 0.6667 - val_loss: 0.7872 - val_accuracy: 0.6682
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3679 - accuracy: 0.6644 - val_loss: 0.8203 - val_accuracy: 0.6589
Epoch 69/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4541 - accuracy: 0.6644 - val_loss: 0.7607 - val_accuracy: 0.6636
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3502 - accuracy: 0.6944 - val_loss: 0.7468 - val_accuracy: 0.6589
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4373 - accuracy: 0.6597 - val_loss: 0.7197 - val_accuracy: 0.6495
Epoch 72/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4293 - accuracy: 0.6574 - val_loss: 0.7231 - val_accuracy: 0.6916
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4184 - accuracy: 0.6157 - val_loss: 0.6935 - val_accuracy: 0.6121
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3637 - accuracy: 0.6111 - val_loss: 0.6841 - val_accuracy: 0.6308
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4513 - accuracy: 0.6065 - val_loss: 0.6739 - val_accuracy: 0.6355
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3691 - accuracy: 0.6343 - val_loss: 0.6674 - val_accuracy: 0.6262
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3221 - accuracy: 0.6435 - val_loss: 0.6980 - val_accuracy: 0.6355
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3882 - accuracy: 0.6273 - val_loss: 0.6616 - val_accuracy: 0.6262
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2959 - accuracy: 0.6481 - val_loss: 0.6658 - val_accuracy: 0.6168
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2725 - accuracy: 0.6343 - val_loss: 0.6512 - val_accuracy: 0.6449
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3353 - accuracy: 0.6412 - val_loss: 0.6495 - val_accuracy: 0.6589
Epoch 82/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3613 - accuracy: 0.6250 - val_loss: 0.6608 - val_accuracy: 0.6495
Epoch 83/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3067 - accuracy: 0.6296 - val_loss: 0.6568 - val_accuracy: 0.6449
Epoch 84/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3443 - accuracy: 0.6366 - val_loss: 0.6286 - val_accuracy: 0.6286

```
accuracy: 0.6449
Epoch 85/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3046 - accuracy: 0.6250 - val_loss: 0.6544 - val_accuracy: 0.6262
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3611 - accuracy: 0.6551 - val_loss: 0.6406 - val_accuracy: 0.6308
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2814 - accuracy: 0.6620 - val_loss: 0.6328 - val_accuracy: 0.6449
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3317 - accuracy: 0.6759 - val_loss: 0.6662 - val_accuracy: 0.6492
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2641 - accuracy: 0.6366 - val_loss: 0.6849 - val_accuracy: 0.6355
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2799 - accuracy: 0.6736 - val_loss: 0.6844 - val_accuracy: 0.6355
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2673 - accuracy: 0.6644 - val_loss: 0.6949 - val_accuracy: 0.6308
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2550 - accuracy: 0.6898 - val_loss: 0.7406 - val_accuracy: 0.6495
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3692 - accuracy: 0.6551 - val_loss: 0.7090 - val_accuracy: 0.6262
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2922 - accuracy: 0.6574 - val_loss: 0.7397 - val_accuracy: 0.6262
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2421 - accuracy: 0.6574 - val_loss: 0.7934 - val_accuracy: 0.6262
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2252 - accuracy: 0.6690 - val_loss: 0.7836 - val_accuracy: 0.6308
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2707 - accuracy: 0.6412 - val_loss: 0.7429 - val_accuracy: 0.6308
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2282 - accuracy: 0.6481 - val_loss: 0.7147 - val_accuracy: 0.6355
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2917 - accuracy: 0.6296 - val_loss: 0.7103 - val_accuracy: 0.6215
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2566 - accuracy: 0.6574 - val_loss: 0.8098 - val_accuracy: 0.6449
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2865 - accuracy: 0.6412 - val_loss: 0.7274 - val_accuracy: 0.6355
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2587 - accuracy: 0.6435 - val_loss: 0.7594 - val_accuracy: 0.6402
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2207 - accuracy: 0.6412 - val_loss: 0.7950 - val_accuracy: 0.6308
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2160 - accuracy: 0.6667 - val_loss: 0.8112 - val_accuracy: 0.6402
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2444 - accuracy: 0.6551 - val_loss: 0.8096 - val_accuracy: 0.6355
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2549 - accuracy: 0.6620 - val_loss: 0.7627 - val_accuracy: 0.6308
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2377 - accuracy: 0.6713 - val_loss: 0.8260 - val_accuracy: 0.6308
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2061 - accuracy: 0.6366 - val_loss: 0.7879 - val_accuracy: 0.6449
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2616 - accuracy: 0.6505 - val_loss: 0.7907 - val_accuracy: 0.6355
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2287 - accuracy: 0.6435 - val_loss: 0.8117 - val_accuracy: 0.6402
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3503 - accuracy: 0.6389 - val_loss: 0.8250 - val_accuracy: 0.6495
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2390 - accuracy: 0.6019 - val_loss: 0.8147 - val_accuracy: 0.6495
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2519 - accuracy: 0.6065 - val_loss: 0.8071 - val_accuracy: 0.6449
Epoch 114/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.2950 - accuracy: 0.6181 - val_loss: 0.8075 - val_accuracy: 0.6449
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2743 - accuracy: 0.6273 - val_loss: 0.8095 - val_accuracy: 0.6495
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2402 - accuracy: 0.6088 - val_loss: 0.7977 - val_accuracy: 0.6402
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2097 - accuracy: 0.6273 - val_loss: 0.8005 - val_accuracy: 0.6262
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2440 - accuracy: 0.6065 - val_loss: 0.8202 - val_accuracy: 0.6121
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4070 - accuracy: 0.6181 - val_loss: 0.8955 - val_accuracy: 0.6402
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2675 - accuracy: 0.6065 - val_loss: 0.8162 - val_accuracy: 0.6542
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3359 - accuracy: 0.6019 - val_loss: 0.8382 - val_accuracy: 0.6355
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2363 - accuracy: 0.6157 - val_loss: 0.8370 - val_accuracy: 0.6495
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2180 - accuracy: 0.6250 - val_loss: 0.8099 - val_accuracy: 0.6449
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2635 - accuracy: 0.6551 - val_loss: 0.8862 - val_accuracy: 0.6308
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1769 - accuracy: 0.6319 - val_loss: 0.8718 - val_accuracy: 0.6308
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1930 - accuracy: 0.6389 - val_loss: 0.8662 - val_accuracy: 0.6355
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2137 - accuracy: 0.6366 - val_loss: 0.8886 - val_accuracy: 0.6542
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2578 - accuracy: 0.6528 - val_loss: 0.8912 - val_accuracy: 0.6495
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2509 - accuracy: 0.6806 - val_loss: 0.8976 - val_accuracy: 0.6682
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2008 - accuracy: 0.6505 - val_loss: 0.9132 - val_accuracy: 0.6495
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2998 - accuracy: 0.6574 - val_loss: 0.8104 - val_accuracy: 0.6542
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2341 - accuracy: 0.6644 - val_loss: 0.8408 - val_accuracy: 0.6402
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1928 - accuracy: 0.6759 - val_loss: 0.7487 - val_accuracy: 0.6402
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2259 - accuracy: 0.6759 - val_loss: 0.7542 - val_accuracy: 0.6355
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2544 - accuracy: 0.6875 - val_loss: 0.8761 - val_accuracy: 0.6495
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2040 - accuracy: 0.6690 - val_loss: 0.8123 - val_accuracy: 0.6495
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2342 - accuracy: 0.6713 - val_loss: 0.8285 - val_accuracy: 0.6308
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2496 - accuracy: 0.6667 - val_loss: 0.8456 - val_accuracy: 0.6355
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2793 - accuracy: 0.6944 - val_loss: 0.9089 - val_accuracy: 0.6168
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2058 - accuracy: 0.7037 - val_loss: 0.9040 - val_accuracy: 0.6308
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1895 - accuracy: 0.6898 - val_loss: 0.9075 - val_accuracy: 0.6262
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1789 - accuracy: 0.6759 - val_loss: 0.8478 - val_accuracy: 0.6262
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2309 - accuracy: 0.6736 - val_loss: 0.9377 - val_accuracy: 0.6262
```

Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3012 - accuracy: 0.6852 - val_loss: 0.9536 - val_accuracy: 0.6308
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2229 - accuracy: 0.7060 - val_loss: 1.0306 - val_accuracy: 0.6355
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1876 - accuracy: 0.6875 - val_loss: 1.0253 - val_accuracy: 0.6449
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1909 - accuracy: 0.7060 - val_loss: 0.9849 - val_accuracy: 0.6402
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1997 - accuracy: 0.6898 - val_loss: 1.0650 - val_accuracy: 0.6495
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2613 - accuracy: 0.6944 - val_loss: 0.9977 - val_accuracy: 0.6589
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2111 - accuracy: 0.6968 - val_loss: 1.0141 - val_accuracy: 0.6308
Epoch 151/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1867 - accuracy: 0.7199 - val_loss: 1.0358 - val_accuracy: 0.6262
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2462 - accuracy: 0.6991 - val_loss: 1.0811 - val_accuracy: 0.6168
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2419 - accuracy: 0.6921 - val_loss: 1.0623 - val_accuracy: 0.6308
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2260 - accuracy: 0.7014 - val_loss: 1.0543 - val_accuracy: 0.6308
Epoch 155/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2328 - accuracy: 0.7153 - val_loss: 1.0950 - val_accuracy: 0.6308
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2415 - accuracy: 0.7083 - val_loss: 1.1076 - val_accuracy: 0.6168
Epoch 157/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1930 - accuracy: 0.6968 - val_loss: 1.0499 - val_accuracy: 0.6168
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2039 - accuracy: 0.7130 - val_loss: 1.0972 - val_accuracy: 0.6121
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1848 - accuracy: 0.7060 - val_loss: 1.1124 - val_accuracy: 0.6028
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2827 - accuracy: 0.6852 - val_loss: 0.9606 - val_accuracy: 0.6168
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2391 - accuracy: 0.7292 - val_loss: 1.0814 - val_accuracy: 0.6215
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1918 - accuracy: 0.7199 - val_loss: 1.0626 - val_accuracy: 0.6168
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2206 - accuracy: 0.7176 - val_loss: 1.1042 - val_accuracy: 0.6168
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2122 - accuracy: 0.7176 - val_loss: 1.0726 - val_accuracy: 0.6168
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2466 - accuracy: 0.7153 - val_loss: 1.0539 - val_accuracy: 0.6028
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1787 - accuracy: 0.7130 - val_loss: 1.0762 - val_accuracy: 0.6075
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1964 - accuracy: 0.6829 - val_loss: 1.0211 - val_accuracy: 0.5888
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2455 - accuracy: 0.6968 - val_loss: 1.0258 - val_accuracy: 0.5888
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2012 - accuracy: 0.6782 - val_loss: 1.1322 - val_accuracy: 0.5981
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1746 - accuracy: 0.6620 - val_loss: 1.0082 - val_accuracy: 0.5935
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1561 - accuracy: 0.7060 - val_loss: 1.0568 - val_accuracy: 0.5981
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2550 - accuracy: 0.6806 - val_loss: 1.0054 - val_accuracy: 0.5935
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2023 - accuracy: 0.6921 - val_loss: 0.9852 - val_accuracy: 0.5935

```

accuracy: 0.6028
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1914 - accuracy: 0.7153 - val_loss: 1.0714 - val_
accuracy: 0.6075
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1680 - accuracy: 0.7037 - val_loss: 1.0399 - val_
accuracy: 0.6075
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2017 - accuracy: 0.6944 - val_loss: 0.9992 - val_
accuracy: 0.5981
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1785 - accuracy: 0.6505 - val_loss: 1.0253 - val_
accuracy: 0.5935
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1666 - accuracy: 0.6852 - val_loss: 0.9852 - val_
accuracy: 0.6262
Epoch 179/1000
1/4 [====>.....] - ETA: 0s - loss: 0.1872 - accuracy: 0.6797Restoring model weights from th
e end of the best epoch: 29.
4/4 [=====] - 0s 14ms/step - loss: 0.1688 - accuracy: 0.6829 - val_loss: 1.0630 - val_
accuracy: 0.6262
Epoch 179: early stopping
7/7 [=====] - 0s 2ms/step - loss: 1.4883 - accuracy: 0.7243
Model: "sequential_101"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_404 (Dense)	(None, 50)	350
batch_normalization_303 (BatchNormalization)	(None, 50)	200
activation_303 (Activation)	(None, 50)	0
dense_405 (Dense)	(None, 50)	2550
batch_normalization_304 (BatchNormalization)	(None, 50)	200
activation_304 (Activation)	(None, 50)	0
dense_406 (Dense)	(None, 10)	510
batch_normalization_305 (BatchNormalization)	(None, 10)	40
activation_305 (Activation)	(None, 10)	0
dense_407 (Dense)	(None, 2)	22
<hr/>		
Total params: 3,872		
Trainable params: 3,652		
Non-trainable params: 220		

```

Epoch 1/1000
4/4 [=====] - 1s 56ms/step - loss: 3.7477 - accuracy: 0.5764 - val_loss: 5.6696 - val_
accuracy: 0.4579
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6059 - accuracy: 0.6481 - val_loss: 5.5595 - val_
accuracy: 0.4626
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5472 - accuracy: 0.6620 - val_loss: 4.3860 - val_
accuracy: 0.4673
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1955 - accuracy: 0.6759 - val_loss: 3.7074 - val_
accuracy: 0.4953
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0114 - accuracy: 0.6898 - val_loss: 3.2478 - val_
accuracy: 0.5374
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8462 - accuracy: 0.6921 - val_loss: 2.8155 - val_
accuracy: 0.5514
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7281 - accuracy: 0.6759 - val_loss: 2.6570 - val_
accuracy: 0.6355
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 1.7046 - accuracy: 0.6713 - val_loss: 2.3980 - val_
accuracy: 0.6776
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6836 - accuracy: 0.6620 - val_loss: 2.3005 - val_
accuracy: 0.6916
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5364 - accuracy: 0.6898 - val_loss: 2.1324 - val_
accuracy: 0.7009
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5390 - accuracy: 0.7176 - val_loss: 2.0770 - val_
accuracy: 0.6869
Epoch 12/1000

```

4/4 [=====] - 0s 14ms/step - loss: 1.3876 - accuracy: 0.6944 - val_loss: 2.0181 - val_accuracy: 0.6916
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2904 - accuracy: 0.7130 - val_loss: 1.9603 - val_accuracy: 0.6449
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3249 - accuracy: 0.6898 - val_loss: 1.8933 - val_accuracy: 0.6542
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2814 - accuracy: 0.7222 - val_loss: 1.8392 - val_accuracy: 0.6589
Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3340 - accuracy: 0.7222 - val_loss: 1.7913 - val_accuracy: 0.6869
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2272 - accuracy: 0.7130 - val_loss: 1.7208 - val_accuracy: 0.6589
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1557 - accuracy: 0.7361 - val_loss: 1.6753 - val_accuracy: 0.6963
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2025 - accuracy: 0.7315 - val_loss: 1.6437 - val_accuracy: 0.6869
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0025 - accuracy: 0.7384 - val_loss: 1.6007 - val_accuracy: 0.6729
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0999 - accuracy: 0.7454 - val_loss: 1.6013 - val_accuracy: 0.6916
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9884 - accuracy: 0.7454 - val_loss: 1.5544 - val_accuracy: 0.6729
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0873 - accuracy: 0.7338 - val_loss: 1.5392 - val_accuracy: 0.7103
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9340 - accuracy: 0.7500 - val_loss: 1.5025 - val_accuracy: 0.6963
Epoch 25/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8983 - accuracy: 0.7685 - val_loss: 1.4794 - val_accuracy: 0.7383
Epoch 26/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8976 - accuracy: 0.7685 - val_loss: 1.4674 - val_accuracy: 0.7523
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8741 - accuracy: 0.7662 - val_loss: 1.4643 - val_accuracy: 0.7056
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8070 - accuracy: 0.7685 - val_loss: 1.4384 - val_accuracy: 0.6869
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8402 - accuracy: 0.7616 - val_loss: 1.4085 - val_accuracy: 0.6822
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7993 - accuracy: 0.7708 - val_loss: 1.3884 - val_accuracy: 0.6776
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7559 - accuracy: 0.7685 - val_loss: 1.3798 - val_accuracy: 0.6822
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7597 - accuracy: 0.7639 - val_loss: 1.3271 - val_accuracy: 0.6916
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8219 - accuracy: 0.7685 - val_loss: 1.3071 - val_accuracy: 0.6916
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7974 - accuracy: 0.7477 - val_loss: 1.2815 - val_accuracy: 0.6822
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7216 - accuracy: 0.7431 - val_loss: 1.2554 - val_accuracy: 0.7009
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6804 - accuracy: 0.7593 - val_loss: 1.2272 - val_accuracy: 0.7009
Epoch 37/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6666 - accuracy: 0.7755 - val_loss: 1.1808 - val_accuracy: 0.6963
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6350 - accuracy: 0.7361 - val_loss: 1.1617 - val_accuracy: 0.6916
Epoch 39/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6312 - accuracy: 0.7384 - val_loss: 1.1298 - val_accuracy: 0.7336
Epoch 40/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6166 - accuracy: 0.7477 - val_loss: 1.0915 - val_accuracy: 0.7290
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5831 - accuracy: 0.7569 - val_loss: 1.0699 - val_accuracy: 0.7383

Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7466 - accuracy: 0.7546 - val_loss: 1.0366 - val_accuracy: 0.7804
Epoch 43/1000
4/4 [=====] - 0s 16ms/step - loss: 0.6382 - accuracy: 0.7847 - val_loss: 1.0430 - val_accuracy: 0.7523
Epoch 44/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5638 - accuracy: 0.7593 - val_loss: 1.0356 - val_accuracy: 0.7570
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5624 - accuracy: 0.7662 - val_loss: 1.0295 - val_accuracy: 0.7570
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5941 - accuracy: 0.7477 - val_loss: 1.0572 - val_accuracy: 0.7664
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5638 - accuracy: 0.7454 - val_loss: 1.0448 - val_accuracy: 0.7477
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5055 - accuracy: 0.7662 - val_loss: 1.0330 - val_accuracy: 0.7617
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5261 - accuracy: 0.7338 - val_loss: 1.0271 - val_accuracy: 0.7757
Epoch 50/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5217 - accuracy: 0.7569 - val_loss: 1.0231 - val_accuracy: 0.7617
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6011 - accuracy: 0.7523 - val_loss: 1.0115 - val_accuracy: 0.7430
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5598 - accuracy: 0.7454 - val_loss: 1.0041 - val_accuracy: 0.7523
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4585 - accuracy: 0.7523 - val_loss: 0.9942 - val_accuracy: 0.7523
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5006 - accuracy: 0.7593 - val_loss: 0.9813 - val_accuracy: 0.7336
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4153 - accuracy: 0.7523 - val_loss: 0.9666 - val_accuracy: 0.7430
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3723 - accuracy: 0.7847 - val_loss: 0.9507 - val_accuracy: 0.7430
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3915 - accuracy: 0.7708 - val_loss: 0.9322 - val_accuracy: 0.7570
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4291 - accuracy: 0.7546 - val_loss: 0.9118 - val_accuracy: 0.7664
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4519 - accuracy: 0.7523 - val_loss: 0.9040 - val_accuracy: 0.7570
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4879 - accuracy: 0.7616 - val_loss: 0.8904 - val_accuracy: 0.7617
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3864 - accuracy: 0.7384 - val_loss: 0.8930 - val_accuracy: 0.7523
Epoch 62/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3980 - accuracy: 0.7338 - val_loss: 0.8741 - val_accuracy: 0.7477
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4410 - accuracy: 0.7292 - val_loss: 0.8545 - val_accuracy: 0.7664
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3750 - accuracy: 0.7454 - val_loss: 0.8474 - val_accuracy: 0.7664
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3468 - accuracy: 0.7778 - val_loss: 0.8267 - val_accuracy: 0.7570
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4268 - accuracy: 0.7523 - val_loss: 0.8250 - val_accuracy: 0.7804
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4330 - accuracy: 0.7593 - val_loss: 0.8325 - val_accuracy: 0.7664
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4997 - accuracy: 0.7361 - val_loss: 0.7695 - val_accuracy: 0.7757
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3804 - accuracy: 0.7685 - val_loss: 0.7815 - val_accuracy: 0.7757
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4039 - accuracy: 0.7083 - val_loss: 0.7596 - val_accuracy: 0.7430
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3575 - accuracy: 0.6991 - val_loss: 0.7446 - val_accuracy: 0.7446

```
accuracy: 0.7336
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3347 - accuracy: 0.7384 - val_loss: 0.6773 - val_
accuracy: 0.7430
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4805 - accuracy: 0.6921 - val_loss: 0.6607 - val_
accuracy: 0.7523
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3694 - accuracy: 0.6875 - val_loss: 0.6591 - val_
accuracy: 0.7523
Epoch 75/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3704 - accuracy: 0.6898 - val_loss: 0.6470 - val_
accuracy: 0.7383
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3794 - accuracy: 0.6991 - val_loss: 0.6473 - val_
accuracy: 0.7430
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4057 - accuracy: 0.6898 - val_loss: 0.6486 - val_
accuracy: 0.7523
Epoch 78/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3542 - accuracy: 0.7338 - val_loss: 0.6403 - val_
accuracy: 0.7523
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3779 - accuracy: 0.7083 - val_loss: 0.6353 - val_
accuracy: 0.7430
Epoch 80/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2982 - accuracy: 0.7060 - val_loss: 0.6311 - val_
accuracy: 0.7523
Epoch 81/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4007 - accuracy: 0.7106 - val_loss: 0.6242 - val_
accuracy: 0.7477
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3473 - accuracy: 0.7153 - val_loss: 0.6141 - val_
accuracy: 0.7523
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2911 - accuracy: 0.7083 - val_loss: 0.6107 - val_
accuracy: 0.7430
Epoch 84/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4109 - accuracy: 0.7130 - val_loss: 0.6011 - val_
accuracy: 0.7430
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3324 - accuracy: 0.7153 - val_loss: 0.6011 - val_
accuracy: 0.7336
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3488 - accuracy: 0.6991 - val_loss: 0.6212 - val_
accuracy: 0.7290
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3654 - accuracy: 0.7199 - val_loss: 0.6185 - val_
accuracy: 0.7430
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2775 - accuracy: 0.7292 - val_loss: 0.6007 - val_
accuracy: 0.7430
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3479 - accuracy: 0.7060 - val_loss: 0.5852 - val_
accuracy: 0.7617
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3709 - accuracy: 0.7176 - val_loss: 0.5506 - val_
accuracy: 0.7617
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3355 - accuracy: 0.7269 - val_loss: 0.5245 - val_
accuracy: 0.7710
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3313 - accuracy: 0.7407 - val_loss: 0.5883 - val_
accuracy: 0.7430
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3334 - accuracy: 0.7338 - val_loss: 0.5624 - val_
accuracy: 0.7430
Epoch 94/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3138 - accuracy: 0.7384 - val_loss: 0.5537 - val_
accuracy: 0.7430
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3239 - accuracy: 0.7616 - val_loss: 0.5575 - val_
accuracy: 0.7570
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3407 - accuracy: 0.7685 - val_loss: 0.5499 - val_
accuracy: 0.7430
Epoch 97/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3793 - accuracy: 0.7662 - val_loss: 0.7014 - val_
accuracy: 0.6729
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3203 - accuracy: 0.7708 - val_loss: 0.6213 - val_
accuracy: 0.6869
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3335 - accuracy: 0.7500 - val_loss: 0.6044 - val_
accuracy: 0.6916
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3661 - accuracy: 0.7569 - val_loss: 0.5967 - val_
accuracy: 0.6963
Epoch 101/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.3678 - accuracy: 0.7616 - val_loss: 0.6240 - val_accuracy: 0.6822
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2871 - accuracy: 0.7593 - val_loss: 0.5855 - val_accuracy: 0.6822
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2889 - accuracy: 0.7616 - val_loss: 0.5867 - val_accuracy: 0.6869
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2879 - accuracy: 0.7222 - val_loss: 0.5812 - val_accuracy: 0.7009
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2960 - accuracy: 0.7546 - val_loss: 0.5590 - val_accuracy: 0.7056
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2863 - accuracy: 0.7662 - val_loss: 0.5646 - val_accuracy: 0.6963
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2547 - accuracy: 0.7824 - val_loss: 0.5442 - val_accuracy: 0.7103
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2998 - accuracy: 0.7917 - val_loss: 0.5519 - val_accuracy: 0.7150
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2727 - accuracy: 0.7569 - val_loss: 0.5568 - val_accuracy: 0.7196
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2951 - accuracy: 0.7778 - val_loss: 0.5483 - val_accuracy: 0.6916
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3559 - accuracy: 0.7315 - val_loss: 0.5467 - val_accuracy: 0.6822
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2569 - accuracy: 0.7523 - val_loss: 0.5465 - val_accuracy: 0.6869
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3920 - accuracy: 0.7500 - val_loss: 0.5889 - val_accuracy: 0.6682
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3009 - accuracy: 0.7639 - val_loss: 0.6243 - val_accuracy: 0.7009
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2959 - accuracy: 0.7407 - val_loss: 0.6446 - val_accuracy: 0.6682
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2672 - accuracy: 0.7569 - val_loss: 0.6857 - val_accuracy: 0.6589
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2854 - accuracy: 0.7847 - val_loss: 0.6508 - val_accuracy: 0.6589
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3228 - accuracy: 0.7523 - val_loss: 0.6206 - val_accuracy: 0.6589
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2943 - accuracy: 0.7685 - val_loss: 0.6193 - val_accuracy: 0.6636
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2677 - accuracy: 0.7639 - val_loss: 0.6412 - val_accuracy: 0.6822
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2971 - accuracy: 0.7894 - val_loss: 0.7027 - val_accuracy: 0.6776
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3089 - accuracy: 0.8079 - val_loss: 0.6818 - val_accuracy: 0.7196
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2436 - accuracy: 0.7917 - val_loss: 0.6399 - val_accuracy: 0.7009
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3275 - accuracy: 0.7755 - val_loss: 0.6852 - val_accuracy: 0.6869
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2624 - accuracy: 0.7847 - val_loss: 0.8047 - val_accuracy: 0.6776
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2960 - accuracy: 0.7870 - val_loss: 0.7840 - val_accuracy: 0.6963
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2431 - accuracy: 0.7731 - val_loss: 0.8115 - val_accuracy: 0.6963
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2270 - accuracy: 0.7546 - val_loss: 0.7737 - val_accuracy: 0.6822
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2790 - accuracy: 0.7662 - val_loss: 0.8072 - val_accuracy: 0.6542
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2775 - accuracy: 0.7662 - val_loss: 0.8273 - val_accuracy: 0.6682
```

Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2743 - accuracy: 0.7708 - val_loss: 0.8389 - val_accuracy: 0.6589
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3657 - accuracy: 0.7569 - val_loss: 0.7512 - val_accuracy: 0.6542
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2506 - accuracy: 0.7153 - val_loss: 0.6836 - val_accuracy: 0.6215
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3368 - accuracy: 0.7060 - val_loss: 0.7026 - val_accuracy: 0.6308
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3312 - accuracy: 0.6690 - val_loss: 0.6968 - val_accuracy: 0.6168
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3039 - accuracy: 0.6829 - val_loss: 0.7161 - val_accuracy: 0.6308
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2660 - accuracy: 0.6944 - val_loss: 0.7478 - val_accuracy: 0.6542
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2699 - accuracy: 0.6806 - val_loss: 0.7730 - val_accuracy: 0.6168
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3112 - accuracy: 0.6898 - val_loss: 0.8424 - val_accuracy: 0.6028
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2688 - accuracy: 0.6736 - val_loss: 0.8338 - val_accuracy: 0.5794
Epoch 141/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2991 - accuracy: 0.7037 - val_loss: 0.8357 - val_accuracy: 0.5841
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2392 - accuracy: 0.7083 - val_loss: 0.8080 - val_accuracy: 0.5935
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2507 - accuracy: 0.6944 - val_loss: 0.8416 - val_accuracy: 0.6168
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2111 - accuracy: 0.7060 - val_loss: 0.8644 - val_accuracy: 0.6028
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2258 - accuracy: 0.6991 - val_loss: 0.8501 - val_accuracy: 0.6355
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2436 - accuracy: 0.7477 - val_loss: 1.0111 - val_accuracy: 0.6028
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2060 - accuracy: 0.7292 - val_loss: 0.8642 - val_accuracy: 0.6121
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2987 - accuracy: 0.7500 - val_loss: 1.0067 - val_accuracy: 0.6589
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2921 - accuracy: 0.7315 - val_loss: 0.8825 - val_accuracy: 0.6589
Epoch 150/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2806 - accuracy: 0.7315 - val_loss: 0.8251 - val_accuracy: 0.6308
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2026 - accuracy: 0.7014 - val_loss: 0.7809 - val_accuracy: 0.6402
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1865 - accuracy: 0.7083 - val_loss: 0.7838 - val_accuracy: 0.6262
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2710 - accuracy: 0.7500 - val_loss: 0.8129 - val_accuracy: 0.6262
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2527 - accuracy: 0.7500 - val_loss: 0.7640 - val_accuracy: 0.6121
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2556 - accuracy: 0.7546 - val_loss: 1.0005 - val_accuracy: 0.5888
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2312 - accuracy: 0.7176 - val_loss: 0.8242 - val_accuracy: 0.6028
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2181 - accuracy: 0.7292 - val_loss: 0.8334 - val_accuracy: 0.6262
Epoch 158/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2344 - accuracy: 0.7477 - val_loss: 0.8274 - val_accuracy: 0.6121
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1933 - accuracy: 0.7500 - val_loss: 1.0199 - val_accuracy: 0.5981
Epoch 160/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2583 - accuracy: 0.7222 - val_loss: 0.9426 - val_accuracy: 0.6121

```
accuracy: 0.5935
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2389 - accuracy: 0.7500 - val_loss: 0.9738 - val_
accuracy: 0.5981
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2378 - accuracy: 0.7315 - val_loss: 0.9273 - val_
accuracy: 0.5981
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2220 - accuracy: 0.7222 - val_loss: 0.8862 - val_
accuracy: 0.5981
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2825 - accuracy: 0.7569 - val_loss: 1.0612 - val_
accuracy: 0.5794
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2995 - accuracy: 0.7616 - val_loss: 1.4149 - val_
accuracy: 0.5467
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3404 - accuracy: 0.6921 - val_loss: 1.1115 - val_
accuracy: 0.5888
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3055 - accuracy: 0.7222 - val_loss: 1.0937 - val_
accuracy: 0.5748
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3332 - accuracy: 0.7292 - val_loss: 1.2141 - val_
accuracy: 0.5467
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2584 - accuracy: 0.6852 - val_loss: 1.1360 - val_
accuracy: 0.5841
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2026 - accuracy: 0.7083 - val_loss: 1.1558 - val_
accuracy: 0.5841
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3072 - accuracy: 0.6852 - val_loss: 0.9295 - val_
accuracy: 0.6075
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1806 - accuracy: 0.7431 - val_loss: 0.9292 - val_
accuracy: 0.5841
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2733 - accuracy: 0.7315 - val_loss: 0.9296 - val_
accuracy: 0.5981
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2118 - accuracy: 0.7130 - val_loss: 0.9238 - val_
accuracy: 0.6028
Epoch 175/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1795 - accuracy: 0.7014 - val_loss: 0.9877 - val_
accuracy: 0.6075
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2352 - accuracy: 0.7292 - val_loss: 1.0075 - val_
accuracy: 0.6075
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3387 - accuracy: 0.7315 - val_loss: 1.0191 - val_
accuracy: 0.5841
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1757 - accuracy: 0.7060 - val_loss: 1.0119 - val_
accuracy: 0.5981
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2299 - accuracy: 0.7037 - val_loss: 0.9922 - val_
accuracy: 0.6168
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2112 - accuracy: 0.7338 - val_loss: 0.9118 - val_
accuracy: 0.6028
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2183 - accuracy: 0.6875 - val_loss: 0.9083 - val_
accuracy: 0.6121
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3263 - accuracy: 0.7037 - val_loss: 0.9687 - val_
accuracy: 0.5888
Epoch 183/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2510 - accuracy: 0.7106 - val_loss: 1.0800 - val_
accuracy: 0.5701
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1921 - accuracy: 0.6875 - val_loss: 0.9607 - val_
accuracy: 0.6075
Epoch 185/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2335 - accuracy: 0.7014 - val_loss: 0.9637 - val_
accuracy: 0.6215
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1809 - accuracy: 0.7384 - val_loss: 1.0834 - val_
accuracy: 0.6121
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1807 - accuracy: 0.7292 - val_loss: 0.9771 - val_
accuracy: 0.6308
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1667 - accuracy: 0.7384 - val_loss: 1.0012 - val_
accuracy: 0.6168
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1634 - accuracy: 0.7130 - val_loss: 1.0337 - val_
accuracy: 0.6075
Epoch 190/1000
```

```

4/4 [=====] - 0s 15ms/step - loss: 0.1875 - accuracy: 0.7338 - val_loss: 1.0143 - val_accuracy: 0.6262
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2000 - accuracy: 0.7431 - val_loss: 1.0441 - val_accuracy: 0.6121
Epoch 192/1000
1/4 [====>.....] - ETA: 0s - loss: 0.4299 - accuracy: 0.7734Restoring model weights from the end of the best epoch: 42.
4/4 [=====] - 0s 15ms/step - loss: 0.2576 - accuracy: 0.7338 - val_loss: 1.0453 - val_accuracy: 0.6028
Epoch 192: early stopping
7/7 [=====] - 0s 2ms/step - loss: 1.0366 - accuracy: 0.7804
Model: "sequential_102"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_408 (Dense)	(None, 50)	350
batch_normalization_306 (BatchNormalization)	(None, 50)	200
activation_306 (Activation)	(None, 50)	0
dense_409 (Dense)	(None, 50)	2550
batch_normalization_307 (BatchNormalization)	(None, 50)	200
activation_307 (Activation)	(None, 50)	0
dense_410 (Dense)	(None, 10)	510
batch_normalization_308 (BatchNormalization)	(None, 10)	40
activation_308 (Activation)	(None, 10)	0
dense_411 (Dense)	(None, 2)	22
<hr/>		
Total params: 3,872		
Trainable params: 3,652		
Non-trainable params: 220		

```

Epoch 1/1000
4/4 [=====] - 1s 56ms/step - loss: 5.3908 - accuracy: 0.4977 - val_loss: 6.7508 - val_accuracy: 0.4626
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 4.5433 - accuracy: 0.5324 - val_loss: 5.4834 - val_accuracy: 0.4720
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 4.0213 - accuracy: 0.5648 - val_loss: 4.7169 - val_accuracy: 0.5140
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5974 - accuracy: 0.5787 - val_loss: 3.8627 - val_accuracy: 0.5514
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 3.3817 - accuracy: 0.6481 - val_loss: 3.4553 - val_accuracy: 0.5607
Epoch 6/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3560 - accuracy: 0.6435 - val_loss: 3.0684 - val_accuracy: 0.5561
Epoch 7/1000
4/4 [=====] - 0s 12ms/step - loss: 2.9549 - accuracy: 0.6481 - val_loss: 2.6966 - val_accuracy: 0.5561
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8860 - accuracy: 0.6319 - val_loss: 2.2688 - val_accuracy: 0.5514
Epoch 9/1000
4/4 [=====] - 0s 15ms/step - loss: 2.5468 - accuracy: 0.6528 - val_loss: 2.2418 - val_accuracy: 0.5841
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5962 - accuracy: 0.6412 - val_loss: 2.1480 - val_accuracy: 0.5467
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 2.5019 - accuracy: 0.6481 - val_loss: 2.0562 - val_accuracy: 0.5794
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3919 - accuracy: 0.6458 - val_loss: 1.9955 - val_accuracy: 0.5841
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4828 - accuracy: 0.6528 - val_loss: 1.9499 - val_accuracy: 0.5514
Epoch 14/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1696 - accuracy: 0.6505 - val_loss: 1.7870 - val_accuracy: 0.5280
Epoch 15/1000
4/4 [=====] - 0s 14ms/step - loss: 2.2412 - accuracy: 0.6458 - val_loss: 1.7429 - val_accuracy: 0.5234

```

Epoch 16/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1439 - accuracy: 0.6667 - val_loss: 1.7162 - val_accuracy: 0.5093
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9661 - accuracy: 0.6667 - val_loss: 1.6849 - val_accuracy: 0.4953
Epoch 18/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9276 - accuracy: 0.6319 - val_loss: 1.6502 - val_accuracy: 0.4907
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8291 - accuracy: 0.6366 - val_loss: 1.6248 - val_accuracy: 0.4907
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8420 - accuracy: 0.6319 - val_loss: 1.5957 - val_accuracy: 0.4766
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5512 - accuracy: 0.6829 - val_loss: 1.5505 - val_accuracy: 0.4673
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6119 - accuracy: 0.6597 - val_loss: 1.5230 - val_accuracy: 0.4673
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5031 - accuracy: 0.6481 - val_loss: 1.5073 - val_accuracy: 0.4626
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2931 - accuracy: 0.6505 - val_loss: 1.4804 - val_accuracy: 0.4673
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2604 - accuracy: 0.6250 - val_loss: 1.4660 - val_accuracy: 0.4673
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1360 - accuracy: 0.6273 - val_loss: 1.4201 - val_accuracy: 0.4579
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9711 - accuracy: 0.6204 - val_loss: 1.4190 - val_accuracy: 0.4533
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0655 - accuracy: 0.6296 - val_loss: 1.4017 - val_accuracy: 0.4533
Epoch 29/1000
4/4 [=====] - 0s 14ms/step - loss: 0.9036 - accuracy: 0.5764 - val_loss: 1.3610 - val_accuracy: 0.4533
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8992 - accuracy: 0.6273 - val_loss: 1.3459 - val_accuracy: 0.4626
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9352 - accuracy: 0.5926 - val_loss: 1.3490 - val_accuracy: 0.4766
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8269 - accuracy: 0.5764 - val_loss: 1.3316 - val_accuracy: 0.4720
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7465 - accuracy: 0.5810 - val_loss: 1.3209 - val_accuracy: 0.4766
Epoch 34/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7586 - accuracy: 0.5995 - val_loss: 1.2992 - val_accuracy: 0.4907
Epoch 35/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7444 - accuracy: 0.6019 - val_loss: 1.2766 - val_accuracy: 0.5280
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7331 - accuracy: 0.6157 - val_loss: 1.2503 - val_accuracy: 0.5561
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6920 - accuracy: 0.5532 - val_loss: 1.2375 - val_accuracy: 0.5093
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6999 - accuracy: 0.5463 - val_loss: 1.2245 - val_accuracy: 0.5093
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6476 - accuracy: 0.5579 - val_loss: 1.2162 - val_accuracy: 0.5187
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6697 - accuracy: 0.5532 - val_loss: 1.2036 - val_accuracy: 0.5280
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6133 - accuracy: 0.5417 - val_loss: 1.1858 - val_accuracy: 0.5234
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5982 - accuracy: 0.5278 - val_loss: 1.1661 - val_accuracy: 0.5093
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6167 - accuracy: 0.5440 - val_loss: 1.1521 - val_accuracy: 0.5280
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5768 - accuracy: 0.5579 - val_loss: 1.1403 - val_accuracy: 0.5327
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5482 - accuracy: 0.5417 - val_loss: 1.1166 - val_accuracy: 0.5280

```
accuracy: 0.5140
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6655 - accuracy: 0.5509 - val_loss: 1.0969 - val_
accuracy: 0.5421
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5983 - accuracy: 0.5509 - val_loss: 1.0763 - val_
accuracy: 0.5421
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5484 - accuracy: 0.5579 - val_loss: 1.0668 - val_
accuracy: 0.5701
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5967 - accuracy: 0.5694 - val_loss: 1.0504 - val_
accuracy: 0.5654
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5909 - accuracy: 0.5486 - val_loss: 1.0171 - val_
accuracy: 0.5654
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5348 - accuracy: 0.5625 - val_loss: 1.0081 - val_
accuracy: 0.5607
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4858 - accuracy: 0.5532 - val_loss: 0.9938 - val_
accuracy: 0.5561
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4908 - accuracy: 0.5718 - val_loss: 0.9745 - val_
accuracy: 0.5421
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4603 - accuracy: 0.5718 - val_loss: 0.9612 - val_
accuracy: 0.5514
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4476 - accuracy: 0.5486 - val_loss: 0.9189 - val_
accuracy: 0.5421
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4155 - accuracy: 0.5370 - val_loss: 0.9190 - val_
accuracy: 0.5561
Epoch 57/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4159 - accuracy: 0.5579 - val_loss: 0.8890 - val_
accuracy: 0.5654
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5619 - accuracy: 0.5741 - val_loss: 0.8891 - val_
accuracy: 0.5794
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4424 - accuracy: 0.5741 - val_loss: 0.8793 - val_
accuracy: 0.5654
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3917 - accuracy: 0.5579 - val_loss: 0.8657 - val_
accuracy: 0.5794
Epoch 61/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4273 - accuracy: 0.5764 - val_loss: 0.8504 - val_
accuracy: 0.5888
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3950 - accuracy: 0.5833 - val_loss: 0.8405 - val_
accuracy: 0.5981
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4359 - accuracy: 0.5694 - val_loss: 0.8327 - val_
accuracy: 0.5607
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4007 - accuracy: 0.5926 - val_loss: 0.7984 - val_
accuracy: 0.5701
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4289 - accuracy: 0.5787 - val_loss: 0.7920 - val_
accuracy: 0.5748
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4058 - accuracy: 0.5787 - val_loss: 0.7778 - val_
accuracy: 0.5981
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3661 - accuracy: 0.5556 - val_loss: 0.7786 - val_
accuracy: 0.5888
Epoch 68/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3946 - accuracy: 0.6181 - val_loss: 0.7768 - val_
accuracy: 0.5888
Epoch 69/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4193 - accuracy: 0.5856 - val_loss: 0.7562 - val_
accuracy: 0.5701
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4434 - accuracy: 0.5671 - val_loss: 0.7457 - val_
accuracy: 0.5748
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4961 - accuracy: 0.5856 - val_loss: 0.7354 - val_
accuracy: 0.5888
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4538 - accuracy: 0.5856 - val_loss: 0.7303 - val_
accuracy: 0.5841
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3686 - accuracy: 0.5532 - val_loss: 0.7124 - val_
accuracy: 0.5654
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3735 - accuracy: 0.5856 - val_loss: 0.7224 - val_
accuracy: 0.5748
Epoch 75/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3846 - accuracy: 0.5856 - val_loss: 0.7362 - val_accuracy: 0.5467
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4280 - accuracy: 0.5486 - val_loss: 0.7340 - val_accuracy: 0.5607
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3928 - accuracy: 0.5671 - val_loss: 0.7488 - val_accuracy: 0.5654
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3546 - accuracy: 0.5625 - val_loss: 0.7244 - val_accuracy: 0.5607
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3506 - accuracy: 0.5903 - val_loss: 0.7237 - val_accuracy: 0.5748
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3281 - accuracy: 0.5671 - val_loss: 0.7121 - val_accuracy: 0.5841
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3644 - accuracy: 0.5694 - val_loss: 0.7204 - val_accuracy: 0.5935
Epoch 82/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3655 - accuracy: 0.5532 - val_loss: 0.7177 - val_accuracy: 0.6028
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3281 - accuracy: 0.5556 - val_loss: 0.7343 - val_accuracy: 0.6355
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3657 - accuracy: 0.5741 - val_loss: 0.7467 - val_accuracy: 0.5981
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3024 - accuracy: 0.5532 - val_loss: 0.7433 - val_accuracy: 0.6121
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3050 - accuracy: 0.5949 - val_loss: 0.7561 - val_accuracy: 0.6168
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3366 - accuracy: 0.5556 - val_loss: 0.7669 - val_accuracy: 0.5841
Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3597 - accuracy: 0.5926 - val_loss: 0.7679 - val_accuracy: 0.5981
Epoch 89/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3027 - accuracy: 0.5602 - val_loss: 0.7721 - val_accuracy: 0.5981
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2943 - accuracy: 0.5671 - val_loss: 0.7627 - val_accuracy: 0.5935
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3308 - accuracy: 0.5648 - val_loss: 0.7716 - val_accuracy: 0.5935
Epoch 92/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3435 - accuracy: 0.5741 - val_loss: 0.7351 - val_accuracy: 0.6168
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3146 - accuracy: 0.5949 - val_loss: 0.7598 - val_accuracy: 0.6262
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2994 - accuracy: 0.5972 - val_loss: 0.7403 - val_accuracy: 0.6402
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3046 - accuracy: 0.5694 - val_loss: 0.8165 - val_accuracy: 0.6121
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3162 - accuracy: 0.5880 - val_loss: 0.8146 - val_accuracy: 0.6028
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3210 - accuracy: 0.5995 - val_loss: 0.8086 - val_accuracy: 0.6402
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3399 - accuracy: 0.5949 - val_loss: 0.8546 - val_accuracy: 0.6215
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3524 - accuracy: 0.5741 - val_loss: 0.8524 - val_accuracy: 0.5981
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3348 - accuracy: 0.5764 - val_loss: 0.8551 - val_accuracy: 0.6215
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3404 - accuracy: 0.6042 - val_loss: 0.8442 - val_accuracy: 0.6355
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3211 - accuracy: 0.5787 - val_loss: 0.7757 - val_accuracy: 0.6402
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3583 - accuracy: 0.5972 - val_loss: 0.7921 - val_accuracy: 0.6542
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3516 - accuracy: 0.5880 - val_loss: 0.7757 - val_accuracy: 0.6449
```

Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3276 - accuracy: 0.5833 - val_loss: 0.7679 - val_accuracy: 0.6402
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3533 - accuracy: 0.6181 - val_loss: 0.7843 - val_accuracy: 0.6308
Epoch 107/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3218 - accuracy: 0.6204 - val_loss: 0.7701 - val_accuracy: 0.6121
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3664 - accuracy: 0.5880 - val_loss: 0.7899 - val_accuracy: 0.6168
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2765 - accuracy: 0.6019 - val_loss: 0.8002 - val_accuracy: 0.6121
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2871 - accuracy: 0.5949 - val_loss: 0.7941 - val_accuracy: 0.6215
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3059 - accuracy: 0.6157 - val_loss: 0.7906 - val_accuracy: 0.6215
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2819 - accuracy: 0.5995 - val_loss: 0.8034 - val_accuracy: 0.6355
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3114 - accuracy: 0.5995 - val_loss: 0.7967 - val_accuracy: 0.6355
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3059 - accuracy: 0.6065 - val_loss: 0.8062 - val_accuracy: 0.6308
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2596 - accuracy: 0.5880 - val_loss: 0.7741 - val_accuracy: 0.6308
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3555 - accuracy: 0.5787 - val_loss: 0.8574 - val_accuracy: 0.6215
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3298 - accuracy: 0.5833 - val_loss: 0.8987 - val_accuracy: 0.6402
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2728 - accuracy: 0.5764 - val_loss: 0.8566 - val_accuracy: 0.6355
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3293 - accuracy: 0.5926 - val_loss: 0.8535 - val_accuracy: 0.6542
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2840 - accuracy: 0.5810 - val_loss: 0.8413 - val_accuracy: 0.6402
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3000 - accuracy: 0.5926 - val_loss: 0.8008 - val_accuracy: 0.6589
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2712 - accuracy: 0.5764 - val_loss: 0.7732 - val_accuracy: 0.6589
Epoch 123/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3320 - accuracy: 0.5833 - val_loss: 0.7919 - val_accuracy: 0.6682
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2896 - accuracy: 0.5949 - val_loss: 0.8132 - val_accuracy: 0.6589
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2756 - accuracy: 0.5949 - val_loss: 0.8450 - val_accuracy: 0.6355
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2918 - accuracy: 0.5880 - val_loss: 0.8396 - val_accuracy: 0.6355
Epoch 127/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3509 - accuracy: 0.5972 - val_loss: 0.8472 - val_accuracy: 0.6542
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2809 - accuracy: 0.6227 - val_loss: 0.8437 - val_accuracy: 0.6682
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2495 - accuracy: 0.6042 - val_loss: 0.9279 - val_accuracy: 0.6542
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2888 - accuracy: 0.6019 - val_loss: 0.9016 - val_accuracy: 0.6402
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2615 - accuracy: 0.5694 - val_loss: 0.9043 - val_accuracy: 0.6636
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2567 - accuracy: 0.6181 - val_loss: 1.0361 - val_accuracy: 0.6589
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2464 - accuracy: 0.5972 - val_loss: 0.9319 - val_accuracy: 0.6589
Epoch 134/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3276 - accuracy: 0.6157 - val_loss: 0.9851 - val_accuracy: 0.6589

```
accuracy: 0.6636
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2822 - accuracy: 0.5903 - val_loss: 1.0392 - val_
accuracy: 0.6636
Epoch 136/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3052 - accuracy: 0.6134 - val_loss: 1.0678 - val_
accuracy: 0.6589
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2817 - accuracy: 0.6134 - val_loss: 1.0038 - val_
accuracy: 0.6636
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2686 - accuracy: 0.6019 - val_loss: 1.2532 - val_
accuracy: 0.6495
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2921 - accuracy: 0.6273 - val_loss: 1.0871 - val_
accuracy: 0.6589
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3214 - accuracy: 0.6181 - val_loss: 1.0741 - val_
accuracy: 0.6308
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2502 - accuracy: 0.6019 - val_loss: 1.0564 - val_
accuracy: 0.6402
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2473 - accuracy: 0.6296 - val_loss: 1.1150 - val_
accuracy: 0.6449
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2495 - accuracy: 0.5972 - val_loss: 1.0894 - val_
accuracy: 0.6262
Epoch 144/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2726 - accuracy: 0.6111 - val_loss: 1.0686 - val_
accuracy: 0.6262
Epoch 145/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2514 - accuracy: 0.6019 - val_loss: 1.2424 - val_
accuracy: 0.6075
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2520 - accuracy: 0.6319 - val_loss: 1.2138 - val_
accuracy: 0.6308
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2924 - accuracy: 0.5995 - val_loss: 1.2252 - val_
accuracy: 0.6262
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3274 - accuracy: 0.6157 - val_loss: 1.1698 - val_
accuracy: 0.6449
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2912 - accuracy: 0.6505 - val_loss: 1.1138 - val_
accuracy: 0.6495
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2975 - accuracy: 0.6412 - val_loss: 1.0889 - val_
accuracy: 0.6776
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3457 - accuracy: 0.6227 - val_loss: 1.0374 - val_
accuracy: 0.6449
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2508 - accuracy: 0.6273 - val_loss: 1.1515 - val_
accuracy: 0.6402
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2863 - accuracy: 0.6458 - val_loss: 1.0579 - val_
accuracy: 0.6589
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3367 - accuracy: 0.6296 - val_loss: 1.0479 - val_
accuracy: 0.6542
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3345 - accuracy: 0.6412 - val_loss: 1.1219 - val_
accuracy: 0.6682
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2599 - accuracy: 0.6181 - val_loss: 1.1424 - val_
accuracy: 0.6729
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4138 - accuracy: 0.6157 - val_loss: 1.2504 - val_
accuracy: 0.6589
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2276 - accuracy: 0.6042 - val_loss: 1.2263 - val_
accuracy: 0.6449
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4135 - accuracy: 0.5903 - val_loss: 1.3432 - val_
accuracy: 0.6449
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2973 - accuracy: 0.6042 - val_loss: 1.2385 - val_
accuracy: 0.6402
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2340 - accuracy: 0.6042 - val_loss: 1.2464 - val_
accuracy: 0.6308
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2181 - accuracy: 0.5995 - val_loss: 1.2604 - val_
accuracy: 0.6168
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2900 - accuracy: 0.5833 - val_loss: 1.3201 - val_
accuracy: 0.6215
Epoch 164/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.2501 - accuracy: 0.6065 - val_loss: 1.2879 - val_accuracy: 0.6168
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2704 - accuracy: 0.6134 - val_loss: 1.2063 - val_accuracy: 0.6449
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3656 - accuracy: 0.6042 - val_loss: 1.0354 - val_accuracy: 0.7009
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2530 - accuracy: 0.6088 - val_loss: 1.1526 - val_accuracy: 0.6542
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2166 - accuracy: 0.6227 - val_loss: 1.1973 - val_accuracy: 0.6402
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2205 - accuracy: 0.5926 - val_loss: 1.2604 - val_accuracy: 0.6215
Epoch 170/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2004 - accuracy: 0.6134 - val_loss: 1.2207 - val_accuracy: 0.6215
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2369 - accuracy: 0.5995 - val_loss: 1.0921 - val_accuracy: 0.6075
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2681 - accuracy: 0.5648 - val_loss: 1.0494 - val_accuracy: 0.6075
Epoch 173/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2098 - accuracy: 0.5995 - val_loss: 1.0829 - val_accuracy: 0.6168
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2864 - accuracy: 0.5995 - val_loss: 1.1455 - val_accuracy: 0.6121
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2349 - accuracy: 0.6227 - val_loss: 1.2071 - val_accuracy: 0.6262
Epoch 176/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3501 - accuracy: 0.5625 - val_loss: 1.1961 - val_accuracy: 0.6168
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2405 - accuracy: 0.5926 - val_loss: 1.2225 - val_accuracy: 0.6215
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2025 - accuracy: 0.6157 - val_loss: 1.1804 - val_accuracy: 0.6075
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2329 - accuracy: 0.5926 - val_loss: 1.1916 - val_accuracy: 0.6075
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2496 - accuracy: 0.6111 - val_loss: 1.2054 - val_accuracy: 0.6168
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2317 - accuracy: 0.5486 - val_loss: 1.0354 - val_accuracy: 0.6168
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2562 - accuracy: 0.5671 - val_loss: 1.1443 - val_accuracy: 0.6168
Epoch 183/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2862 - accuracy: 0.5741 - val_loss: 1.0929 - val_accuracy: 0.6168
Epoch 184/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1876 - accuracy: 0.5486 - val_loss: 1.0373 - val_accuracy: 0.5187
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1883 - accuracy: 0.4861 - val_loss: 1.0348 - val_accuracy: 0.5047
Epoch 186/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2522 - accuracy: 0.5000 - val_loss: 1.0576 - val_accuracy: 0.5093
Epoch 187/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2098 - accuracy: 0.4861 - val_loss: 1.1337 - val_accuracy: 0.6215
Epoch 188/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2858 - accuracy: 0.5394 - val_loss: 1.1842 - val_accuracy: 0.5374
Epoch 189/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2000 - accuracy: 0.5509 - val_loss: 1.2026 - val_accuracy: 0.6121
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1904 - accuracy: 0.5463 - val_loss: 1.2465 - val_accuracy: 0.5794
Epoch 191/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2370 - accuracy: 0.5324 - val_loss: 1.1712 - val_accuracy: 0.5374
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2238 - accuracy: 0.4745 - val_loss: 1.1785 - val_accuracy: 0.5607
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2368 - accuracy: 0.5000 - val_loss: 1.1463 - val_accuracy: 0.5794
```

Epoch 194/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2031 - accuracy: 0.5370 - val_loss: 1.1169 - val_accuracy: 0.5327
Epoch 195/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1672 - accuracy: 0.5139 - val_loss: 1.1569 - val_accuracy: 0.5421
Epoch 196/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2459 - accuracy: 0.5069 - val_loss: 1.2001 - val_accuracy: 0.5327
Epoch 197/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2547 - accuracy: 0.5139 - val_loss: 1.3053 - val_accuracy: 0.5421
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2485 - accuracy: 0.5255 - val_loss: 1.3178 - val_accuracy: 0.5514
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2058 - accuracy: 0.5185 - val_loss: 1.4141 - val_accuracy: 0.5514
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1582 - accuracy: 0.5255 - val_loss: 1.3512 - val_accuracy: 0.5421
Epoch 201/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1799 - accuracy: 0.5093 - val_loss: 1.4148 - val_accuracy: 0.5467
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1558 - accuracy: 0.5301 - val_loss: 1.4490 - val_accuracy: 0.5561
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1969 - accuracy: 0.5671 - val_loss: 1.4335 - val_accuracy: 0.5701
Epoch 204/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2948 - accuracy: 0.5856 - val_loss: 1.3460 - val_accuracy: 0.5701
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1773 - accuracy: 0.5671 - val_loss: 1.3397 - val_accuracy: 0.5794
Epoch 206/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2574 - accuracy: 0.5694 - val_loss: 1.4157 - val_accuracy: 0.5421
Epoch 207/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2431 - accuracy: 0.5625 - val_loss: 1.4932 - val_accuracy: 0.5374
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2171 - accuracy: 0.5694 - val_loss: 1.3486 - val_accuracy: 0.5280
Epoch 209/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2736 - accuracy: 0.5370 - val_loss: 1.4039 - val_accuracy: 0.5187
Epoch 210/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1775 - accuracy: 0.5394 - val_loss: 1.4496 - val_accuracy: 0.5421
Epoch 211/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2195 - accuracy: 0.5625 - val_loss: 1.2775 - val_accuracy: 0.5888
Epoch 212/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1888 - accuracy: 0.5694 - val_loss: 1.2969 - val_accuracy: 0.5654
Epoch 213/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1921 - accuracy: 0.5741 - val_loss: 1.3465 - val_accuracy: 0.5654
Epoch 214/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3300 - accuracy: 0.5787 - val_loss: 1.2378 - val_accuracy: 0.5748
Epoch 215/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2546 - accuracy: 0.6065 - val_loss: 1.2272 - val_accuracy: 0.5841
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2911 - accuracy: 0.5926 - val_loss: 1.2051 - val_accuracy: 0.5935
Epoch 217/1000
4/4 [=====] - 0s 38ms/step - loss: 0.2555 - accuracy: 0.6250 - val_loss: 1.3090 - val_accuracy: 0.6075
Epoch 218/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2050 - accuracy: 0.6111 - val_loss: 1.3251 - val_accuracy: 0.6121
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2714 - accuracy: 0.6134 - val_loss: 1.3138 - val_accuracy: 0.6028
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2236 - accuracy: 0.6042 - val_loss: 1.3062 - val_accuracy: 0.6075
Epoch 221/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1743 - accuracy: 0.5995 - val_loss: 1.3516 - val_accuracy: 0.6028
Epoch 222/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2097 - accuracy: 0.5926 - val_loss: 1.3193 - val_accuracy: 0.5981
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1855 - accuracy: 0.6088 - val_loss: 1.3337 - val_accuracy: 0.6088

```
accuracy: 0.5888
Epoch 224/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2238 - accuracy: 0.5903 - val_loss: 1.3082 - val_
accuracy: 0.5888
Epoch 225/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2235 - accuracy: 0.5949 - val_loss: 1.3145 - val_
accuracy: 0.5888
Epoch 226/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2328 - accuracy: 0.5972 - val_loss: 1.2915 - val_
accuracy: 0.6028
Epoch 227/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2605 - accuracy: 0.5949 - val_loss: 1.3085 - val_
accuracy: 0.6121
Epoch 228/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1805 - accuracy: 0.5995 - val_loss: 1.2273 - val_
accuracy: 0.5981
Epoch 229/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2262 - accuracy: 0.5856 - val_loss: 1.2558 - val_
accuracy: 0.6028
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1784 - accuracy: 0.5949 - val_loss: 1.2786 - val_
accuracy: 0.5981
Epoch 231/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1677 - accuracy: 0.5741 - val_loss: 1.2965 - val_
accuracy: 0.5981
Epoch 232/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2372 - accuracy: 0.5995 - val_loss: 1.2613 - val_
accuracy: 0.5981
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2131 - accuracy: 0.6157 - val_loss: 1.2360 - val_
accuracy: 0.6075
Epoch 234/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1995 - accuracy: 0.5741 - val_loss: 1.0945 - val_
accuracy: 0.6262
Epoch 235/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1543 - accuracy: 0.5972 - val_loss: 1.1454 - val_
accuracy: 0.6262
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2220 - accuracy: 0.6134 - val_loss: 1.3192 - val_
accuracy: 0.6262
Epoch 237/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1914 - accuracy: 0.5972 - val_loss: 1.2457 - val_
accuracy: 0.6308
Epoch 238/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1512 - accuracy: 0.6042 - val_loss: 1.2980 - val_
accuracy: 0.6168
Epoch 239/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1623 - accuracy: 0.5856 - val_loss: 1.4206 - val_
accuracy: 0.6308
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2239 - accuracy: 0.6042 - val_loss: 1.5185 - val_
accuracy: 0.6028
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1627 - accuracy: 0.5972 - val_loss: 1.4700 - val_
accuracy: 0.6262
Epoch 242/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2259 - accuracy: 0.6019 - val_loss: 1.4614 - val_
accuracy: 0.6121
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1582 - accuracy: 0.6088 - val_loss: 1.4062 - val_
accuracy: 0.5981
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1967 - accuracy: 0.5787 - val_loss: 1.3759 - val_
accuracy: 0.6168
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2630 - accuracy: 0.5856 - val_loss: 1.4886 - val_
accuracy: 0.5888
Epoch 246/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1960 - accuracy: 0.6065 - val_loss: 1.4197 - val_
accuracy: 0.6262
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1958 - accuracy: 0.5833 - val_loss: 1.3571 - val_
accuracy: 0.6121
Epoch 248/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1814 - accuracy: 0.5764 - val_loss: 1.1534 - val_
accuracy: 0.6308
Epoch 249/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2231 - accuracy: 0.5671 - val_loss: 1.3089 - val_
accuracy: 0.6121
Epoch 250/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2027 - accuracy: 0.5648 - val_loss: 1.4014 - val_
accuracy: 0.6121
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1674 - accuracy: 0.5718 - val_loss: 1.2378 - val_
accuracy: 0.5421
Epoch 252/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2033 - accuracy: 0.5208 - val_loss: 1.3409 - val_
accuracy: 0.5327
Epoch 253/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.1360 - accuracy: 0.4884 - val_loss: 1.2452 - val_accuracy: 0.5093
Epoch 254/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1598 - accuracy: 0.4815 - val_loss: 1.3433 - val_accuracy: 0.5093
Epoch 255/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2097 - accuracy: 0.5139 - val_loss: 1.3708 - val_accuracy: 0.5047
Epoch 256/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1866 - accuracy: 0.5093 - val_loss: 1.4725 - val_accuracy: 0.4953
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1627 - accuracy: 0.4954 - val_loss: 1.4724 - val_accuracy: 0.5000
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1614 - accuracy: 0.5000 - val_loss: 1.4823 - val_accuracy: 0.5000
Epoch 259/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2185 - accuracy: 0.4931 - val_loss: 1.4764 - val_accuracy: 0.5093
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1500 - accuracy: 0.4792 - val_loss: 1.4522 - val_accuracy: 0.5000
Epoch 261/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2198 - accuracy: 0.5231 - val_loss: 1.4584 - val_accuracy: 0.5047
Epoch 262/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1381 - accuracy: 0.5185 - val_loss: 1.3789 - val_accuracy: 0.5047
Epoch 263/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1769 - accuracy: 0.5000 - val_loss: 1.3707 - val_accuracy: 0.5093
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2319 - accuracy: 0.5046 - val_loss: 1.3955 - val_accuracy: 0.5047
Epoch 265/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1418 - accuracy: 0.5185 - val_loss: 1.5177 - val_accuracy: 0.5187
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1534 - accuracy: 0.5046 - val_loss: 1.4722 - val_accuracy: 0.5047
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1365 - accuracy: 0.5255 - val_loss: 1.3297 - val_accuracy: 0.5000
Epoch 268/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1262 - accuracy: 0.5000 - val_loss: 1.4461 - val_accuracy: 0.5093
Epoch 269/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1340 - accuracy: 0.5069 - val_loss: 1.3709 - val_accuracy: 0.4953
Epoch 270/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1502 - accuracy: 0.5324 - val_loss: 1.5894 - val_accuracy: 0.5140
Epoch 271/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2014 - accuracy: 0.5162 - val_loss: 1.5844 - val_accuracy: 0.5187
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1252 - accuracy: 0.5440 - val_loss: 1.5127 - val_accuracy: 0.5374
Epoch 273/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1460 - accuracy: 0.5324 - val_loss: 1.3965 - val_accuracy: 0.5327
Epoch 274/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1387 - accuracy: 0.5324 - val_loss: 1.4321 - val_accuracy: 0.5327
Epoch 275/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1852 - accuracy: 0.5301 - val_loss: 1.3563 - val_accuracy: 0.5280
Epoch 276/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4107 - accuracy: 0.5139 - val_loss: 1.4230 - val_accuracy: 0.5234
Epoch 277/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1680 - accuracy: 0.5278 - val_loss: 1.4484 - val_accuracy: 0.5327
Epoch 278/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1748 - accuracy: 0.5069 - val_loss: 1.4921 - val_accuracy: 0.5140
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1541 - accuracy: 0.4954 - val_loss: 1.5069 - val_accuracy: 0.5140
Epoch 280/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1664 - accuracy: 0.5116 - val_loss: 1.4555 - val_accuracy: 0.5421
Epoch 281/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2411 - accuracy: 0.5162 - val_loss: 1.4824 - val_accuracy: 0.5561
Epoch 282/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1337 - accuracy: 0.5370 - val_loss: 1.5308 - val_accuracy: 0.5654
```

Epoch 283/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2095 - accuracy: 0.5648 - val_loss: 1.5215 - val_accuracy: 0.5935
Epoch 284/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1283 - accuracy: 0.5972 - val_loss: 1.4911 - val_accuracy: 0.5935
Epoch 285/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1520 - accuracy: 0.6134 - val_loss: 1.4211 - val_accuracy: 0.5935
Epoch 286/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1162 - accuracy: 0.6042 - val_loss: 1.4034 - val_accuracy: 0.6028
Epoch 287/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1932 - accuracy: 0.5741 - val_loss: 1.4873 - val_accuracy: 0.6028
Epoch 288/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2351 - accuracy: 0.6088 - val_loss: 1.4009 - val_accuracy: 0.6028
Epoch 289/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1277 - accuracy: 0.5972 - val_loss: 1.4849 - val_accuracy: 0.5935
Epoch 290/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2685 - accuracy: 0.5995 - val_loss: 1.4427 - val_accuracy: 0.5748
Epoch 291/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2520 - accuracy: 0.6134 - val_loss: 1.4355 - val_accuracy: 0.5888
Epoch 292/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1795 - accuracy: 0.5856 - val_loss: 1.5448 - val_accuracy: 0.5981
Epoch 293/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1620 - accuracy: 0.6042 - val_loss: 1.4188 - val_accuracy: 0.6075
Epoch 294/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2106 - accuracy: 0.5972 - val_loss: 1.5189 - val_accuracy: 0.6028
Epoch 295/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1371 - accuracy: 0.6250 - val_loss: 1.5625 - val_accuracy: 0.6121
Epoch 296/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3582 - accuracy: 0.5972 - val_loss: 1.6052 - val_accuracy: 0.6028
Epoch 297/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1907 - accuracy: 0.5926 - val_loss: 1.6846 - val_accuracy: 0.5794
Epoch 298/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1328 - accuracy: 0.5903 - val_loss: 1.7040 - val_accuracy: 0.5841
Epoch 299/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1391 - accuracy: 0.5972 - val_loss: 1.5677 - val_accuracy: 0.5888
Epoch 300/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1603 - accuracy: 0.6088 - val_loss: 1.3518 - val_accuracy: 0.5935
Epoch 301/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1328 - accuracy: 0.6019 - val_loss: 1.5534 - val_accuracy: 0.6075
Epoch 302/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2688 - accuracy: 0.6019 - val_loss: 1.4950 - val_accuracy: 0.6028
Epoch 303/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1438 - accuracy: 0.6019 - val_loss: 1.3860 - val_accuracy: 0.6402
Epoch 304/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1818 - accuracy: 0.6250 - val_loss: 1.5061 - val_accuracy: 0.6355
Epoch 305/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1939 - accuracy: 0.6204 - val_loss: 1.4896 - val_accuracy: 0.6402
Epoch 306/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1579 - accuracy: 0.6343 - val_loss: 1.6036 - val_accuracy: 0.6355
Epoch 307/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1836 - accuracy: 0.6366 - val_loss: 1.4226 - val_accuracy: 0.6449
Epoch 308/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1264 - accuracy: 0.6389 - val_loss: 1.4162 - val_accuracy: 0.6449
Epoch 309/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1353 - accuracy: 0.6366 - val_loss: 1.5665 - val_accuracy: 0.6495
Epoch 310/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1261 - accuracy: 0.6389 - val_loss: 1.6605 - val_accuracy: 0.6449
Epoch 311/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2362 - accuracy: 0.6481 - val_loss: 1.5885 - val_accuracy: 0.6402
Epoch 312/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2404 - accuracy: 0.6343 - val_loss: 1.5390 - val_accuracy: 0.6343

```

accuracy: 0.6589
Epoch 313/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1573 - accuracy: 0.6366 - val_loss: 1.6002 - val_
accuracy: 0.6542
Epoch 314/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1160 - accuracy: 0.6319 - val_loss: 1.5816 - val_
accuracy: 0.6729
Epoch 315/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1474 - accuracy: 0.6412 - val_loss: 1.5141 - val_
accuracy: 0.6542
Epoch 316/1000
1/4 [=====>.....] - ETA: 0s - loss: 0.1532 - accuracy: 0.6328Restoring model weights from th
e end of the best epoch: 166.
4/4 [=====] - 0s 15ms/step - loss: 0.1329 - accuracy: 0.6181 - val_loss: 1.4772 - val_
accuracy: 0.6636
Epoch 316: early stopping
7/7 [=====] - 0s 2ms/step - loss: 1.0354 - accuracy: 0.7009
Model: "sequential_103"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_412 (Dense)	(None, 50)	350
batch_normalization_309 (BatchNormalization)	(None, 50)	200
activation_309 (Activation)	(None, 50)	0
dense_413 (Dense)	(None, 50)	2550
batch_normalization_310 (BatchNormalization)	(None, 50)	200
activation_310 (Activation)	(None, 50)	0
dense_414 (Dense)	(None, 10)	510
batch_normalization_311 (BatchNormalization)	(None, 10)	40
activation_311 (Activation)	(None, 10)	0
dense_415 (Dense)	(None, 2)	22
<hr/>		

Total params: 3,872
Trainable params: 3,652
Non-trainable params: 220

```

Epoch 1/1000
4/4 [=====] - 1s 52ms/step - loss: 4.8007 - accuracy: 0.5579 - val_loss: 7.4399 - val_
accuracy: 0.5000
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 3.1590 - accuracy: 0.5370 - val_loss: 5.8802 - val_
accuracy: 0.6075
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7541 - accuracy: 0.5093 - val_loss: 4.8045 - val_
accuracy: 0.6215
Epoch 4/1000
4/4 [=====] - 0s 15ms/step - loss: 2.5897 - accuracy: 0.4769 - val_loss: 4.1212 - val_
accuracy: 0.5888
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 2.1964 - accuracy: 0.4884 - val_loss: 3.2257 - val_
accuracy: 0.5327
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1738 - accuracy: 0.4838 - val_loss: 2.6670 - val_
accuracy: 0.5093
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0434 - accuracy: 0.4560 - val_loss: 2.5700 - val_
accuracy: 0.4673
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9586 - accuracy: 0.5116 - val_loss: 2.4323 - val_
accuracy: 0.4626
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8033 - accuracy: 0.4722 - val_loss: 2.3175 - val_
accuracy: 0.4346
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6752 - accuracy: 0.4838 - val_loss: 2.2499 - val_
accuracy: 0.4346
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6562 - accuracy: 0.4931 - val_loss: 2.1614 - val_
accuracy: 0.4065
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6901 - accuracy: 0.4907 - val_loss: 2.0905 - val_
accuracy: 0.3832
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7009 - accuracy: 0.5116 - val_loss: 1.9455 - val_
accuracy: 0.4019
Epoch 14/1000

```

```
4/4 [=====] - 0s 12ms/step - loss: 1.6092 - accuracy: 0.4977 - val_loss: 1.8446 - val_accuracy: 0.3832
Epoch 15/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3308 - accuracy: 0.4884 - val_loss: 1.8163 - val_accuracy: 0.3692
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3659 - accuracy: 0.5023 - val_loss: 1.7586 - val_accuracy: 0.3598
Epoch 17/1000
4/4 [=====] - 0s 11ms/step - loss: 1.3447 - accuracy: 0.4838 - val_loss: 1.7391 - val_accuracy: 0.3551
Epoch 18/1000
4/4 [=====] - 0s 11ms/step - loss: 1.3043 - accuracy: 0.5023 - val_loss: 1.7263 - val_accuracy: 0.3411
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2784 - accuracy: 0.5139 - val_loss: 1.7203 - val_accuracy: 0.3411
Epoch 20/1000
4/4 [=====] - 0s 11ms/step - loss: 1.3132 - accuracy: 0.5000 - val_loss: 1.6736 - val_accuracy: 0.3551
Epoch 21/1000
4/4 [=====] - 0s 11ms/step - loss: 1.2240 - accuracy: 0.4977 - val_loss: 1.6540 - val_accuracy: 0.3411
Epoch 22/1000
4/4 [=====] - 0s 11ms/step - loss: 1.1029 - accuracy: 0.5347 - val_loss: 1.6370 - val_accuracy: 0.3411
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1349 - accuracy: 0.4977 - val_loss: 1.5987 - val_accuracy: 0.3598
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1535 - accuracy: 0.4722 - val_loss: 1.5701 - val_accuracy: 0.3411
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0657 - accuracy: 0.4907 - val_loss: 1.5255 - val_accuracy: 0.3505
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0680 - accuracy: 0.4699 - val_loss: 1.5078 - val_accuracy: 0.3505
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1270 - accuracy: 0.5069 - val_loss: 1.4814 - val_accuracy: 0.3458
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0442 - accuracy: 0.5255 - val_loss: 1.4585 - val_accuracy: 0.3411
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0500 - accuracy: 0.5023 - val_loss: 1.4003 - val_accuracy: 0.3692
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9977 - accuracy: 0.5231 - val_loss: 1.3643 - val_accuracy: 0.3692
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0523 - accuracy: 0.5046 - val_loss: 1.3482 - val_accuracy: 0.3692
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9056 - accuracy: 0.5000 - val_loss: 1.3317 - val_accuracy: 0.3692
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0478 - accuracy: 0.5208 - val_loss: 1.2852 - val_accuracy: 0.3598
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0192 - accuracy: 0.5093 - val_loss: 1.2668 - val_accuracy: 0.3551
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9540 - accuracy: 0.5255 - val_loss: 1.2841 - val_accuracy: 0.3551
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9096 - accuracy: 0.5255 - val_loss: 1.2445 - val_accuracy: 0.3505
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7994 - accuracy: 0.5069 - val_loss: 1.2352 - val_accuracy: 0.3598
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8628 - accuracy: 0.5278 - val_loss: 1.2355 - val_accuracy: 0.3364
Epoch 39/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8679 - accuracy: 0.4907 - val_loss: 1.2462 - val_accuracy: 0.3271
Epoch 40/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8462 - accuracy: 0.4977 - val_loss: 1.2276 - val_accuracy: 0.3318
Epoch 41/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8650 - accuracy: 0.5023 - val_loss: 1.1993 - val_accuracy: 0.3411
Epoch 42/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8803 - accuracy: 0.4884 - val_loss: 1.2194 - val_accuracy: 0.3458
Epoch 43/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8429 - accuracy: 0.5116 - val_loss: 1.1632 - val_accuracy: 0.3692
```

Epoch 44/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7074 - accuracy: 0.4977 - val_loss: 0.9803 - val_accuracy: 0.3505
Epoch 45/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6973 - accuracy: 0.4907 - val_loss: 0.9741 - val_accuracy: 0.3551
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6569 - accuracy: 0.4699 - val_loss: 0.9174 - val_accuracy: 0.3645
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6607 - accuracy: 0.5093 - val_loss: 0.9020 - val_accuracy: 0.3458
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6172 - accuracy: 0.4653 - val_loss: 0.8962 - val_accuracy: 0.3505
Epoch 49/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5958 - accuracy: 0.4630 - val_loss: 0.8729 - val_accuracy: 0.3411
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6435 - accuracy: 0.4745 - val_loss: 0.8464 - val_accuracy: 0.3318
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6053 - accuracy: 0.4630 - val_loss: 0.8508 - val_accuracy: 0.3411
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5880 - accuracy: 0.4560 - val_loss: 0.8799 - val_accuracy: 0.3458
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6247 - accuracy: 0.4583 - val_loss: 0.8963 - val_accuracy: 0.3505
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5639 - accuracy: 0.4352 - val_loss: 0.8621 - val_accuracy: 0.3411
Epoch 55/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5446 - accuracy: 0.4699 - val_loss: 0.9168 - val_accuracy: 0.3411
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6476 - accuracy: 0.4606 - val_loss: 0.8781 - val_accuracy: 0.3505
Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5352 - accuracy: 0.4815 - val_loss: 0.8113 - val_accuracy: 0.3692
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5734 - accuracy: 0.4722 - val_loss: 0.7982 - val_accuracy: 0.3692
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5133 - accuracy: 0.4954 - val_loss: 0.8375 - val_accuracy: 0.3879
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5525 - accuracy: 0.5255 - val_loss: 0.9706 - val_accuracy: 0.3785
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5796 - accuracy: 0.5116 - val_loss: 0.9628 - val_accuracy: 0.3832
Epoch 62/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4528 - accuracy: 0.4884 - val_loss: 0.7617 - val_accuracy: 0.3785
Epoch 63/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4195 - accuracy: 0.4792 - val_loss: 0.7913 - val_accuracy: 0.3832
Epoch 64/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6269 - accuracy: 0.4514 - val_loss: 0.7575 - val_accuracy: 0.3832
Epoch 65/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4684 - accuracy: 0.4606 - val_loss: 0.8011 - val_accuracy: 0.3879
Epoch 66/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5168 - accuracy: 0.4537 - val_loss: 0.9526 - val_accuracy: 0.4019
Epoch 67/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4373 - accuracy: 0.4583 - val_loss: 0.9770 - val_accuracy: 0.3972
Epoch 68/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4481 - accuracy: 0.4907 - val_loss: 1.0206 - val_accuracy: 0.3972
Epoch 69/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5283 - accuracy: 0.5023 - val_loss: 0.9618 - val_accuracy: 0.4065
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4831 - accuracy: 0.4606 - val_loss: 0.9246 - val_accuracy: 0.4065
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4847 - accuracy: 0.4375 - val_loss: 0.7824 - val_accuracy: 0.4346
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4799 - accuracy: 0.4769 - val_loss: 0.7965 - val_accuracy: 0.3925
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4277 - accuracy: 0.4282 - val_loss: 0.8360 - val_accuracy: 0.3925

```
accuracy: 0.4159
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4648 - accuracy: 0.4306 - val_loss: 0.9771 - val_accuracy: 0.3879
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4478 - accuracy: 0.4329 - val_loss: 0.9786 - val_accuracy: 0.3925
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4469 - accuracy: 0.4444 - val_loss: 0.9796 - val_accuracy: 0.3972
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5382 - accuracy: 0.4190 - val_loss: 0.9526 - val_accuracy: 0.3972
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4678 - accuracy: 0.4213 - val_loss: 0.9472 - val_accuracy: 0.4065
Epoch 79/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4996 - accuracy: 0.4745 - val_loss: 0.9765 - val_accuracy: 0.4019
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5053 - accuracy: 0.4120 - val_loss: 1.0012 - val_accuracy: 0.3925
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5023 - accuracy: 0.4375 - val_loss: 0.9271 - val_accuracy: 0.3925
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4847 - accuracy: 0.4236 - val_loss: 0.9149 - val_accuracy: 0.3832
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4686 - accuracy: 0.4306 - val_loss: 0.9102 - val_accuracy: 0.3879
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5437 - accuracy: 0.4421 - val_loss: 0.9109 - val_accuracy: 0.3879
Epoch 85/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4483 - accuracy: 0.4398 - val_loss: 0.9586 - val_accuracy: 0.3832
Epoch 86/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3929 - accuracy: 0.4421 - val_loss: 0.9724 - val_accuracy: 0.3879
Epoch 87/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4140 - accuracy: 0.4514 - val_loss: 1.0170 - val_accuracy: 0.3925
Epoch 88/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4931 - accuracy: 0.4398 - val_loss: 1.0956 - val_accuracy: 0.3925
Epoch 89/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4586 - accuracy: 0.4352 - val_loss: 0.9591 - val_accuracy: 0.3925
Epoch 90/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4630 - accuracy: 0.4306 - val_loss: 1.0880 - val_accuracy: 0.3832
Epoch 91/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4547 - accuracy: 0.4468 - val_loss: 1.1122 - val_accuracy: 0.3972
Epoch 92/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3921 - accuracy: 0.4491 - val_loss: 1.0067 - val_accuracy: 0.3832
Epoch 93/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4121 - accuracy: 0.4606 - val_loss: 0.9891 - val_accuracy: 0.3972
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4841 - accuracy: 0.4630 - val_loss: 0.9582 - val_accuracy: 0.3879
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4248 - accuracy: 0.4653 - val_loss: 1.0043 - val_accuracy: 0.3925
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4300 - accuracy: 0.4398 - val_loss: 1.0064 - val_accuracy: 0.3972
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4791 - accuracy: 0.4491 - val_loss: 0.9926 - val_accuracy: 0.4065
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4787 - accuracy: 0.4606 - val_loss: 1.0504 - val_accuracy: 0.4019
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4184 - accuracy: 0.4468 - val_loss: 1.0080 - val_accuracy: 0.4019
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4152 - accuracy: 0.4699 - val_loss: 1.0125 - val_accuracy: 0.4112
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4216 - accuracy: 0.4444 - val_loss: 1.0184 - val_accuracy: 0.4299
Epoch 102/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4684 - accuracy: 0.4676 - val_loss: 1.1009 - val_accuracy: 0.4206
Epoch 103/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.4637 - accuracy: 0.4444 - val_loss: 1.0521 - val_accuracy: 0.4065
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4541 - accuracy: 0.4537 - val_loss: 1.0000 - val_accuracy: 0.4346
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4985 - accuracy: 0.4722 - val_loss: 1.0147 - val_accuracy: 0.4299
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4483 - accuracy: 0.4769 - val_loss: 1.0708 - val_accuracy: 0.4626
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4822 - accuracy: 0.4653 - val_loss: 1.0251 - val_accuracy: 0.4766
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5216 - accuracy: 0.4745 - val_loss: 1.0290 - val_accuracy: 0.4907
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4147 - accuracy: 0.4560 - val_loss: 1.0259 - val_accuracy: 0.4766
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4183 - accuracy: 0.4583 - val_loss: 1.0261 - val_accuracy: 0.4720
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4246 - accuracy: 0.4514 - val_loss: 1.0237 - val_accuracy: 0.4720
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3877 - accuracy: 0.4838 - val_loss: 1.0019 - val_accuracy: 0.4439
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4652 - accuracy: 0.4745 - val_loss: 1.0139 - val_accuracy: 0.4206
Epoch 114/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4358 - accuracy: 0.5139 - val_loss: 0.9777 - val_accuracy: 0.4252
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4123 - accuracy: 0.4722 - val_loss: 0.9488 - val_accuracy: 0.4346
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4603 - accuracy: 0.4676 - val_loss: 0.9884 - val_accuracy: 0.3925
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3964 - accuracy: 0.4514 - val_loss: 0.9763 - val_accuracy: 0.4019
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4378 - accuracy: 0.4630 - val_loss: 1.0027 - val_accuracy: 0.4019
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3969 - accuracy: 0.4745 - val_loss: 0.9682 - val_accuracy: 0.4252
Epoch 120/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3768 - accuracy: 0.4815 - val_loss: 0.9964 - val_accuracy: 0.4346
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4522 - accuracy: 0.4583 - val_loss: 1.0705 - val_accuracy: 0.4159
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3815 - accuracy: 0.4421 - val_loss: 1.0497 - val_accuracy: 0.4159
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4490 - accuracy: 0.4630 - val_loss: 1.0214 - val_accuracy: 0.4112
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3745 - accuracy: 0.4722 - val_loss: 1.0521 - val_accuracy: 0.4299
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3206 - accuracy: 0.4468 - val_loss: 1.1164 - val_accuracy: 0.4346
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3799 - accuracy: 0.4676 - val_loss: 1.1627 - val_accuracy: 0.4346
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4404 - accuracy: 0.4514 - val_loss: 1.1763 - val_accuracy: 0.4486
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4128 - accuracy: 0.4861 - val_loss: 1.2846 - val_accuracy: 0.4673
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3770 - accuracy: 0.4861 - val_loss: 1.1674 - val_accuracy: 0.4720
Epoch 130/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3266 - accuracy: 0.4745 - val_loss: 1.2073 - val_accuracy: 0.4813
Epoch 131/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3121 - accuracy: 0.4977 - val_loss: 1.2033 - val_accuracy: 0.4907
Epoch 132/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4112 - accuracy: 0.4884 - val_loss: 1.1067 - val_accuracy: 0.4533
```

Epoch 133/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3090 - accuracy: 0.4630 - val_loss: 1.1737 - val_accuracy: 0.4486
 Epoch 134/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3468 - accuracy: 0.4537 - val_loss: 1.2717 - val_accuracy: 0.4720
 Epoch 135/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3543 - accuracy: 0.4606 - val_loss: 1.0891 - val_accuracy: 0.4813
 Epoch 136/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3245 - accuracy: 0.5162 - val_loss: 1.1871 - val_accuracy: 0.4720
 Epoch 137/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3537 - accuracy: 0.4769 - val_loss: 1.0881 - val_accuracy: 0.4907
 Epoch 138/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.3433 - accuracy: 0.5255 - val_loss: 1.1482 - val_accuracy: 0.4720
 Epoch 139/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4222 - accuracy: 0.5231 - val_loss: 1.1886 - val_accuracy: 0.4907
 Epoch 140/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4248 - accuracy: 0.5046 - val_loss: 1.2230 - val_accuracy: 0.4907
 Epoch 141/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3016 - accuracy: 0.5069 - val_loss: 1.2736 - val_accuracy: 0.4720
 Epoch 142/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4090 - accuracy: 0.5278 - val_loss: 1.3549 - val_accuracy: 0.4346
 Epoch 143/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4149 - accuracy: 0.4606 - val_loss: 1.2886 - val_accuracy: 0.4486
 Epoch 144/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3677 - accuracy: 0.4699 - val_loss: 1.3073 - val_accuracy: 0.4860
 Epoch 145/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3630 - accuracy: 0.4931 - val_loss: 1.3494 - val_accuracy: 0.4860
 Epoch 146/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3628 - accuracy: 0.4861 - val_loss: 1.3286 - val_accuracy: 0.4907
 Epoch 147/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2940 - accuracy: 0.4769 - val_loss: 1.3667 - val_accuracy: 0.4860
 Epoch 148/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2924 - accuracy: 0.5046 - val_loss: 1.3387 - val_accuracy: 0.5093
 Epoch 149/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3185 - accuracy: 0.5370 - val_loss: 1.3681 - val_accuracy: 0.4813
 Epoch 150/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4643 - accuracy: 0.5093 - val_loss: 1.5538 - val_accuracy: 0.4533
 Epoch 151/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3218 - accuracy: 0.4907 - val_loss: 1.5097 - val_accuracy: 0.4439
 Epoch 152/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.4067 - accuracy: 0.4699 - val_loss: 1.5190 - val_accuracy: 0.4439
 Epoch 153/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.1456 - accuracy: 0.5156 Restoring model weights from the end of the best epoch: 3.
 4/4 [=====] - 0s 13ms/step - loss: 0.3245 - accuracy: 0.4838 - val_loss: 1.4827 - val_accuracy: 0.4439
 Epoch 153: early stopping
 7/7 [=====] - 0s 2ms/step - loss: 4.8047 - accuracy: 0.6215
 Model: "sequential_104"

Layer (type)	Output Shape	Param #
dense_416 (Dense)	(None, 50)	350
batch_normalization_312 (BatchNormalization)	(None, 50)	200
activation_312 (Activation)	(None, 50)	0
dense_417 (Dense)	(None, 50)	2550
batch_normalization_313 (BatchNormalization)	(None, 50)	200
activation_313 (Activation)	(None, 50)	0
dense_418 (Dense)	(None, 10)	510
batch_normalization_314 (BatchNormalization)	(None, 10)	40

```
activation_314 (Activation) (None, 10)          0
dense_419 (Dense)      (None, 2)                22
=====
Total params: 3,872
Trainable params: 3,652
Non-trainable params: 220

Epoch 1/1000
4/4 [=====] - 1s 54ms/step - loss: 5.2780 - accuracy: 0.5231 - val_loss: 6.4633 - val_accuracy: 0.5280
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 3.8657 - accuracy: 0.5093 - val_loss: 4.9949 - val_accuracy: 0.5140
Epoch 3/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6701 - accuracy: 0.5463 - val_loss: 3.9804 - val_accuracy: 0.5794
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6252 - accuracy: 0.5602 - val_loss: 3.3950 - val_accuracy: 0.4533
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4262 - accuracy: 0.5417 - val_loss: 3.1206 - val_accuracy: 0.4813
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 3.1004 - accuracy: 0.5579 - val_loss: 2.8634 - val_accuracy: 0.7056
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8853 - accuracy: 0.6157 - val_loss: 2.7041 - val_accuracy: 0.7009
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8910 - accuracy: 0.5810 - val_loss: 2.5877 - val_accuracy: 0.5935
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6061 - accuracy: 0.5880 - val_loss: 2.4578 - val_accuracy: 0.6776
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6773 - accuracy: 0.6181 - val_loss: 2.2915 - val_accuracy: 0.6729
Epoch 11/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3654 - accuracy: 0.5880 - val_loss: 2.2329 - val_accuracy: 0.6729
Epoch 12/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2821 - accuracy: 0.6343 - val_loss: 2.2049 - val_accuracy: 0.6682
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0653 - accuracy: 0.6898 - val_loss: 2.1727 - val_accuracy: 0.6682
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0438 - accuracy: 0.6620 - val_loss: 2.1595 - val_accuracy: 0.6729
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8875 - accuracy: 0.6829 - val_loss: 2.1164 - val_accuracy: 0.6729
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8761 - accuracy: 0.6690 - val_loss: 2.0661 - val_accuracy: 0.6869
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7755 - accuracy: 0.6713 - val_loss: 2.0042 - val_accuracy: 0.6682
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8130 - accuracy: 0.6690 - val_loss: 1.9861 - val_accuracy: 0.6636
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8565 - accuracy: 0.6528 - val_loss: 1.9665 - val_accuracy: 0.6495
Epoch 20/1000
4/4 [=====] - 0s 11ms/step - loss: 1.7553 - accuracy: 0.6898 - val_loss: 1.9427 - val_accuracy: 0.6402
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8084 - accuracy: 0.6690 - val_loss: 1.9212 - val_accuracy: 0.6355
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6204 - accuracy: 0.6690 - val_loss: 1.8954 - val_accuracy: 0.6308
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6986 - accuracy: 0.6574 - val_loss: 1.8707 - val_accuracy: 0.6355
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5929 - accuracy: 0.6736 - val_loss: 1.8507 - val_accuracy: 0.6262
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5247 - accuracy: 0.6782 - val_loss: 1.7780 - val_accuracy: 0.6168
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5573 - accuracy: 0.6690 - val_loss: 1.7720 - val_accuracy: 0.6355
Epoch 27/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 1.3039 - accuracy: 0.6759 - val_loss: 1.6866 - val_accuracy: 0.6355
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2927 - accuracy: 0.6898 - val_loss: 1.6403 - val_accuracy: 0.6168
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2982 - accuracy: 0.6968 - val_loss: 1.6076 - val_accuracy: 0.6121
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2394 - accuracy: 0.7315 - val_loss: 1.5848 - val_accuracy: 0.6075
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1925 - accuracy: 0.7199 - val_loss: 1.5519 - val_accuracy: 0.5654
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1846 - accuracy: 0.7083 - val_loss: 1.5102 - val_accuracy: 0.5607
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1770 - accuracy: 0.7199 - val_loss: 1.4776 - val_accuracy: 0.6075
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 1.1836 - accuracy: 0.7361 - val_loss: 1.4549 - val_accuracy: 0.6262
Epoch 35/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1564 - accuracy: 0.7431 - val_loss: 1.4392 - val_accuracy: 0.5935
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0517 - accuracy: 0.7407 - val_loss: 1.4224 - val_accuracy: 0.5981
Epoch 37/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0558 - accuracy: 0.7384 - val_loss: 1.4347 - val_accuracy: 0.5421
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9726 - accuracy: 0.7593 - val_loss: 1.3956 - val_accuracy: 0.5327
Epoch 39/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9938 - accuracy: 0.7384 - val_loss: 1.3742 - val_accuracy: 0.5467
Epoch 40/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9156 - accuracy: 0.7454 - val_loss: 1.3493 - val_accuracy: 0.5654
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9445 - accuracy: 0.7338 - val_loss: 1.3285 - val_accuracy: 0.5421
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8650 - accuracy: 0.7500 - val_loss: 1.2503 - val_accuracy: 0.5748
Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7068 - accuracy: 0.7639 - val_loss: 1.1769 - val_accuracy: 0.6121
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7406 - accuracy: 0.7685 - val_loss: 1.1650 - val_accuracy: 0.5280
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7094 - accuracy: 0.7708 - val_loss: 1.1507 - val_accuracy: 0.4860
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6889 - accuracy: 0.7778 - val_loss: 1.1405 - val_accuracy: 0.4673
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6770 - accuracy: 0.7801 - val_loss: 1.1277 - val_accuracy: 0.4766
Epoch 48/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7044 - accuracy: 0.7755 - val_loss: 1.1108 - val_accuracy: 0.4720
Epoch 49/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7014 - accuracy: 0.7500 - val_loss: 1.1007 - val_accuracy: 0.4673
Epoch 50/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7254 - accuracy: 0.7755 - val_loss: 1.1071 - val_accuracy: 0.4579
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6743 - accuracy: 0.7824 - val_loss: 1.0895 - val_accuracy: 0.4486
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6041 - accuracy: 0.7755 - val_loss: 1.0760 - val_accuracy: 0.4486
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6628 - accuracy: 0.7708 - val_loss: 1.0633 - val_accuracy: 0.4533
Epoch 54/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6593 - accuracy: 0.7731 - val_loss: 1.0459 - val_accuracy: 0.4533
Epoch 55/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6312 - accuracy: 0.7639 - val_loss: 1.0309 - val_accuracy: 0.4486
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6600 - accuracy: 0.7616 - val_loss: 1.0235 - val_accuracy: 0.4439
```

Epoch 57/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5685 - accuracy: 0.7500 - val_loss: 0.9778 - val_accuracy: 0.4486
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5823 - accuracy: 0.7176 - val_loss: 0.9645 - val_accuracy: 0.4346
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5541 - accuracy: 0.7407 - val_loss: 0.9290 - val_accuracy: 0.4439
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5559 - accuracy: 0.7338 - val_loss: 0.9437 - val_accuracy: 0.4439
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5587 - accuracy: 0.6944 - val_loss: 0.9379 - val_accuracy: 0.4393
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4995 - accuracy: 0.7083 - val_loss: 0.9206 - val_accuracy: 0.4393
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5211 - accuracy: 0.6806 - val_loss: 0.9120 - val_accuracy: 0.4393
Epoch 64/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5262 - accuracy: 0.6667 - val_loss: 0.9059 - val_accuracy: 0.4393
Epoch 65/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5680 - accuracy: 0.6898 - val_loss: 0.8770 - val_accuracy: 0.4346
Epoch 66/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4606 - accuracy: 0.6736 - val_loss: 0.8733 - val_accuracy: 0.4346
Epoch 67/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4453 - accuracy: 0.6667 - val_loss: 0.8887 - val_accuracy: 0.4346
Epoch 68/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4873 - accuracy: 0.6736 - val_loss: 0.9019 - val_accuracy: 0.4346
Epoch 69/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4948 - accuracy: 0.6991 - val_loss: 0.8494 - val_accuracy: 0.4393
Epoch 70/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5465 - accuracy: 0.6620 - val_loss: 0.8266 - val_accuracy: 0.4346
Epoch 71/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4361 - accuracy: 0.6412 - val_loss: 0.7878 - val_accuracy: 0.4346
Epoch 72/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4692 - accuracy: 0.6458 - val_loss: 0.7390 - val_accuracy: 0.4346
Epoch 73/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4306 - accuracy: 0.6157 - val_loss: 0.7518 - val_accuracy: 0.4299
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4323 - accuracy: 0.6389 - val_loss: 0.7249 - val_accuracy: 0.4346
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4636 - accuracy: 0.6458 - val_loss: 0.7184 - val_accuracy: 0.4346
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5222 - accuracy: 0.6458 - val_loss: 0.7133 - val_accuracy: 0.4346
Epoch 77/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4151 - accuracy: 0.6412 - val_loss: 0.7382 - val_accuracy: 0.4439
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3675 - accuracy: 0.6505 - val_loss: 0.6950 - val_accuracy: 0.4439
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3815 - accuracy: 0.6319 - val_loss: 0.6666 - val_accuracy: 0.4439
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3970 - accuracy: 0.6065 - val_loss: 0.6745 - val_accuracy: 0.4393
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3936 - accuracy: 0.6319 - val_loss: 0.6759 - val_accuracy: 0.4439
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4568 - accuracy: 0.6157 - val_loss: 0.7379 - val_accuracy: 0.4393
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4297 - accuracy: 0.6412 - val_loss: 0.7156 - val_accuracy: 0.4533
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4378 - accuracy: 0.7083 - val_loss: 0.6751 - val_accuracy: 0.4579
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3724 - accuracy: 0.7384 - val_loss: 0.6601 - val_accuracy: 0.4766
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3458 - accuracy: 0.7477 - val_loss: 0.6708 - val_accuracy: 0.4766

```
accuracy: 0.4907
Epoch 87/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5472 - accuracy: 0.7431 - val_loss: 0.6897 - val_
accuracy: 0.5187
Epoch 88/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3568 - accuracy: 0.7778 - val_loss: 0.6780 - val_
accuracy: 0.5467
Epoch 89/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4016 - accuracy: 0.7523 - val_loss: 0.7176 - val_
accuracy: 0.5234
Epoch 90/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4008 - accuracy: 0.7477 - val_loss: 0.7087 - val_
accuracy: 0.5327
Epoch 91/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4154 - accuracy: 0.7407 - val_loss: 0.7031 - val_
accuracy: 0.5607
Epoch 92/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3807 - accuracy: 0.7616 - val_loss: 0.7015 - val_
accuracy: 0.5374
Epoch 93/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3398 - accuracy: 0.7824 - val_loss: 0.7095 - val_
accuracy: 0.5421
Epoch 94/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3845 - accuracy: 0.7685 - val_loss: 0.7061 - val_
accuracy: 0.5561
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3873 - accuracy: 0.7870 - val_loss: 0.7080 - val_
accuracy: 0.5794
Epoch 96/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3612 - accuracy: 0.8032 - val_loss: 0.7315 - val_
accuracy: 0.5794
Epoch 97/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3892 - accuracy: 0.7593 - val_loss: 0.7265 - val_
accuracy: 0.5794
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4099 - accuracy: 0.7870 - val_loss: 0.7211 - val_
accuracy: 0.6215
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3427 - accuracy: 0.8356 - val_loss: 0.7319 - val_
accuracy: 0.6121
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4103 - accuracy: 0.8241 - val_loss: 0.7083 - val_
accuracy: 0.6449
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3964 - accuracy: 0.7824 - val_loss: 0.7169 - val_
accuracy: 0.6262
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3788 - accuracy: 0.7639 - val_loss: 0.7379 - val_
accuracy: 0.5888
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4106 - accuracy: 0.7778 - val_loss: 0.7396 - val_
accuracy: 0.5888
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3439 - accuracy: 0.7986 - val_loss: 0.7344 - val_
accuracy: 0.5654
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3677 - accuracy: 0.7755 - val_loss: 0.7284 - val_
accuracy: 0.5701
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3462 - accuracy: 0.7523 - val_loss: 0.7122 - val_
accuracy: 0.5748
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3847 - accuracy: 0.7546 - val_loss: 0.7418 - val_
accuracy: 0.5421
Epoch 108/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3330 - accuracy: 0.7894 - val_loss: 0.7162 - val_
accuracy: 0.5748
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3590 - accuracy: 0.7986 - val_loss: 0.7241 - val_
accuracy: 0.5748
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3962 - accuracy: 0.7778 - val_loss: 0.6932 - val_
accuracy: 0.6402
Epoch 111/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3483 - accuracy: 0.8287 - val_loss: 0.7120 - val_
accuracy: 0.6542
Epoch 112/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3512 - accuracy: 0.8565 - val_loss: 0.7204 - val_
accuracy: 0.6495
Epoch 113/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3136 - accuracy: 0.8472 - val_loss: 0.7507 - val_
accuracy: 0.6355
Epoch 114/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3645 - accuracy: 0.8310 - val_loss: 0.7280 - val_
accuracy: 0.6729
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3579 - accuracy: 0.8287 - val_loss: 0.7346 - val_
accuracy: 0.7196
Epoch 116/1000
```

```
4/4 [=====] - 0s 11ms/step - loss: 0.4085 - accuracy: 0.8403 - val_loss: 0.7576 - val_accuracy: 0.7103
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3285 - accuracy: 0.8750 - val_loss: 0.7486 - val_accuracy: 0.7336
Epoch 118/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3832 - accuracy: 0.8611 - val_loss: 0.7354 - val_accuracy: 0.7383
Epoch 119/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3287 - accuracy: 0.8704 - val_loss: 0.7358 - val_accuracy: 0.7430
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3210 - accuracy: 0.8542 - val_loss: 0.7260 - val_accuracy: 0.7477
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3285 - accuracy: 0.8750 - val_loss: 0.7400 - val_accuracy: 0.7290
Epoch 122/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4173 - accuracy: 0.8704 - val_loss: 0.7967 - val_accuracy: 0.7804
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3784 - accuracy: 0.8588 - val_loss: 0.7708 - val_accuracy: 0.7804
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3378 - accuracy: 0.8843 - val_loss: 0.7359 - val_accuracy: 0.7757
Epoch 125/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3715 - accuracy: 0.8796 - val_loss: 0.7859 - val_accuracy: 0.7897
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3661 - accuracy: 0.8750 - val_loss: 0.7461 - val_accuracy: 0.7850
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3067 - accuracy: 0.9028 - val_loss: 0.7510 - val_accuracy: 0.7991
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3241 - accuracy: 0.9005 - val_loss: 0.7290 - val_accuracy: 0.7757
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3946 - accuracy: 0.8634 - val_loss: 0.8315 - val_accuracy: 0.7850
Epoch 130/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3553 - accuracy: 0.8727 - val_loss: 0.8365 - val_accuracy: 0.7757
Epoch 131/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2958 - accuracy: 0.8981 - val_loss: 0.8305 - val_accuracy: 0.7804
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3306 - accuracy: 0.8472 - val_loss: 0.8343 - val_accuracy: 0.7757
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3334 - accuracy: 0.8889 - val_loss: 0.8286 - val_accuracy: 0.7850
Epoch 134/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3373 - accuracy: 0.8773 - val_loss: 0.8254 - val_accuracy: 0.7757
Epoch 135/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3136 - accuracy: 0.8657 - val_loss: 0.8098 - val_accuracy: 0.7757
Epoch 136/1000
4/4 [=====] - 0s 10ms/step - loss: 0.3986 - accuracy: 0.8565 - val_loss: 0.8378 - val_accuracy: 0.7804
Epoch 137/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3396 - accuracy: 0.8519 - val_loss: 0.7362 - val_accuracy: 0.7243
Epoch 138/1000
4/4 [=====] - 0s 10ms/step - loss: 0.3457 - accuracy: 0.8472 - val_loss: 0.7298 - val_accuracy: 0.7430
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3177 - accuracy: 0.8403 - val_loss: 0.8475 - val_accuracy: 0.7430
Epoch 140/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3611 - accuracy: 0.7986 - val_loss: 0.8421 - val_accuracy: 0.7523
Epoch 141/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3650 - accuracy: 0.8194 - val_loss: 0.8415 - val_accuracy: 0.7430
Epoch 142/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3320 - accuracy: 0.8472 - val_loss: 0.8438 - val_accuracy: 0.7243
Epoch 143/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3057 - accuracy: 0.8542 - val_loss: 0.7543 - val_accuracy: 0.6542
Epoch 144/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3176 - accuracy: 0.8426 - val_loss: 0.7372 - val_accuracy: 0.6822
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3350 - accuracy: 0.8125 - val_loss: 0.7390 - val_accuracy: 0.6776
```

Epoch 146/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2898 - accuracy: 0.8102 - val_loss: 0.8301 - val_accuracy: 0.6916
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3472 - accuracy: 0.8241 - val_loss: 0.7565 - val_accuracy: 0.6682
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3168 - accuracy: 0.8264 - val_loss: 0.7707 - val_accuracy: 0.6822
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2923 - accuracy: 0.8356 - val_loss: 0.8189 - val_accuracy: 0.6682
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3213 - accuracy: 0.8310 - val_loss: 0.8676 - val_accuracy: 0.7056
Epoch 151/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3278 - accuracy: 0.8356 - val_loss: 0.8392 - val_accuracy: 0.7103
Epoch 152/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2991 - accuracy: 0.8310 - val_loss: 0.7926 - val_accuracy: 0.6636
Epoch 153/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3744 - accuracy: 0.8310 - val_loss: 1.0493 - val_accuracy: 0.7710
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3247 - accuracy: 0.8565 - val_loss: 1.0368 - val_accuracy: 0.7570
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2934 - accuracy: 0.8519 - val_loss: 0.9810 - val_accuracy: 0.7617
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3596 - accuracy: 0.8426 - val_loss: 0.9698 - val_accuracy: 0.7664
Epoch 157/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3068 - accuracy: 0.8102 - val_loss: 0.8792 - val_accuracy: 0.7383
Epoch 158/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3102 - accuracy: 0.8333 - val_loss: 1.0311 - val_accuracy: 0.7430
Epoch 159/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3390 - accuracy: 0.8241 - val_loss: 1.0047 - val_accuracy: 0.7570
Epoch 160/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2942 - accuracy: 0.8194 - val_loss: 0.9881 - val_accuracy: 0.7664
Epoch 161/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2934 - accuracy: 0.8380 - val_loss: 1.0692 - val_accuracy: 0.7523
Epoch 162/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3229 - accuracy: 0.8403 - val_loss: 1.0079 - val_accuracy: 0.7664
Epoch 163/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3462 - accuracy: 0.8426 - val_loss: 1.1203 - val_accuracy: 0.7477
Epoch 164/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4395 - accuracy: 0.7801 - val_loss: 1.3074 - val_accuracy: 0.7850
Epoch 165/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3930 - accuracy: 0.8565 - val_loss: 1.1442 - val_accuracy: 0.7897
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3087 - accuracy: 0.8750 - val_loss: 1.1123 - val_accuracy: 0.7850
Epoch 167/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3650 - accuracy: 0.8866 - val_loss: 1.1115 - val_accuracy: 0.7710
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3007 - accuracy: 0.8912 - val_loss: 1.0478 - val_accuracy: 0.7757
Epoch 169/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2928 - accuracy: 0.8773 - val_loss: 1.0469 - val_accuracy: 0.7804
Epoch 170/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2924 - accuracy: 0.8704 - val_loss: 1.0473 - val_accuracy: 0.8037
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3285 - accuracy: 0.8565 - val_loss: 1.0932 - val_accuracy: 0.7710
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2893 - accuracy: 0.8634 - val_loss: 1.0582 - val_accuracy: 0.7897
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3318 - accuracy: 0.8565 - val_loss: 1.1350 - val_accuracy: 0.8037
Epoch 174/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3263 - accuracy: 0.8565 - val_loss: 0.9345 - val_accuracy: 0.7991
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3968 - accuracy: 0.8657 - val_loss: 0.9486 - val_accuracy: 0.8037

```
accuracy: 0.7477
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3535 - accuracy: 0.8657 - val_loss: 1.0164 - val_
accuracy: 0.7710
Epoch 177/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2936 - accuracy: 0.8611 - val_loss: 0.9494 - val_
accuracy: 0.7570
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3479 - accuracy: 0.8426 - val_loss: 1.1499 - val_
accuracy: 0.7804
Epoch 179/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3185 - accuracy: 0.8194 - val_loss: 1.0557 - val_
accuracy: 0.7617
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3048 - accuracy: 0.8194 - val_loss: 1.0970 - val_
accuracy: 0.7570
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3011 - accuracy: 0.8171 - val_loss: 0.9413 - val_
accuracy: 0.7477
Epoch 182/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3095 - accuracy: 0.8148 - val_loss: 0.9467 - val_
accuracy: 0.7477
Epoch 183/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2931 - accuracy: 0.8194 - val_loss: 0.9844 - val_
accuracy: 0.7383
Epoch 184/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2882 - accuracy: 0.8056 - val_loss: 0.9455 - val_
accuracy: 0.6963
Epoch 185/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2736 - accuracy: 0.7963 - val_loss: 0.9814 - val_
accuracy: 0.6869
Epoch 186/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3224 - accuracy: 0.7847 - val_loss: 1.0537 - val_
accuracy: 0.6729
Epoch 187/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2779 - accuracy: 0.7662 - val_loss: 1.0793 - val_
accuracy: 0.7290
Epoch 188/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3541 - accuracy: 0.7662 - val_loss: 1.0074 - val_
accuracy: 0.7290
Epoch 189/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3097 - accuracy: 0.7708 - val_loss: 0.9962 - val_
accuracy: 0.7290
Epoch 190/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3339 - accuracy: 0.7708 - val_loss: 1.0021 - val_
accuracy: 0.7290
Epoch 191/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2879 - accuracy: 0.7894 - val_loss: 1.0294 - val_
accuracy: 0.7290
Epoch 192/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3160 - accuracy: 0.8264 - val_loss: 1.0239 - val_
accuracy: 0.7383
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3177 - accuracy: 0.8287 - val_loss: 1.0397 - val_
accuracy: 0.7336
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2719 - accuracy: 0.8171 - val_loss: 0.9275 - val_
accuracy: 0.7804
Epoch 195/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2807 - accuracy: 0.8287 - val_loss: 1.0656 - val_
accuracy: 0.7664
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3178 - accuracy: 0.8426 - val_loss: 1.0714 - val_
accuracy: 0.7664
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4548 - accuracy: 0.8102 - val_loss: 0.9631 - val_
accuracy: 0.7944
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3559 - accuracy: 0.8495 - val_loss: 1.0392 - val_
accuracy: 0.7664
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3310 - accuracy: 0.7847 - val_loss: 1.1406 - val_
accuracy: 0.7944
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3328 - accuracy: 0.7940 - val_loss: 1.0392 - val_
accuracy: 0.7991
Epoch 201/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3404 - accuracy: 0.8264 - val_loss: 1.0864 - val_
accuracy: 0.7897
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3132 - accuracy: 0.8426 - val_loss: 1.0601 - val_
accuracy: 0.8037
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3406 - accuracy: 0.8380 - val_loss: 1.1631 - val_
accuracy: 0.7991
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4296 - accuracy: 0.8403 - val_loss: 1.1309 - val_
accuracy: 0.7944
Epoch 205/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.3829 - accuracy: 0.8218 - val_loss: 1.1061 - val_accuracy: 0.7944
Epoch 206/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3246 - accuracy: 0.8056 - val_loss: 0.9935 - val_accuracy: 0.7944
Epoch 207/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2959 - accuracy: 0.8218 - val_loss: 0.9456 - val_accuracy: 0.7897
Epoch 208/1000
4/4 [=====] - 0s 10ms/step - loss: 0.3373 - accuracy: 0.8542 - val_loss: 0.9820 - val_accuracy: 0.8037
Epoch 209/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2805 - accuracy: 0.8403 - val_loss: 1.0632 - val_accuracy: 0.7991
Epoch 210/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3898 - accuracy: 0.8171 - val_loss: 1.1568 - val_accuracy: 0.7850
Epoch 211/1000
4/4 [=====] - 0s 10ms/step - loss: 0.2804 - accuracy: 0.8310 - val_loss: 1.1550 - val_accuracy: 0.7757
Epoch 212/1000
4/4 [=====] - 0s 10ms/step - loss: 0.2814 - accuracy: 0.8241 - val_loss: 0.9170 - val_accuracy: 0.8037
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2660 - accuracy: 0.8565 - val_loss: 1.0002 - val_accuracy: 0.8084
Epoch 214/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2810 - accuracy: 0.8519 - val_loss: 1.1464 - val_accuracy: 0.8037
Epoch 215/1000
4/4 [=====] - 0s 10ms/step - loss: 0.2709 - accuracy: 0.8403 - val_loss: 1.2895 - val_accuracy: 0.7944
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2917 - accuracy: 0.8426 - val_loss: 1.3409 - val_accuracy: 0.8178
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3300 - accuracy: 0.8796 - val_loss: 1.2569 - val_accuracy: 0.8037
Epoch 218/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3158 - accuracy: 0.8611 - val_loss: 1.2785 - val_accuracy: 0.8271
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3414 - accuracy: 0.8588 - val_loss: 1.0151 - val_accuracy: 0.8037
Epoch 220/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2696 - accuracy: 0.8403 - val_loss: 1.2361 - val_accuracy: 0.8411
Epoch 221/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3315 - accuracy: 0.8704 - val_loss: 1.1508 - val_accuracy: 0.8458
Epoch 222/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2528 - accuracy: 0.8704 - val_loss: 1.2200 - val_accuracy: 0.8411
Epoch 223/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3399 - accuracy: 0.8102 - val_loss: 1.2890 - val_accuracy: 0.8178
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2868 - accuracy: 0.8611 - val_loss: 1.2873 - val_accuracy: 0.8131
Epoch 225/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3561 - accuracy: 0.8032 - val_loss: 1.2981 - val_accuracy: 0.7150
Epoch 226/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2796 - accuracy: 0.7454 - val_loss: 1.1569 - val_accuracy: 0.7103
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3940 - accuracy: 0.7616 - val_loss: 1.1785 - val_accuracy: 0.7430
Epoch 228/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2750 - accuracy: 0.7940 - val_loss: 1.1292 - val_accuracy: 0.7570
Epoch 229/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2684 - accuracy: 0.7847 - val_loss: 1.2315 - val_accuracy: 0.7570
Epoch 230/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2676 - accuracy: 0.7870 - val_loss: 1.2324 - val_accuracy: 0.7383
Epoch 231/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3925 - accuracy: 0.8009 - val_loss: 1.2894 - val_accuracy: 0.7710
Epoch 232/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3012 - accuracy: 0.8241 - val_loss: 1.2010 - val_accuracy: 0.7757
Epoch 233/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3756 - accuracy: 0.7870 - val_loss: 1.1293 - val_accuracy: 0.7617
Epoch 234/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2665 - accuracy: 0.7986 - val_loss: 1.0653 - val_accuracy: 0.7570
```

Epoch 235/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2608 - accuracy: 0.7847 - val_loss: 1.0091 - val_accuracy: 0.7664
Epoch 236/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2669 - accuracy: 0.8287 - val_loss: 1.0158 - val_accuracy: 0.7617
Epoch 237/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2667 - accuracy: 0.7708 - val_loss: 1.0254 - val_accuracy: 0.7617
Epoch 238/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2611 - accuracy: 0.8241 - val_loss: 0.9948 - val_accuracy: 0.7664
Epoch 239/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2657 - accuracy: 0.8241 - val_loss: 1.0445 - val_accuracy: 0.7757
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3583 - accuracy: 0.8426 - val_loss: 1.1544 - val_accuracy: 0.7710
Epoch 241/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3103 - accuracy: 0.8495 - val_loss: 1.1664 - val_accuracy: 0.8084
Epoch 242/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3060 - accuracy: 0.8449 - val_loss: 1.0990 - val_accuracy: 0.7944
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3037 - accuracy: 0.8588 - val_loss: 1.0227 - val_accuracy: 0.7897
Epoch 244/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3726 - accuracy: 0.8495 - val_loss: 1.0935 - val_accuracy: 0.7477
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3155 - accuracy: 0.8079 - val_loss: 1.1367 - val_accuracy: 0.7290
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2453 - accuracy: 0.7824 - val_loss: 1.1152 - val_accuracy: 0.7383
Epoch 247/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2619 - accuracy: 0.7847 - val_loss: 0.9685 - val_accuracy: 0.6589
Epoch 248/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3552 - accuracy: 0.7523 - val_loss: 1.0532 - val_accuracy: 0.6963
Epoch 249/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2899 - accuracy: 0.7523 - val_loss: 1.0735 - val_accuracy: 0.7150
Epoch 250/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3875 - accuracy: 0.7685 - val_loss: 1.1643 - val_accuracy: 0.7196
Epoch 251/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3670 - accuracy: 0.7431 - val_loss: 1.1786 - val_accuracy: 0.7243
Epoch 252/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3489 - accuracy: 0.7708 - val_loss: 1.0854 - val_accuracy: 0.7336
Epoch 253/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3319 - accuracy: 0.7847 - val_loss: 1.1262 - val_accuracy: 0.7523
Epoch 254/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4305 - accuracy: 0.7824 - val_loss: 1.2158 - val_accuracy: 0.7991
Epoch 255/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2818 - accuracy: 0.8241 - val_loss: 1.0841 - val_accuracy: 0.7850
Epoch 256/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2734 - accuracy: 0.8194 - val_loss: 1.0461 - val_accuracy: 0.7804
Epoch 257/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3322 - accuracy: 0.8403 - val_loss: 0.9744 - val_accuracy: 0.7617
Epoch 258/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3158 - accuracy: 0.8472 - val_loss: 0.9670 - val_accuracy: 0.8037
Epoch 259/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3140 - accuracy: 0.8495 - val_loss: 0.9926 - val_accuracy: 0.8318
Epoch 260/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2963 - accuracy: 0.8495 - val_loss: 0.9482 - val_accuracy: 0.8271
Epoch 261/1000
4/4 [=====] - 0s 10ms/step - loss: 0.2740 - accuracy: 0.8449 - val_loss: 1.1251 - val_accuracy: 0.8178
Epoch 262/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3499 - accuracy: 0.8588 - val_loss: 1.1090 - val_accuracy: 0.8178
Epoch 263/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2470 - accuracy: 0.8704 - val_loss: 1.1213 - val_accuracy: 0.8224
Epoch 264/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2776 - accuracy: 0.8657 - val_loss: 1.1228 - val_accuracy: 0.8224

```
accuracy: 0.8131
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2587 - accuracy: 0.8588 - val_loss: 1.2659 - val_
accuracy: 0.8084
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3323 - accuracy: 0.8634 - val_loss: 1.1900 - val_
accuracy: 0.8084
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2570 - accuracy: 0.8773 - val_loss: 1.4029 - val_
accuracy: 0.8224
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2949 - accuracy: 0.8519 - val_loss: 1.4023 - val_
accuracy: 0.8131
Epoch 269/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2914 - accuracy: 0.8380 - val_loss: 1.2107 - val_
accuracy: 0.8131
Epoch 270/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2728 - accuracy: 0.8704 - val_loss: 1.1966 - val_
accuracy: 0.8131
Epoch 271/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2786 - accuracy: 0.8634 - val_loss: 1.3803 - val_
accuracy: 0.8178
Epoch 272/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3176 - accuracy: 0.8264 - val_loss: 1.3283 - val_
accuracy: 0.7944
Epoch 273/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2453 - accuracy: 0.8380 - val_loss: 1.4146 - val_
accuracy: 0.8037
Epoch 274/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3618 - accuracy: 0.8079 - val_loss: 1.1665 - val_
accuracy: 0.7617
Epoch 275/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3058 - accuracy: 0.8056 - val_loss: 1.3547 - val_
accuracy: 0.7664
Epoch 276/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2493 - accuracy: 0.7917 - val_loss: 1.2748 - val_
accuracy: 0.7523
Epoch 277/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2546 - accuracy: 0.7986 - val_loss: 1.3414 - val_
accuracy: 0.7477
Epoch 278/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2767 - accuracy: 0.8148 - val_loss: 1.1957 - val_
accuracy: 0.7430
Epoch 279/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2874 - accuracy: 0.7894 - val_loss: 1.2026 - val_
accuracy: 0.7664
Epoch 280/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3347 - accuracy: 0.8009 - val_loss: 1.2165 - val_
accuracy: 0.7897
Epoch 281/1000
4/4 [=====] - 0s 10ms/step - loss: 0.2438 - accuracy: 0.8102 - val_loss: 1.1866 - val_
accuracy: 0.7897
Epoch 282/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2500 - accuracy: 0.8056 - val_loss: 1.3028 - val_
accuracy: 0.8084
Epoch 283/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2365 - accuracy: 0.8241 - val_loss: 1.1719 - val_
accuracy: 0.8131
Epoch 284/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2967 - accuracy: 0.8241 - val_loss: 1.3115 - val_
accuracy: 0.7897
Epoch 285/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2928 - accuracy: 0.8264 - val_loss: 1.3511 - val_
accuracy: 0.7757
Epoch 286/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3342 - accuracy: 0.8079 - val_loss: 1.1797 - val_
accuracy: 0.7757
Epoch 287/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2961 - accuracy: 0.8079 - val_loss: 1.2643 - val_
accuracy: 0.7897
Epoch 288/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2599 - accuracy: 0.8264 - val_loss: 1.2320 - val_
accuracy: 0.7804
Epoch 289/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2388 - accuracy: 0.8102 - val_loss: 1.2311 - val_
accuracy: 0.7850
Epoch 290/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2760 - accuracy: 0.7824 - val_loss: 1.3016 - val_
accuracy: 0.7430
Epoch 291/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2880 - accuracy: 0.7755 - val_loss: 1.2875 - val_
accuracy: 0.7477
Epoch 292/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3864 - accuracy: 0.7639 - val_loss: 1.2977 - val_
accuracy: 0.7336
Epoch 293/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2600 - accuracy: 0.7708 - val_loss: 1.2021 - val_
accuracy: 0.7477
Epoch 294/1000
```

```
4/4 [=====] - 0s 11ms/step - loss: 0.2869 - accuracy: 0.7616 - val_loss: 1.5077 - val_accuracy: 0.7570
Epoch 295/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3203 - accuracy: 0.7708 - val_loss: 1.2186 - val_accuracy: 0.7664
Epoch 296/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4200 - accuracy: 0.7616 - val_loss: 1.2464 - val_accuracy: 0.7757
Epoch 297/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2536 - accuracy: 0.7963 - val_loss: 1.3080 - val_accuracy: 0.7804
Epoch 298/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2765 - accuracy: 0.7894 - val_loss: 1.1755 - val_accuracy: 0.7664
Epoch 299/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3071 - accuracy: 0.7801 - val_loss: 1.3781 - val_accuracy: 0.7897
Epoch 300/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3581 - accuracy: 0.7963 - val_loss: 1.2752 - val_accuracy: 0.7897
Epoch 301/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3649 - accuracy: 0.7685 - val_loss: 1.2204 - val_accuracy: 0.7757
Epoch 302/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2604 - accuracy: 0.7963 - val_loss: 1.2413 - val_accuracy: 0.7850
Epoch 303/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2675 - accuracy: 0.8056 - val_loss: 1.1359 - val_accuracy: 0.7850
Epoch 304/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2481 - accuracy: 0.7986 - val_loss: 1.2849 - val_accuracy: 0.7944
Epoch 305/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2540 - accuracy: 0.8241 - val_loss: 1.3209 - val_accuracy: 0.7944
Epoch 306/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2748 - accuracy: 0.8287 - val_loss: 1.3074 - val_accuracy: 0.7944
Epoch 307/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3053 - accuracy: 0.8264 - val_loss: 1.1456 - val_accuracy: 0.7991
Epoch 308/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3529 - accuracy: 0.8241 - val_loss: 1.0483 - val_accuracy: 0.7944
Epoch 309/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3544 - accuracy: 0.8241 - val_loss: 1.1701 - val_accuracy: 0.7570
Epoch 310/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2332 - accuracy: 0.8125 - val_loss: 1.1054 - val_accuracy: 0.7664
Epoch 311/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2743 - accuracy: 0.8241 - val_loss: 1.1209 - val_accuracy: 0.7897
Epoch 312/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2963 - accuracy: 0.8449 - val_loss: 1.1603 - val_accuracy: 0.7944
Epoch 313/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2732 - accuracy: 0.8102 - val_loss: 1.1070 - val_accuracy: 0.7897
Epoch 314/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3294 - accuracy: 0.8194 - val_loss: 1.2319 - val_accuracy: 0.7991
Epoch 315/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2691 - accuracy: 0.8333 - val_loss: 1.4203 - val_accuracy: 0.8084
Epoch 316/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2879 - accuracy: 0.8403 - val_loss: 1.1546 - val_accuracy: 0.8131
Epoch 317/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2705 - accuracy: 0.8287 - val_loss: 1.0456 - val_accuracy: 0.8037
Epoch 318/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2410 - accuracy: 0.8056 - val_loss: 1.1080 - val_accuracy: 0.7804
Epoch 319/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2272 - accuracy: 0.8171 - val_loss: 1.0467 - val_accuracy: 0.7757
Epoch 320/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4048 - accuracy: 0.8148 - val_loss: 1.4163 - val_accuracy: 0.7850
Epoch 321/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2445 - accuracy: 0.8634 - val_loss: 1.3497 - val_accuracy: 0.7850
Epoch 322/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2176 - accuracy: 0.8380 - val_loss: 1.3416 - val_accuracy: 0.7944
Epoch 323/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4181 - accuracy: 0.8148 - val_loss: 1.2535 - val_accuracy: 0.7944
```

Epoch 324/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2999 - accuracy: 0.8264 - val_loss: 1.3480 - val_accuracy: 0.7944
Epoch 325/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2718 - accuracy: 0.8287 - val_loss: 1.3403 - val_accuracy: 0.8084
Epoch 326/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2321 - accuracy: 0.8449 - val_loss: 1.3974 - val_accuracy: 0.8084
Epoch 327/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2777 - accuracy: 0.8843 - val_loss: 1.4789 - val_accuracy: 0.8131
Epoch 328/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2586 - accuracy: 0.8796 - val_loss: 1.5834 - val_accuracy: 0.7991
Epoch 329/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4237 - accuracy: 0.8565 - val_loss: 1.4645 - val_accuracy: 0.8131
Epoch 330/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2826 - accuracy: 0.8773 - val_loss: 1.4859 - val_accuracy: 0.7991
Epoch 331/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2297 - accuracy: 0.8889 - val_loss: 1.4756 - val_accuracy: 0.7944
Epoch 332/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3246 - accuracy: 0.8750 - val_loss: 1.5068 - val_accuracy: 0.7944
Epoch 333/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3512 - accuracy: 0.8704 - val_loss: 1.2514 - val_accuracy: 0.8084
Epoch 334/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2679 - accuracy: 0.8796 - val_loss: 1.5188 - val_accuracy: 0.8178
Epoch 335/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2918 - accuracy: 0.8657 - val_loss: 1.3852 - val_accuracy: 0.8271
Epoch 336/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2151 - accuracy: 0.8495 - val_loss: 1.3833 - val_accuracy: 0.8318
Epoch 337/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2781 - accuracy: 0.8750 - val_loss: 1.2944 - val_accuracy: 0.8131
Epoch 338/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2388 - accuracy: 0.8773 - val_loss: 1.3621 - val_accuracy: 0.8224
Epoch 339/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3435 - accuracy: 0.8866 - val_loss: 1.3117 - val_accuracy: 0.8131
Epoch 340/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2821 - accuracy: 0.8843 - val_loss: 1.2670 - val_accuracy: 0.8271
Epoch 341/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2534 - accuracy: 0.8681 - val_loss: 1.2701 - val_accuracy: 0.8318
Epoch 342/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3445 - accuracy: 0.8634 - val_loss: 1.1108 - val_accuracy: 0.8271
Epoch 343/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2593 - accuracy: 0.8843 - val_loss: 1.4691 - val_accuracy: 0.8178
Epoch 344/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2838 - accuracy: 0.8796 - val_loss: 1.2167 - val_accuracy: 0.8271
Epoch 345/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2657 - accuracy: 0.8727 - val_loss: 1.2919 - val_accuracy: 0.8178
Epoch 346/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2414 - accuracy: 0.8866 - val_loss: 1.3237 - val_accuracy: 0.8411
Epoch 347/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2430 - accuracy: 0.8935 - val_loss: 1.1808 - val_accuracy: 0.8411
Epoch 348/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2367 - accuracy: 0.8773 - val_loss: 1.2371 - val_accuracy: 0.8458
Epoch 349/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2978 - accuracy: 0.8866 - val_loss: 1.2186 - val_accuracy: 0.8318
Epoch 350/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2483 - accuracy: 0.8958 - val_loss: 1.3009 - val_accuracy: 0.8364
Epoch 351/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3046 - accuracy: 0.8843 - val_loss: 1.4960 - val_accuracy: 0.8131
Epoch 352/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2283 - accuracy: 0.8935 - val_loss: 1.3723 - val_accuracy: 0.8271
Epoch 353/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2359 - accuracy: 0.8889 - val_loss: 1.3329 - val_accuracy: 0.8271

```

accuracy: 0.8224
Epoch 354/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3038 - accuracy: 0.8773 - val_loss: 1.5797 - val_accuracy: 0.8131
Epoch 355/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3101 - accuracy: 0.8750 - val_loss: 1.7657 - val_accuracy: 0.7944
Epoch 356/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2646 - accuracy: 0.8889 - val_loss: 1.7002 - val_accuracy: 0.7991
Epoch 357/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3047 - accuracy: 0.8634 - val_loss: 1.7166 - val_accuracy: 0.7757
Epoch 358/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2497 - accuracy: 0.8819 - val_loss: 1.6144 - val_accuracy: 0.8037
Epoch 359/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2103 - accuracy: 0.8889 - val_loss: 1.4537 - val_accuracy: 0.7991
Epoch 360/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3051 - accuracy: 0.8681 - val_loss: 1.4400 - val_accuracy: 0.8037
Epoch 361/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2935 - accuracy: 0.8403 - val_loss: 1.3700 - val_accuracy: 0.8037
Epoch 362/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4683 - accuracy: 0.8356 - val_loss: 1.4268 - val_accuracy: 0.8131
Epoch 363/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2473 - accuracy: 0.8519 - val_loss: 1.3588 - val_accuracy: 0.8224
Epoch 364/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2849 - accuracy: 0.8287 - val_loss: 1.3035 - val_accuracy: 0.8178
Epoch 365/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2529 - accuracy: 0.8449 - val_loss: 1.2665 - val_accuracy: 0.8178
Epoch 366/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2429 - accuracy: 0.8681 - val_loss: 1.3938 - val_accuracy: 0.8271
Epoch 367/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2564 - accuracy: 0.8634 - val_loss: 1.2631 - val_accuracy: 0.8271
Epoch 368/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2261 - accuracy: 0.8819 - val_loss: 1.3495 - val_accuracy: 0.8224
Epoch 369/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3190 - accuracy: 0.8866 - val_loss: 1.3415 - val_accuracy: 0.7991
Epoch 370/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2847 - accuracy: 0.8634 - val_loss: 1.2030 - val_accuracy: 0.7991
Epoch 371/1000
1/4 [====>.....] - ETA: 0s - loss: 0.0710 - accuracy: 0.8750Restoring model weights from the end of the best epoch: 221.
4/4 [=====] - 0s 14ms/step - loss: 0.2224 - accuracy: 0.8889 - val_loss: 1.2383 - val_accuracy: 0.8037
Epoch 371: early stopping
7/7 [=====] - 0s 2ms/step - loss: 1.1501 - accuracy: 0.8458
Model: "sequential_105"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_420 (Dense)	(None, 50)	350
<hr/>		
batch_normalization_315 (BatchNormalization)	(None, 50)	200
activation_315 (Activation)	(None, 50)	0
dense_421 (Dense)	(None, 50)	2550
batch_normalization_316 (BatchNormalization)	(None, 50)	200
activation_316 (Activation)	(None, 50)	0
dense_422 (Dense)	(None, 10)	510
batch_normalization_317 (BatchNormalization)	(None, 10)	40
activation_317 (Activation)	(None, 10)	0
dense_423 (Dense)	(None, 2)	22
<hr/>		
Total params:	3,872	
Trainable params:	3,652	

Non-trainable params: 220

Epoch 1/1000
4/4 [=====] - 1s 56ms/step - loss: 4.8983 - accuracy: 0.5370 - val_loss: 7.5426 - val_accuracy: 0.5093
Epoch 2/1000
4/4 [=====] - 0s 14ms/step - loss: 3.8273 - accuracy: 0.5856 - val_loss: 6.8241 - val_accuracy: 0.6028
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 3.7328 - accuracy: 0.6181 - val_loss: 5.4379 - val_accuracy: 0.6776
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 3.5041 - accuracy: 0.6181 - val_loss: 4.4016 - val_accuracy: 0.6542
Epoch 5/1000
4/4 [=====] - 0s 15ms/step - loss: 3.2496 - accuracy: 0.6644 - val_loss: 3.6942 - val_accuracy: 0.6636
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 3.3225 - accuracy: 0.6574 - val_loss: 3.3237 - val_accuracy: 0.6215
Epoch 7/1000
4/4 [=====] - 0s 15ms/step - loss: 3.1234 - accuracy: 0.6250 - val_loss: 3.1922 - val_accuracy: 0.6449
Epoch 8/1000
4/4 [=====] - 0s 16ms/step - loss: 2.9939 - accuracy: 0.6389 - val_loss: 3.1438 - val_accuracy: 0.6215
Epoch 9/1000
4/4 [=====] - 0s 16ms/step - loss: 3.0036 - accuracy: 0.6412 - val_loss: 3.0918 - val_accuracy: 0.6168
Epoch 10/1000
4/4 [=====] - 0s 16ms/step - loss: 2.9558 - accuracy: 0.6343 - val_loss: 2.9931 - val_accuracy: 0.5748
Epoch 11/1000
4/4 [=====] - 0s 17ms/step - loss: 2.9362 - accuracy: 0.6181 - val_loss: 2.9181 - val_accuracy: 0.5654
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6167 - accuracy: 0.5787 - val_loss: 2.7980 - val_accuracy: 0.5607
Epoch 13/1000
4/4 [=====] - 0s 15ms/step - loss: 2.8382 - accuracy: 0.6157 - val_loss: 2.6503 - val_accuracy: 0.5794
Epoch 14/1000
4/4 [=====] - 0s 16ms/step - loss: 2.5794 - accuracy: 0.5995 - val_loss: 2.5383 - val_accuracy: 0.5421
Epoch 15/1000
4/4 [=====] - 0s 15ms/step - loss: 2.5545 - accuracy: 0.6134 - val_loss: 2.4760 - val_accuracy: 0.5467
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 2.5384 - accuracy: 0.5718 - val_loss: 2.4270 - val_accuracy: 0.5374
Epoch 17/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4851 - accuracy: 0.6019 - val_loss: 2.3724 - val_accuracy: 0.5374
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2669 - accuracy: 0.6042 - val_loss: 2.3190 - val_accuracy: 0.5327
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3653 - accuracy: 0.5625 - val_loss: 2.1855 - val_accuracy: 0.5421
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1640 - accuracy: 0.5764 - val_loss: 2.1903 - val_accuracy: 0.5421
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1875 - accuracy: 0.5648 - val_loss: 2.0458 - val_accuracy: 0.5467
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0853 - accuracy: 0.5741 - val_loss: 1.9539 - val_accuracy: 0.5561
Epoch 23/1000
4/4 [=====] - 0s 14ms/step - loss: 1.9871 - accuracy: 0.5625 - val_loss: 1.8651 - val_accuracy: 0.5561
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8654 - accuracy: 0.5625 - val_loss: 1.8283 - val_accuracy: 0.5514
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7772 - accuracy: 0.5463 - val_loss: 1.7687 - val_accuracy: 0.5607
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5688 - accuracy: 0.5579 - val_loss: 1.7366 - val_accuracy: 0.5514
Epoch 27/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6096 - accuracy: 0.5532 - val_loss: 1.6867 - val_accuracy: 0.5514
Epoch 28/1000
4/4 [=====] - 0s 13ms/step - loss: 1.4966 - accuracy: 0.5370 - val_loss: 1.5397 - val_accuracy: 0.5327
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 1.6295 - accuracy: 0.5394 - val_loss: 1.5139 - val_accuracy: 0.5234

Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5493 - accuracy: 0.5324 - val_loss: 1.5247 - val_accuracy: 0.4907
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3111 - accuracy: 0.5301 - val_loss: 1.4641 - val_accuracy: 0.4860
Epoch 32/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2083 - accuracy: 0.4907 - val_loss: 1.4096 - val_accuracy: 0.4953
Epoch 33/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1764 - accuracy: 0.5185 - val_loss: 1.3776 - val_accuracy: 0.4766
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0698 - accuracy: 0.4977 - val_loss: 1.3685 - val_accuracy: 0.4673
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0566 - accuracy: 0.4769 - val_loss: 1.3186 - val_accuracy: 0.4766
Epoch 36/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0535 - accuracy: 0.4954 - val_loss: 1.2965 - val_accuracy: 0.4720
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8891 - accuracy: 0.4838 - val_loss: 1.2513 - val_accuracy: 0.4766
Epoch 38/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8317 - accuracy: 0.4722 - val_loss: 1.2228 - val_accuracy: 0.4766
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8120 - accuracy: 0.5093 - val_loss: 1.1545 - val_accuracy: 0.4720
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7999 - accuracy: 0.4653 - val_loss: 1.1119 - val_accuracy: 0.4720
Epoch 41/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7913 - accuracy: 0.4676 - val_loss: 1.0834 - val_accuracy: 0.4766
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8143 - accuracy: 0.5255 - val_loss: 1.0633 - val_accuracy: 0.5000
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6962 - accuracy: 0.4838 - val_loss: 0.9968 - val_accuracy: 0.5047
Epoch 44/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7282 - accuracy: 0.5162 - val_loss: 0.9773 - val_accuracy: 0.5000
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6441 - accuracy: 0.4861 - val_loss: 0.9947 - val_accuracy: 0.5047
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6625 - accuracy: 0.4630 - val_loss: 0.9816 - val_accuracy: 0.5140
Epoch 47/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6588 - accuracy: 0.4861 - val_loss: 0.9737 - val_accuracy: 0.5093
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6694 - accuracy: 0.4514 - val_loss: 0.9570 - val_accuracy: 0.5187
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6734 - accuracy: 0.4653 - val_loss: 0.9140 - val_accuracy: 0.5047
Epoch 50/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5966 - accuracy: 0.5093 - val_loss: 0.9041 - val_accuracy: 0.5280
Epoch 51/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5827 - accuracy: 0.4676 - val_loss: 0.9018 - val_accuracy: 0.5140
Epoch 52/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6386 - accuracy: 0.5116 - val_loss: 0.8843 - val_accuracy: 0.5140
Epoch 53/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6499 - accuracy: 0.4861 - val_loss: 0.8863 - val_accuracy: 0.5421
Epoch 54/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6315 - accuracy: 0.4861 - val_loss: 0.9108 - val_accuracy: 0.5748
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6198 - accuracy: 0.4792 - val_loss: 0.9300 - val_accuracy: 0.5654
Epoch 56/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6755 - accuracy: 0.4676 - val_loss: 0.8911 - val_accuracy: 0.5701
Epoch 57/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6238 - accuracy: 0.4977 - val_loss: 0.8651 - val_accuracy: 0.5701
Epoch 58/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6395 - accuracy: 0.5069 - val_loss: 0.8730 - val_accuracy: 0.5654
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5599 - accuracy: 0.4931 - val_loss: 0.8663 - val_accuracy: 0.5654

```
accuracy: 0.5888
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6610 - accuracy: 0.5000 - val_loss: 0.8546 - val_accuracy: 0.5654
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5404 - accuracy: 0.5185 - val_loss: 0.8501 - val_accuracy: 0.5701
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5823 - accuracy: 0.5301 - val_loss: 0.8423 - val_accuracy: 0.5748
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6127 - accuracy: 0.5324 - val_loss: 0.8368 - val_accuracy: 0.5701
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5543 - accuracy: 0.5255 - val_loss: 0.8314 - val_accuracy: 0.5561
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5725 - accuracy: 0.5509 - val_loss: 0.8391 - val_accuracy: 0.5514
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6034 - accuracy: 0.5648 - val_loss: 0.8237 - val_accuracy: 0.5467
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5680 - accuracy: 0.5486 - val_loss: 0.8250 - val_accuracy: 0.5701
Epoch 68/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5874 - accuracy: 0.5926 - val_loss: 0.8173 - val_accuracy: 0.5654
Epoch 69/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5728 - accuracy: 0.5579 - val_loss: 0.7998 - val_accuracy: 0.5701
Epoch 70/1000
4/4 [=====] - 0s 18ms/step - loss: 0.4954 - accuracy: 0.5579 - val_loss: 0.7891 - val_accuracy: 0.5794
Epoch 71/1000
4/4 [=====] - 0s 16ms/step - loss: 0.5200 - accuracy: 0.5648 - val_loss: 0.7778 - val_accuracy: 0.5981
Epoch 72/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6136 - accuracy: 0.5648 - val_loss: 0.7788 - val_accuracy: 0.5841
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4891 - accuracy: 0.5671 - val_loss: 0.7784 - val_accuracy: 0.5748
Epoch 74/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5244 - accuracy: 0.5995 - val_loss: 0.7712 - val_accuracy: 0.5748
Epoch 75/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6049 - accuracy: 0.5764 - val_loss: 0.7064 - val_accuracy: 0.5935
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6925 - accuracy: 0.5741 - val_loss: 0.6947 - val_accuracy: 0.5841
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5451 - accuracy: 0.5648 - val_loss: 0.6923 - val_accuracy: 0.5701
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5769 - accuracy: 0.5509 - val_loss: 0.6847 - val_accuracy: 0.5607
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5834 - accuracy: 0.5648 - val_loss: 0.7004 - val_accuracy: 0.5654
Epoch 80/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4898 - accuracy: 0.5463 - val_loss: 0.6924 - val_accuracy: 0.5654
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4979 - accuracy: 0.5532 - val_loss: 0.6815 - val_accuracy: 0.5514
Epoch 82/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4494 - accuracy: 0.5694 - val_loss: 0.6878 - val_accuracy: 0.5467
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4402 - accuracy: 0.5602 - val_loss: 0.6618 - val_accuracy: 0.5701
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4890 - accuracy: 0.5417 - val_loss: 0.6521 - val_accuracy: 0.5607
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5271 - accuracy: 0.5255 - val_loss: 0.6512 - val_accuracy: 0.5421
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5098 - accuracy: 0.5532 - val_loss: 0.6851 - val_accuracy: 0.5234
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5039 - accuracy: 0.5440 - val_loss: 0.6831 - val_accuracy: 0.5187
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4252 - accuracy: 0.5532 - val_loss: 0.6796 - val_accuracy: 0.5047
Epoch 89/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3943 - accuracy: 0.5185 - val_loss: 0.7001 - val_accuracy: 0.4720
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5084 - accuracy: 0.5532 - val_loss: 0.6742 - val_accuracy: 0.4720
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5331 - accuracy: 0.5093 - val_loss: 0.6539 - val_accuracy: 0.4720
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4606 - accuracy: 0.5602 - val_loss: 0.6803 - val_accuracy: 0.4673
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4483 - accuracy: 0.5394 - val_loss: 0.6809 - val_accuracy: 0.4720
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4351 - accuracy: 0.5694 - val_loss: 0.6788 - val_accuracy: 0.4813
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4848 - accuracy: 0.5324 - val_loss: 0.6841 - val_accuracy: 0.4813
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4660 - accuracy: 0.5509 - val_loss: 0.6759 - val_accuracy: 0.4720
Epoch 97/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4228 - accuracy: 0.5532 - val_loss: 0.6725 - val_accuracy: 0.5000
Epoch 98/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5275 - accuracy: 0.5440 - val_loss: 0.6918 - val_accuracy: 0.4766
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4391 - accuracy: 0.5718 - val_loss: 0.7012 - val_accuracy: 0.4860
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4394 - accuracy: 0.5602 - val_loss: 0.7517 - val_accuracy: 0.4953
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5622 - accuracy: 0.5694 - val_loss: 0.6769 - val_accuracy: 0.4766
Epoch 102/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4798 - accuracy: 0.5394 - val_loss: 0.7594 - val_accuracy: 0.4673
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4489 - accuracy: 0.6111 - val_loss: 0.7432 - val_accuracy: 0.4860
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4374 - accuracy: 0.5926 - val_loss: 0.7459 - val_accuracy: 0.4907
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5453 - accuracy: 0.5903 - val_loss: 0.8096 - val_accuracy: 0.5000
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4962 - accuracy: 0.5995 - val_loss: 0.8079 - val_accuracy: 0.4907
Epoch 107/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5722 - accuracy: 0.5556 - val_loss: 0.8202 - val_accuracy: 0.4953
Epoch 108/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4185 - accuracy: 0.5880 - val_loss: 0.8429 - val_accuracy: 0.4953
Epoch 109/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5010 - accuracy: 0.6227 - val_loss: 0.8390 - val_accuracy: 0.4860
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4993 - accuracy: 0.5926 - val_loss: 0.8364 - val_accuracy: 0.4813
Epoch 111/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4214 - accuracy: 0.6250 - val_loss: 0.8389 - val_accuracy: 0.5140
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4667 - accuracy: 0.6134 - val_loss: 0.8345 - val_accuracy: 0.4953
Epoch 113/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4485 - accuracy: 0.5995 - val_loss: 0.8562 - val_accuracy: 0.4860
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3938 - accuracy: 0.6134 - val_loss: 0.8930 - val_accuracy: 0.4953
Epoch 115/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4731 - accuracy: 0.5741 - val_loss: 0.9190 - val_accuracy: 0.5000
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4083 - accuracy: 0.5833 - val_loss: 0.8813 - val_accuracy: 0.5140
Epoch 117/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4244 - accuracy: 0.5903 - val_loss: 0.8792 - val_accuracy: 0.5327
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3738 - accuracy: 0.5972 - val_loss: 0.9084 - val_accuracy: 0.5187
```

Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3825 - accuracy: 0.5880 - val_loss: 0.8972 - val_accuracy: 0.5327
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3655 - accuracy: 0.6065 - val_loss: 0.8764 - val_accuracy: 0.5047
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3957 - accuracy: 0.5764 - val_loss: 0.8688 - val_accuracy: 0.5093
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3968 - accuracy: 0.5648 - val_loss: 0.8687 - val_accuracy: 0.5187
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3640 - accuracy: 0.6042 - val_loss: 0.8973 - val_accuracy: 0.5187
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4865 - accuracy: 0.6088 - val_loss: 0.9349 - val_accuracy: 0.5421
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3958 - accuracy: 0.6088 - val_loss: 0.9355 - val_accuracy: 0.5374
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4394 - accuracy: 0.5926 - val_loss: 0.9146 - val_accuracy: 0.5374
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4350 - accuracy: 0.5810 - val_loss: 0.9389 - val_accuracy: 0.5374
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3451 - accuracy: 0.5833 - val_loss: 0.9900 - val_accuracy: 0.5467
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3250 - accuracy: 0.5718 - val_loss: 0.9467 - val_accuracy: 0.5467
Epoch 130/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3954 - accuracy: 0.5995 - val_loss: 0.9482 - val_accuracy: 0.5421
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4165 - accuracy: 0.5903 - val_loss: 0.9502 - val_accuracy: 0.5561
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4915 - accuracy: 0.5764 - val_loss: 0.8862 - val_accuracy: 0.5327
Epoch 133/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4021 - accuracy: 0.5741 - val_loss: 0.9413 - val_accuracy: 0.5327
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4271 - accuracy: 0.5880 - val_loss: 0.9394 - val_accuracy: 0.5234
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3915 - accuracy: 0.5880 - val_loss: 0.8991 - val_accuracy: 0.5327
Epoch 136/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3699 - accuracy: 0.5741 - val_loss: 0.9252 - val_accuracy: 0.5561
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4316 - accuracy: 0.5741 - val_loss: 0.9016 - val_accuracy: 0.5654
Epoch 138/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3647 - accuracy: 0.5903 - val_loss: 0.9262 - val_accuracy: 0.5841
Epoch 139/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3955 - accuracy: 0.5602 - val_loss: 0.9277 - val_accuracy: 0.5654
Epoch 140/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3172 - accuracy: 0.5856 - val_loss: 0.9582 - val_accuracy: 0.5607
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3712 - accuracy: 0.5694 - val_loss: 0.9387 - val_accuracy: 0.5327
Epoch 142/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4441 - accuracy: 0.5602 - val_loss: 0.9232 - val_accuracy: 0.5467
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3064 - accuracy: 0.5741 - val_loss: 0.9262 - val_accuracy: 0.5561
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3283 - accuracy: 0.5648 - val_loss: 0.9642 - val_accuracy: 0.5514
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3234 - accuracy: 0.5856 - val_loss: 0.9609 - val_accuracy: 0.5701
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4021 - accuracy: 0.5648 - val_loss: 0.9392 - val_accuracy: 0.5467
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3015 - accuracy: 0.5741 - val_loss: 1.0011 - val_accuracy: 0.5467
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2860 - accuracy: 0.5625 - val_loss: 1.0327 - val_accuracy: 0.5467

```

accuracy: 0.5794
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3197 - accuracy: 0.5741 - val_loss: 1.0040 - val_accuracy: 0.5654
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2859 - accuracy: 0.5648 - val_loss: 0.9880 - val_accuracy: 0.5654
Epoch 151/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3310 - accuracy: 0.5532 - val_loss: 1.0035 - val_accuracy: 0.5654
Epoch 152/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3091 - accuracy: 0.5741 - val_loss: 1.0502 - val_accuracy: 0.5607
Epoch 153/1000
1/4 [====>.....] - ETA: 0s - loss: 0.3513 - accuracy: 0.6172Restoring model weights from the end of the best epoch: 3.
4/4 [=====] - 0s 15ms/step - loss: 0.2658 - accuracy: 0.5903 - val_loss: 0.9673 - val_accuracy: 0.5701
Epoch 153: early stopping
7/7 [=====] - 0s 2ms/step - loss: 5.4254 - accuracy: 0.6822
Model: "sequential_106"

```

Layer (type)	Output Shape	Param #
<hr/>		
dense_424 (Dense)	(None, 50)	350
batch_normalization_318 (BatchNormalization)	(None, 50)	200
activation_318 (Activation)	(None, 50)	0
dense_425 (Dense)	(None, 50)	2550
batch_normalization_319 (BatchNormalization)	(None, 50)	200
activation_319 (Activation)	(None, 50)	0
dense_426 (Dense)	(None, 10)	510
batch_normalization_320 (BatchNormalization)	(None, 10)	40
activation_320 (Activation)	(None, 10)	0
dense_427 (Dense)	(None, 2)	22
<hr/>		
Total params: 3,872		
Trainable params: 3,652		
Non-trainable params: 220		

```

Epoch 1/1000
4/4 [=====] - 1s 55ms/step - loss: 5.6929 - accuracy: 0.5162 - val_loss: 4.6403 - val_accuracy: 0.4579
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 4.7006 - accuracy: 0.5278 - val_loss: 3.7897 - val_accuracy: 0.4579
Epoch 3/1000
4/4 [=====] - 0s 15ms/step - loss: 4.5012 - accuracy: 0.5278 - val_loss: 3.3748 - val_accuracy: 0.4626
Epoch 4/1000
4/4 [=====] - 0s 14ms/step - loss: 4.3221 - accuracy: 0.4977 - val_loss: 3.1840 - val_accuracy: 0.5000
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 3.9949 - accuracy: 0.5116 - val_loss: 2.8432 - val_accuracy: 0.4533
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 3.9480 - accuracy: 0.5301 - val_loss: 2.7565 - val_accuracy: 0.4533
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 3.7596 - accuracy: 0.5162 - val_loss: 2.5229 - val_accuracy: 0.4533
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 3.6982 - accuracy: 0.5046 - val_loss: 2.2240 - val_accuracy: 0.4533
Epoch 9/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5008 - accuracy: 0.5185 - val_loss: 2.0592 - val_accuracy: 0.4486
Epoch 10/1000
4/4 [=====] - 0s 13ms/step - loss: 3.5097 - accuracy: 0.5255 - val_loss: 1.9468 - val_accuracy: 0.4486
Epoch 11/1000
4/4 [=====] - 0s 12ms/step - loss: 3.2178 - accuracy: 0.5231 - val_loss: 1.8943 - val_accuracy: 0.4533
Epoch 12/1000
4/4 [=====] - 0s 12ms/step - loss: 3.2654 - accuracy: 0.5162 - val_loss: 1.8751 - val_accuracy: 0.4626
Epoch 13/1000

```

```
4/4 [=====] - 0s 13ms/step - loss: 3.2148 - accuracy: 0.5231 - val_loss: 1.7737 - val_accuracy: 0.4533
Epoch 14/1000
4/4 [=====] - 0s 12ms/step - loss: 3.0813 - accuracy: 0.5301 - val_loss: 1.7174 - val_accuracy: 0.4673
Epoch 15/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8270 - accuracy: 0.5255 - val_loss: 1.6738 - val_accuracy: 0.4720
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8574 - accuracy: 0.5093 - val_loss: 1.6460 - val_accuracy: 0.4626
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7458 - accuracy: 0.5278 - val_loss: 1.6300 - val_accuracy: 0.4579
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8158 - accuracy: 0.5162 - val_loss: 1.5664 - val_accuracy: 0.4626
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 2.6077 - accuracy: 0.5278 - val_loss: 1.5086 - val_accuracy: 0.4626
Epoch 20/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4659 - accuracy: 0.5301 - val_loss: 1.4838 - val_accuracy: 0.4626
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.4814 - accuracy: 0.5023 - val_loss: 1.4173 - val_accuracy: 0.4626
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2978 - accuracy: 0.5185 - val_loss: 1.4031 - val_accuracy: 0.4579
Epoch 23/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1159 - accuracy: 0.5231 - val_loss: 1.3608 - val_accuracy: 0.4579
Epoch 24/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0095 - accuracy: 0.5324 - val_loss: 1.3296 - val_accuracy: 0.4626
Epoch 25/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0188 - accuracy: 0.5255 - val_loss: 1.2973 - val_accuracy: 0.3084
Epoch 26/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9852 - accuracy: 0.5023 - val_loss: 1.2970 - val_accuracy: 0.3084
Epoch 27/1000
4/4 [=====] - 0s 13ms/step - loss: 1.9153 - accuracy: 0.5093 - val_loss: 1.2855 - val_accuracy: 0.3037
Epoch 28/1000
4/4 [=====] - 0s 14ms/step - loss: 1.8888 - accuracy: 0.4931 - val_loss: 1.2899 - val_accuracy: 0.3318
Epoch 29/1000
4/4 [=====] - 0s 12ms/step - loss: 1.6772 - accuracy: 0.5023 - val_loss: 1.2677 - val_accuracy: 0.3271
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6169 - accuracy: 0.5000 - val_loss: 1.2547 - val_accuracy: 0.3411
Epoch 31/1000
4/4 [=====] - 0s 13ms/step - loss: 1.5826 - accuracy: 0.5000 - val_loss: 1.1993 - val_accuracy: 0.3224
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5768 - accuracy: 0.4769 - val_loss: 1.1839 - val_accuracy: 0.3364
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4143 - accuracy: 0.5162 - val_loss: 1.1712 - val_accuracy: 0.3551
Epoch 34/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2371 - accuracy: 0.4931 - val_loss: 1.1612 - val_accuracy: 0.3505
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2977 - accuracy: 0.4977 - val_loss: 1.1350 - val_accuracy: 0.3318
Epoch 36/1000
4/4 [=====] - 0s 16ms/step - loss: 1.1210 - accuracy: 0.5208 - val_loss: 1.1278 - val_accuracy: 0.3411
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0310 - accuracy: 0.5093 - val_loss: 1.1152 - val_accuracy: 0.3692
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9524 - accuracy: 0.5255 - val_loss: 1.1012 - val_accuracy: 0.3551
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9898 - accuracy: 0.5023 - val_loss: 1.0863 - val_accuracy: 0.3645
Epoch 40/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0055 - accuracy: 0.4977 - val_loss: 1.0836 - val_accuracy: 0.3692
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8362 - accuracy: 0.4954 - val_loss: 1.0794 - val_accuracy: 0.3925
Epoch 42/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8803 - accuracy: 0.4861 - val_loss: 1.1001 - val_accuracy: 0.3738
```

Epoch 43/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9516 - accuracy: 0.4954 - val_loss: 1.1117 - val_accuracy: 0.3598
Epoch 44/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8346 - accuracy: 0.4931 - val_loss: 1.0959 - val_accuracy: 0.3458
Epoch 45/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8872 - accuracy: 0.4745 - val_loss: 1.0914 - val_accuracy: 0.3692
Epoch 46/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7991 - accuracy: 0.4560 - val_loss: 1.0835 - val_accuracy: 0.3692
Epoch 47/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7750 - accuracy: 0.4606 - val_loss: 1.0691 - val_accuracy: 0.3692
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8976 - accuracy: 0.5046 - val_loss: 1.0564 - val_accuracy: 0.3598
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7053 - accuracy: 0.5046 - val_loss: 1.0480 - val_accuracy: 0.3551
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8753 - accuracy: 0.4907 - val_loss: 1.0246 - val_accuracy: 0.3598
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6567 - accuracy: 0.4630 - val_loss: 0.9662 - val_accuracy: 0.3131
Epoch 52/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8216 - accuracy: 0.4907 - val_loss: 0.9520 - val_accuracy: 0.3037
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6565 - accuracy: 0.4583 - val_loss: 0.9529 - val_accuracy: 0.3178
Epoch 54/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7640 - accuracy: 0.4606 - val_loss: 0.9439 - val_accuracy: 0.3131
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7260 - accuracy: 0.4769 - val_loss: 0.9318 - val_accuracy: 0.3084
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7118 - accuracy: 0.4514 - val_loss: 0.9314 - val_accuracy: 0.3037
Epoch 57/1000
4/4 [=====] - 0s 11ms/step - loss: 0.7622 - accuracy: 0.4722 - val_loss: 0.9110 - val_accuracy: 0.3084
Epoch 58/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7422 - accuracy: 0.4722 - val_loss: 0.8646 - val_accuracy: 0.3037
Epoch 59/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8064 - accuracy: 0.4491 - val_loss: 0.8766 - val_accuracy: 0.3224
Epoch 60/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6750 - accuracy: 0.4769 - val_loss: 0.8749 - val_accuracy: 0.3178
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7290 - accuracy: 0.4514 - val_loss: 0.8592 - val_accuracy: 0.3037
Epoch 62/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7158 - accuracy: 0.4838 - val_loss: 0.8518 - val_accuracy: 0.3131
Epoch 63/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7763 - accuracy: 0.4745 - val_loss: 0.8506 - val_accuracy: 0.3271
Epoch 64/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6446 - accuracy: 0.4676 - val_loss: 0.8618 - val_accuracy: 0.3271
Epoch 65/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6494 - accuracy: 0.4606 - val_loss: 0.8547 - val_accuracy: 0.3318
Epoch 66/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6019 - accuracy: 0.4745 - val_loss: 0.8361 - val_accuracy: 0.3178
Epoch 67/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7141 - accuracy: 0.4699 - val_loss: 0.8115 - val_accuracy: 0.3084
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5936 - accuracy: 0.4606 - val_loss: 0.8128 - val_accuracy: 0.3318
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6355 - accuracy: 0.4745 - val_loss: 0.7970 - val_accuracy: 0.3271
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5674 - accuracy: 0.4792 - val_loss: 0.7833 - val_accuracy: 0.3271
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6283 - accuracy: 0.4722 - val_loss: 0.7655 - val_accuracy: 0.3271
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5155 - accuracy: 0.4815 - val_loss: 0.7719 - val_accuracy: 0.3271

```
accuracy: 0.3131
Epoch 73/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4819 - accuracy: 0.4815 - val_loss: 0.7444 - val_
accuracy: 0.3178
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6011 - accuracy: 0.4676 - val_loss: 0.7135 - val_
accuracy: 0.3131
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6484 - accuracy: 0.4838 - val_loss: 0.7225 - val_
accuracy: 0.3084
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5855 - accuracy: 0.4884 - val_loss: 0.7028 - val_
accuracy: 0.3224
Epoch 77/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5097 - accuracy: 0.4792 - val_loss: 0.6950 - val_
accuracy: 0.3178
Epoch 78/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4664 - accuracy: 0.4745 - val_loss: 0.7112 - val_
accuracy: 0.3178
Epoch 79/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4781 - accuracy: 0.4699 - val_loss: 0.6928 - val_
accuracy: 0.3224
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5612 - accuracy: 0.4815 - val_loss: 0.7128 - val_
accuracy: 0.3178
Epoch 81/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5108 - accuracy: 0.4838 - val_loss: 0.6976 - val_
accuracy: 0.3224
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3801 - accuracy: 0.4954 - val_loss: 0.6872 - val_
accuracy: 0.3178
Epoch 83/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4507 - accuracy: 0.4977 - val_loss: 0.6850 - val_
accuracy: 0.3271
Epoch 84/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4364 - accuracy: 0.4884 - val_loss: 0.6675 - val_
accuracy: 0.3131
Epoch 85/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4284 - accuracy: 0.4931 - val_loss: 0.6707 - val_
accuracy: 0.3318
Epoch 86/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4459 - accuracy: 0.5000 - val_loss: 0.6292 - val_
accuracy: 0.3318
Epoch 87/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4118 - accuracy: 0.5046 - val_loss: 0.6717 - val_
accuracy: 0.3598
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4138 - accuracy: 0.4977 - val_loss: 0.6472 - val_
accuracy: 0.3458
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4126 - accuracy: 0.5023 - val_loss: 0.6945 - val_
accuracy: 0.3598
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4265 - accuracy: 0.5046 - val_loss: 0.6849 - val_
accuracy: 0.3598
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3802 - accuracy: 0.4769 - val_loss: 0.6619 - val_
accuracy: 0.3551
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4230 - accuracy: 0.4769 - val_loss: 0.6736 - val_
accuracy: 0.3411
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4292 - accuracy: 0.5255 - val_loss: 0.6520 - val_
accuracy: 0.3645
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3881 - accuracy: 0.4954 - val_loss: 0.6585 - val_
accuracy: 0.3692
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4378 - accuracy: 0.4815 - val_loss: 0.6842 - val_
accuracy: 0.3738
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4919 - accuracy: 0.4977 - val_loss: 0.6739 - val_
accuracy: 0.3785
Epoch 97/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4198 - accuracy: 0.5093 - val_loss: 0.6691 - val_
accuracy: 0.3738
Epoch 98/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3901 - accuracy: 0.5000 - val_loss: 0.6552 - val_
accuracy: 0.3785
Epoch 99/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3826 - accuracy: 0.5000 - val_loss: 0.6401 - val_
accuracy: 0.3832
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3904 - accuracy: 0.4931 - val_loss: 0.6388 - val_
accuracy: 0.3785
Epoch 101/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3111 - accuracy: 0.4792 - val_loss: 0.6762 - val_
accuracy: 0.3879
Epoch 102/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.3134 - accuracy: 0.4792 - val_loss: 0.6697 - val_accuracy: 0.3879
Epoch 103/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2923 - accuracy: 0.4838 - val_loss: 0.6638 - val_accuracy: 0.3925
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3887 - accuracy: 0.4815 - val_loss: 0.6586 - val_accuracy: 0.4019
Epoch 105/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3491 - accuracy: 0.5023 - val_loss: 0.6587 - val_accuracy: 0.3972
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5007 - accuracy: 0.4884 - val_loss: 0.6171 - val_accuracy: 0.3972
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3936 - accuracy: 0.4884 - val_loss: 0.6473 - val_accuracy: 0.4019
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3143 - accuracy: 0.4907 - val_loss: 0.7067 - val_accuracy: 0.3972
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2867 - accuracy: 0.4884 - val_loss: 0.6964 - val_accuracy: 0.3972
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3244 - accuracy: 0.4954 - val_loss: 0.7249 - val_accuracy: 0.3925
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3285 - accuracy: 0.4884 - val_loss: 0.7298 - val_accuracy: 0.4019
Epoch 112/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4335 - accuracy: 0.4954 - val_loss: 0.7257 - val_accuracy: 0.4206
Epoch 113/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3275 - accuracy: 0.4838 - val_loss: 0.7249 - val_accuracy: 0.4252
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3078 - accuracy: 0.5069 - val_loss: 0.7476 - val_accuracy: 0.4346
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3383 - accuracy: 0.5093 - val_loss: 0.7188 - val_accuracy: 0.4346
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4083 - accuracy: 0.4977 - val_loss: 0.8130 - val_accuracy: 0.4299
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3152 - accuracy: 0.4792 - val_loss: 0.8634 - val_accuracy: 0.4346
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4205 - accuracy: 0.5116 - val_loss: 0.8685 - val_accuracy: 0.4299
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3978 - accuracy: 0.4861 - val_loss: 0.8914 - val_accuracy: 0.4159
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4055 - accuracy: 0.4931 - val_loss: 0.8883 - val_accuracy: 0.4252
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4022 - accuracy: 0.5139 - val_loss: 0.8874 - val_accuracy: 0.4252
Epoch 122/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3489 - accuracy: 0.4884 - val_loss: 0.8718 - val_accuracy: 0.4252
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3699 - accuracy: 0.4977 - val_loss: 0.8710 - val_accuracy: 0.4206
Epoch 124/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3655 - accuracy: 0.4861 - val_loss: 0.9047 - val_accuracy: 0.4299
Epoch 125/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4461 - accuracy: 0.5255 - val_loss: 0.9478 - val_accuracy: 0.4065
Epoch 126/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3895 - accuracy: 0.4815 - val_loss: 0.9472 - val_accuracy: 0.4112
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4531 - accuracy: 0.5185 - val_loss: 0.9481 - val_accuracy: 0.4065
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3974 - accuracy: 0.5023 - val_loss: 0.9486 - val_accuracy: 0.4112
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4355 - accuracy: 0.4931 - val_loss: 0.9257 - val_accuracy: 0.4065
Epoch 130/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3639 - accuracy: 0.4931 - val_loss: 0.9395 - val_accuracy: 0.4019
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4502 - accuracy: 0.5162 - val_loss: 0.9392 - val_accuracy: 0.4065
```

Epoch 132/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4164 - accuracy: 0.4977 - val_loss: 0.9107 - val_accuracy: 0.4206
 Epoch 133/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4741 - accuracy: 0.4977 - val_loss: 0.9078 - val_accuracy: 0.4206
 Epoch 134/1000
 4/4 [=====] - 0s 16ms/step - loss: 0.3633 - accuracy: 0.4838 - val_loss: 0.9078 - val_accuracy: 0.4252
 Epoch 135/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3368 - accuracy: 0.4769 - val_loss: 0.9106 - val_accuracy: 0.4112
 Epoch 136/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4136 - accuracy: 0.4977 - val_loss: 0.9639 - val_accuracy: 0.4159
 Epoch 137/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.4363 - accuracy: 0.4884 - val_loss: 0.9366 - val_accuracy: 0.4299
 Epoch 138/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3106 - accuracy: 0.5000 - val_loss: 0.9355 - val_accuracy: 0.4393
 Epoch 139/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3200 - accuracy: 0.4792 - val_loss: 0.9649 - val_accuracy: 0.4393
 Epoch 140/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3370 - accuracy: 0.5139 - val_loss: 0.9619 - val_accuracy: 0.4299
 Epoch 141/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3596 - accuracy: 0.4815 - val_loss: 0.9884 - val_accuracy: 0.4486
 Epoch 142/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.3005 - accuracy: 0.4792 - val_loss: 1.0753 - val_accuracy: 0.4112
 Epoch 143/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.2880 - accuracy: 0.5000 - val_loss: 0.9878 - val_accuracy: 0.4206
 Epoch 144/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2645 - accuracy: 0.4722 - val_loss: 1.0595 - val_accuracy: 0.4252
 Epoch 145/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3662 - accuracy: 0.4861 - val_loss: 1.0471 - val_accuracy: 0.4393
 Epoch 146/1000
 4/4 [=====] - 0s 11ms/step - loss: 0.2779 - accuracy: 0.4884 - val_loss: 0.9314 - val_accuracy: 0.4252
 Epoch 147/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2303 - accuracy: 0.4745 - val_loss: 0.9537 - val_accuracy: 0.4206
 Epoch 148/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.2441 - accuracy: 0.4861 - val_loss: 1.0499 - val_accuracy: 0.4393
 Epoch 149/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.3093 - accuracy: 0.4769 - val_loss: 1.0132 - val_accuracy: 0.4393
 Epoch 150/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2325 - accuracy: 0.4884 - val_loss: 1.0812 - val_accuracy: 0.4252
 Epoch 151/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2860 - accuracy: 0.4861 - val_loss: 1.1425 - val_accuracy: 0.4299
 Epoch 152/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2700 - accuracy: 0.4954 - val_loss: 1.1473 - val_accuracy: 0.4346
 Epoch 153/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.2327 - accuracy: 0.4907 - val_loss: 1.1364 - val_accuracy: 0.4299
 Epoch 154/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.1912 - accuracy: 0.4688 Restoring model weights from the end of the best epoch: 4.
 4/4 [=====] - 0s 18ms/step - loss: 0.2675 - accuracy: 0.4861 - val_loss: 1.1144 - val_accuracy: 0.4393
 Epoch 154: early stopping
 7/7 [=====] - 0s 3ms/step - loss: 3.1833 - accuracy: 0.5000
 Model: "sequential_107"

Layer (type)	Output Shape	Param #
dense_428 (Dense)	(None, 50)	350
batch_normalization_321 (BatchNormalization)	(None, 50)	200
activation_321 (Activation)	(None, 50)	0
dense_429 (Dense)	(None, 50)	2550
batch_normalization_322 (BatchNormalization)	(None, 50)	200

activation_322 (Activation)	(None, 50)	0
dense_430 (Dense)	(None, 10)	510
batch_normalization_323 (BatchNormalization)	(None, 10)	40
activation_323 (Activation)	(None, 10)	0
dense_431 (Dense)	(None, 2)	22

Total params: 3,872
Trainable params: 3,652
Non-trainable params: 220

Epoch 1/1000
4/4 [=====] - 1s 52ms/step - loss: 5.2090 - accuracy: 0.5046 - val_loss: 7.4899 - val_accuracy: 0.5093
Epoch 2/1000
4/4 [=====] - 0s 15ms/step - loss: 3.8002 - accuracy: 0.5926 - val_loss: 6.1408 - val_accuracy: 0.5841
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 3.4075 - accuracy: 0.5602 - val_loss: 4.5429 - val_accuracy: 0.5234
Epoch 4/1000
4/4 [=====] - 0s 15ms/step - loss: 3.4245 - accuracy: 0.5718 - val_loss: 3.7390 - val_accuracy: 0.4579
Epoch 5/1000
4/4 [=====] - 0s 14ms/step - loss: 3.2147 - accuracy: 0.5347 - val_loss: 3.1762 - val_accuracy: 0.4299
Epoch 6/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0627 - accuracy: 0.5255 - val_loss: 3.0647 - val_accuracy: 0.4019
Epoch 7/1000
4/4 [=====] - 0s 15ms/step - loss: 2.9965 - accuracy: 0.5509 - val_loss: 3.0038 - val_accuracy: 0.3972
Epoch 8/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8533 - accuracy: 0.5347 - val_loss: 2.8265 - val_accuracy: 0.3925
Epoch 9/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7964 - accuracy: 0.5648 - val_loss: 2.7092 - val_accuracy: 0.3925
Epoch 10/1000
4/4 [=====] - 0s 14ms/step - loss: 2.6485 - accuracy: 0.5486 - val_loss: 2.6487 - val_accuracy: 0.3925
Epoch 11/1000
4/4 [=====] - 0s 14ms/step - loss: 2.4765 - accuracy: 0.5625 - val_loss: 2.5769 - val_accuracy: 0.3925
Epoch 12/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3898 - accuracy: 0.5833 - val_loss: 2.4985 - val_accuracy: 0.3879
Epoch 13/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2363 - accuracy: 0.5602 - val_loss: 2.4714 - val_accuracy: 0.3832
Epoch 14/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1952 - accuracy: 0.5556 - val_loss: 2.3923 - val_accuracy: 0.3785
Epoch 15/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1360 - accuracy: 0.5509 - val_loss: 2.3614 - val_accuracy: 0.3738
Epoch 16/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2806 - accuracy: 0.5532 - val_loss: 2.3607 - val_accuracy: 0.3738
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1816 - accuracy: 0.5486 - val_loss: 2.3139 - val_accuracy: 0.3785
Epoch 18/1000
4/4 [=====] - 0s 13ms/step - loss: 2.1211 - accuracy: 0.5417 - val_loss: 2.2898 - val_accuracy: 0.3785
Epoch 19/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2349 - accuracy: 0.5532 - val_loss: 2.2823 - val_accuracy: 0.4486
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0729 - accuracy: 0.5602 - val_loss: 2.2500 - val_accuracy: 0.4579
Epoch 21/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0436 - accuracy: 0.5787 - val_loss: 2.2306 - val_accuracy: 0.4626
Epoch 22/1000
4/4 [=====] - 0s 13ms/step - loss: 2.0066 - accuracy: 0.5694 - val_loss: 2.2179 - val_accuracy: 0.4579
Epoch 23/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0798 - accuracy: 0.5810 - val_loss: 2.1543 - val_accuracy: 0.4673
Epoch 24/1000
4/4 [=====] - 0s 15ms/step - loss: 1.8922 - accuracy: 0.5856 - val_loss: 2.1443 - val_accuracy: 0.4766
Epoch 25/1000

```
4/4 [=====] - 0s 15ms/step - loss: 1.8434 - accuracy: 0.5648 - val_loss: 2.1058 - val_accuracy: 0.4860
Epoch 26/1000
4/4 [=====] - 0s 15ms/step - loss: 1.7870 - accuracy: 0.5741 - val_loss: 2.0530 - val_accuracy: 0.4813
Epoch 27/1000
4/4 [=====] - 0s 16ms/step - loss: 1.8639 - accuracy: 0.5648 - val_loss: 2.0170 - val_accuracy: 0.4860
Epoch 28/1000
4/4 [=====] - 0s 14ms/step - loss: 1.6995 - accuracy: 0.5718 - val_loss: 2.0040 - val_accuracy: 0.4953
Epoch 29/1000
4/4 [=====] - 0s 16ms/step - loss: 1.7173 - accuracy: 0.5602 - val_loss: 1.9515 - val_accuracy: 0.4860
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 1.5105 - accuracy: 0.5440 - val_loss: 1.9371 - val_accuracy: 0.4813
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4700 - accuracy: 0.5532 - val_loss: 1.9176 - val_accuracy: 0.4813
Epoch 32/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4867 - accuracy: 0.5648 - val_loss: 1.8964 - val_accuracy: 0.4766
Epoch 33/1000
4/4 [=====] - 0s 15ms/step - loss: 1.3710 - accuracy: 0.5718 - val_loss: 1.8689 - val_accuracy: 0.4813
Epoch 34/1000
4/4 [=====] - 0s 16ms/step - loss: 1.3035 - accuracy: 0.5625 - val_loss: 1.8506 - val_accuracy: 0.4860
Epoch 35/1000
4/4 [=====] - 0s 16ms/step - loss: 1.3267 - accuracy: 0.5648 - val_loss: 1.8214 - val_accuracy: 0.4953
Epoch 36/1000
4/4 [=====] - 0s 13ms/step - loss: 1.3322 - accuracy: 0.5764 - val_loss: 1.8030 - val_accuracy: 0.4953
Epoch 37/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2675 - accuracy: 0.5579 - val_loss: 1.7893 - val_accuracy: 0.4907
Epoch 38/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2585 - accuracy: 0.5532 - val_loss: 1.7677 - val_accuracy: 0.4813
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2045 - accuracy: 0.5625 - val_loss: 1.7517 - val_accuracy: 0.4813
Epoch 40/1000
4/4 [=====] - 0s 19ms/step - loss: 1.2205 - accuracy: 0.5463 - val_loss: 1.7062 - val_accuracy: 0.4860
Epoch 41/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1990 - accuracy: 0.5417 - val_loss: 1.6887 - val_accuracy: 0.4907
Epoch 42/1000
4/4 [=====] - 0s 18ms/step - loss: 1.1590 - accuracy: 0.5694 - val_loss: 1.6646 - val_accuracy: 0.4907
Epoch 43/1000
4/4 [=====] - 0s 16ms/step - loss: 1.1594 - accuracy: 0.5602 - val_loss: 1.6415 - val_accuracy: 0.4860
Epoch 44/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0508 - accuracy: 0.5625 - val_loss: 1.6195 - val_accuracy: 0.4813
Epoch 45/1000
4/4 [=====] - 0s 17ms/step - loss: 1.0671 - accuracy: 0.5833 - val_loss: 1.6105 - val_accuracy: 0.4907
Epoch 46/1000
4/4 [=====] - 0s 19ms/step - loss: 1.0265 - accuracy: 0.5741 - val_loss: 1.5923 - val_accuracy: 0.4860
Epoch 47/1000
4/4 [=====] - 0s 18ms/step - loss: 1.0281 - accuracy: 0.5370 - val_loss: 1.5192 - val_accuracy: 0.4766
Epoch 48/1000
4/4 [=====] - 0s 20ms/step - loss: 0.9525 - accuracy: 0.5810 - val_loss: 1.5031 - val_accuracy: 0.4766
Epoch 49/1000
4/4 [=====] - 0s 17ms/step - loss: 0.9600 - accuracy: 0.5764 - val_loss: 1.4797 - val_accuracy: 0.4860
Epoch 50/1000
4/4 [=====] - 0s 17ms/step - loss: 0.9930 - accuracy: 0.5741 - val_loss: 1.4587 - val_accuracy: 0.4907
Epoch 51/1000
4/4 [=====] - 0s 21ms/step - loss: 0.9262 - accuracy: 0.5417 - val_loss: 1.4453 - val_accuracy: 0.4860
Epoch 52/1000
4/4 [=====] - 0s 17ms/step - loss: 0.9758 - accuracy: 0.5787 - val_loss: 1.4274 - val_accuracy: 0.4813
Epoch 53/1000
4/4 [=====] - 0s 17ms/step - loss: 1.0180 - accuracy: 0.5602 - val_loss: 1.4072 - val_accuracy: 0.4766
Epoch 54/1000
4/4 [=====] - 0s 20ms/step - loss: 1.0033 - accuracy: 0.5602 - val_loss: 1.3710 - val_accuracy: 0.4720
```

Epoch 55/1000
4/4 [=====] - 0s 17ms/step - loss: 0.8766 - accuracy: 0.5856 - val_loss: 1.3457 - val_accuracy: 0.4626
Epoch 56/1000
4/4 [=====] - 0s 18ms/step - loss: 0.9102 - accuracy: 0.6088 - val_loss: 1.3301 - val_accuracy: 0.4533
Epoch 57/1000
4/4 [=====] - 0s 15ms/step - loss: 0.9461 - accuracy: 0.5972 - val_loss: 1.2897 - val_accuracy: 0.4159
Epoch 58/1000
4/4 [=====] - 0s 20ms/step - loss: 0.8595 - accuracy: 0.5579 - val_loss: 1.2557 - val_accuracy: 0.4346
Epoch 59/1000
4/4 [=====] - 0s 16ms/step - loss: 0.9079 - accuracy: 0.5440 - val_loss: 1.2467 - val_accuracy: 0.4159
Epoch 60/1000
4/4 [=====] - 0s 16ms/step - loss: 0.9106 - accuracy: 0.5486 - val_loss: 1.2652 - val_accuracy: 0.4019
Epoch 61/1000
4/4 [=====] - 0s 16ms/step - loss: 0.8214 - accuracy: 0.5787 - val_loss: 1.2523 - val_accuracy: 0.4159
Epoch 62/1000
4/4 [=====] - 0s 15ms/step - loss: 0.8082 - accuracy: 0.5718 - val_loss: 1.2469 - val_accuracy: 0.4393
Epoch 63/1000
4/4 [=====] - 0s 16ms/step - loss: 0.8607 - accuracy: 0.5718 - val_loss: 1.2299 - val_accuracy: 0.4346
Epoch 64/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8876 - accuracy: 0.5648 - val_loss: 1.1970 - val_accuracy: 0.4299
Epoch 65/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8501 - accuracy: 0.5486 - val_loss: 1.2043 - val_accuracy: 0.4439
Epoch 66/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8705 - accuracy: 0.5417 - val_loss: 1.1881 - val_accuracy: 0.4252
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8138 - accuracy: 0.5440 - val_loss: 1.1601 - val_accuracy: 0.4065
Epoch 68/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8760 - accuracy: 0.5208 - val_loss: 1.1378 - val_accuracy: 0.4112
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8045 - accuracy: 0.5509 - val_loss: 1.1454 - val_accuracy: 0.4019
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8501 - accuracy: 0.5278 - val_loss: 1.1234 - val_accuracy: 0.4065
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7712 - accuracy: 0.5278 - val_loss: 1.1339 - val_accuracy: 0.3972
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7951 - accuracy: 0.5440 - val_loss: 1.0981 - val_accuracy: 0.4065
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7954 - accuracy: 0.5278 - val_loss: 1.0724 - val_accuracy: 0.3832
Epoch 74/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8446 - accuracy: 0.5394 - val_loss: 1.0735 - val_accuracy: 0.3879
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8682 - accuracy: 0.5648 - val_loss: 1.0513 - val_accuracy: 0.3645
Epoch 76/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8417 - accuracy: 0.5625 - val_loss: 1.0385 - val_accuracy: 0.3645
Epoch 77/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8525 - accuracy: 0.5833 - val_loss: 1.0156 - val_accuracy: 0.3785
Epoch 78/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8156 - accuracy: 0.5579 - val_loss: 1.0141 - val_accuracy: 0.3832
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7246 - accuracy: 0.5810 - val_loss: 1.0007 - val_accuracy: 0.4112
Epoch 80/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7877 - accuracy: 0.5602 - val_loss: 0.9924 - val_accuracy: 0.4206
Epoch 81/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7715 - accuracy: 0.5694 - val_loss: 0.9925 - val_accuracy: 0.4112
Epoch 82/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7431 - accuracy: 0.5787 - val_loss: 0.9962 - val_accuracy: 0.4206
Epoch 83/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7830 - accuracy: 0.5602 - val_loss: 1.0067 - val_accuracy: 0.4159
Epoch 84/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7950 - accuracy: 0.5718 - val_loss: 1.0076 - val_accuracy: 0.4159

```
accuracy: 0.4065
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7031 - accuracy: 0.5694 - val_loss: 1.0067 - val_
accuracy: 0.4159
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7305 - accuracy: 0.5370 - val_loss: 0.9963 - val_
accuracy: 0.4206
Epoch 87/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6969 - accuracy: 0.5648 - val_loss: 0.9811 - val_
accuracy: 0.4206
Epoch 88/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6790 - accuracy: 0.5440 - val_loss: 1.0163 - val_
accuracy: 0.4393
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7361 - accuracy: 0.5648 - val_loss: 0.9807 - val_
accuracy: 0.4439
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6963 - accuracy: 0.5509 - val_loss: 0.9487 - val_
accuracy: 0.4346
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6748 - accuracy: 0.5579 - val_loss: 0.9739 - val_
accuracy: 0.4439
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7341 - accuracy: 0.5532 - val_loss: 0.9739 - val_
accuracy: 0.4533
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6445 - accuracy: 0.5532 - val_loss: 0.9549 - val_
accuracy: 0.4720
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6575 - accuracy: 0.5463 - val_loss: 0.9525 - val_
accuracy: 0.4299
Epoch 95/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6779 - accuracy: 0.5486 - val_loss: 0.9902 - val_
accuracy: 0.4439
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7026 - accuracy: 0.5625 - val_loss: 0.9819 - val_
accuracy: 0.4486
Epoch 97/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6570 - accuracy: 0.5417 - val_loss: 0.9436 - val_
accuracy: 0.4439
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6981 - accuracy: 0.5741 - val_loss: 1.0348 - val_
accuracy: 0.4953
Epoch 99/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6631 - accuracy: 0.5718 - val_loss: 0.9538 - val_
accuracy: 0.4766
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6552 - accuracy: 0.5741 - val_loss: 0.9798 - val_
accuracy: 0.4673
Epoch 101/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7444 - accuracy: 0.5556 - val_loss: 0.9594 - val_
accuracy: 0.4486
Epoch 102/1000
4/4 [=====] - 0s 15ms/step - loss: 0.7843 - accuracy: 0.5486 - val_loss: 0.9522 - val_
accuracy: 0.4813
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6513 - accuracy: 0.5208 - val_loss: 0.9923 - val_
accuracy: 0.4953
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6489 - accuracy: 0.5486 - val_loss: 0.9830 - val_
accuracy: 0.5000
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7218 - accuracy: 0.5856 - val_loss: 0.9509 - val_
accuracy: 0.4720
Epoch 106/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7167 - accuracy: 0.5556 - val_loss: 0.9624 - val_
accuracy: 0.4907
Epoch 107/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6618 - accuracy: 0.5602 - val_loss: 0.9628 - val_
accuracy: 0.5047
Epoch 108/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6773 - accuracy: 0.5949 - val_loss: 0.9587 - val_
accuracy: 0.5047
Epoch 109/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6709 - accuracy: 0.5532 - val_loss: 0.9531 - val_
accuracy: 0.4953
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6365 - accuracy: 0.5880 - val_loss: 0.9674 - val_
accuracy: 0.5093
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6671 - accuracy: 0.5903 - val_loss: 0.9725 - val_
accuracy: 0.5234
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6544 - accuracy: 0.5764 - val_loss: 0.9723 - val_
accuracy: 0.4953
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6422 - accuracy: 0.5718 - val_loss: 1.0611 - val_
accuracy: 0.4953
Epoch 114/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.6465 - accuracy: 0.5648 - val_loss: 1.0424 - val_accuracy: 0.5234
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6510 - accuracy: 0.5995 - val_loss: 1.0837 - val_accuracy: 0.5234
Epoch 116/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6634 - accuracy: 0.5880 - val_loss: 1.0683 - val_accuracy: 0.5140
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6483 - accuracy: 0.5648 - val_loss: 0.9883 - val_accuracy: 0.5187
Epoch 118/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6605 - accuracy: 0.5602 - val_loss: 1.0031 - val_accuracy: 0.5374
Epoch 119/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7165 - accuracy: 0.5579 - val_loss: 0.9614 - val_accuracy: 0.5327
Epoch 120/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6928 - accuracy: 0.5231 - val_loss: 0.9645 - val_accuracy: 0.5187
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6885 - accuracy: 0.5486 - val_loss: 0.9614 - val_accuracy: 0.5374
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6427 - accuracy: 0.5648 - val_loss: 0.9693 - val_accuracy: 0.5374
Epoch 123/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6728 - accuracy: 0.5556 - val_loss: 0.9765 - val_accuracy: 0.5607
Epoch 124/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6201 - accuracy: 0.5995 - val_loss: 0.9994 - val_accuracy: 0.5280
Epoch 125/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6236 - accuracy: 0.5856 - val_loss: 0.9672 - val_accuracy: 0.5187
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6482 - accuracy: 0.5532 - val_loss: 0.9595 - val_accuracy: 0.5140
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6701 - accuracy: 0.6042 - val_loss: 0.9559 - val_accuracy: 0.5467
Epoch 128/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6937 - accuracy: 0.5949 - val_loss: 0.9181 - val_accuracy: 0.5421
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7090 - accuracy: 0.5903 - val_loss: 1.0244 - val_accuracy: 0.5794
Epoch 130/1000
4/4 [=====] - 0s 17ms/step - loss: 0.6444 - accuracy: 0.6065 - val_loss: 1.0444 - val_accuracy: 0.5888
Epoch 131/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7184 - accuracy: 0.6204 - val_loss: 1.0224 - val_accuracy: 0.5748
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6265 - accuracy: 0.5972 - val_loss: 0.9872 - val_accuracy: 0.5748
Epoch 133/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6229 - accuracy: 0.5949 - val_loss: 0.9788 - val_accuracy: 0.5561
Epoch 134/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5555 - accuracy: 0.6296 - val_loss: 0.9378 - val_accuracy: 0.5561
Epoch 135/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6094 - accuracy: 0.6019 - val_loss: 0.9674 - val_accuracy: 0.5561
Epoch 136/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6042 - accuracy: 0.6181 - val_loss: 0.9774 - val_accuracy: 0.5794
Epoch 137/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5492 - accuracy: 0.6181 - val_loss: 0.9649 - val_accuracy: 0.5374
Epoch 138/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5847 - accuracy: 0.6204 - val_loss: 0.8360 - val_accuracy: 0.5514
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5720 - accuracy: 0.6111 - val_loss: 0.8574 - val_accuracy: 0.5654
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5685 - accuracy: 0.5856 - val_loss: 0.9226 - val_accuracy: 0.5280
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5724 - accuracy: 0.6019 - val_loss: 0.8606 - val_accuracy: 0.5374
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5881 - accuracy: 0.6157 - val_loss: 0.9153 - val_accuracy: 0.5187
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5617 - accuracy: 0.6019 - val_loss: 0.8494 - val_accuracy: 0.5234
```

Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.6508 - accuracy: 0.5880 - val_loss: 0.8088 - val_accuracy: 0.5421
Epoch 145/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5401 - accuracy: 0.6204 - val_loss: 0.7618 - val_accuracy: 0.5000
Epoch 146/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5342 - accuracy: 0.5903 - val_loss: 0.8063 - val_accuracy: 0.5047
Epoch 147/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5281 - accuracy: 0.6227 - val_loss: 0.8128 - val_accuracy: 0.5234
Epoch 148/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5755 - accuracy: 0.5694 - val_loss: 0.9015 - val_accuracy: 0.4953
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5769 - accuracy: 0.5880 - val_loss: 0.8754 - val_accuracy: 0.5421
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5615 - accuracy: 0.5949 - val_loss: 0.9212 - val_accuracy: 0.5514
Epoch 151/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5492 - accuracy: 0.6019 - val_loss: 0.8830 - val_accuracy: 0.5514
Epoch 152/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6003 - accuracy: 0.6343 - val_loss: 0.8700 - val_accuracy: 0.5561
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5541 - accuracy: 0.6204 - val_loss: 0.8991 - val_accuracy: 0.5514
Epoch 154/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5732 - accuracy: 0.6481 - val_loss: 0.8806 - val_accuracy: 0.5514
Epoch 155/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6564 - accuracy: 0.6366 - val_loss: 0.9116 - val_accuracy: 0.5561
Epoch 156/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5967 - accuracy: 0.6273 - val_loss: 0.8086 - val_accuracy: 0.5841
Epoch 157/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5273 - accuracy: 0.6204 - val_loss: 0.8666 - val_accuracy: 0.5701
Epoch 158/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5460 - accuracy: 0.6204 - val_loss: 0.8038 - val_accuracy: 0.5888
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5150 - accuracy: 0.6458 - val_loss: 0.8364 - val_accuracy: 0.5981
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4984 - accuracy: 0.6458 - val_loss: 0.7583 - val_accuracy: 0.5935
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5109 - accuracy: 0.6898 - val_loss: 0.8051 - val_accuracy: 0.6075
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5361 - accuracy: 0.6667 - val_loss: 0.8140 - val_accuracy: 0.6262
Epoch 163/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5244 - accuracy: 0.6343 - val_loss: 0.8738 - val_accuracy: 0.6262
Epoch 164/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5504 - accuracy: 0.6481 - val_loss: 0.8850 - val_accuracy: 0.6121
Epoch 165/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5240 - accuracy: 0.6620 - val_loss: 0.8876 - val_accuracy: 0.6075
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5945 - accuracy: 0.6528 - val_loss: 0.8218 - val_accuracy: 0.6121
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5520 - accuracy: 0.6181 - val_loss: 0.8218 - val_accuracy: 0.6075
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5429 - accuracy: 0.6296 - val_loss: 0.9365 - val_accuracy: 0.5935
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5129 - accuracy: 0.6134 - val_loss: 0.9883 - val_accuracy: 0.5607
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5147 - accuracy: 0.6204 - val_loss: 0.8884 - val_accuracy: 0.6075
Epoch 171/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5119 - accuracy: 0.6204 - val_loss: 0.9686 - val_accuracy: 0.5421
Epoch 172/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5323 - accuracy: 0.6181 - val_loss: 0.9329 - val_accuracy: 0.5841
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4827 - accuracy: 0.6366 - val_loss: 1.0079 - val_accuracy: 0.5841

```
accuracy: 0.5701
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3814 - accuracy: 0.6319 - val_loss: 1.0076 - val_
accuracy: 0.5421
Epoch 175/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4159 - accuracy: 0.5787 - val_loss: 0.7708 - val_
accuracy: 0.5794
Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3620 - accuracy: 0.6620 - val_loss: 0.7107 - val_
accuracy: 0.5841
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3473 - accuracy: 0.6343 - val_loss: 0.9017 - val_
accuracy: 0.5654
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3782 - accuracy: 0.6319 - val_loss: 0.8728 - val_
accuracy: 0.5841
Epoch 179/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4038 - accuracy: 0.5903 - val_loss: 0.8806 - val_
accuracy: 0.5467
Epoch 180/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3341 - accuracy: 0.6181 - val_loss: 0.9417 - val_
accuracy: 0.5280
Epoch 181/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3541 - accuracy: 0.5833 - val_loss: 0.9756 - val_
accuracy: 0.5514
Epoch 182/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3245 - accuracy: 0.5972 - val_loss: 0.9711 - val_
accuracy: 0.5561
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3600 - accuracy: 0.5903 - val_loss: 0.8489 - val_
accuracy: 0.5234
Epoch 184/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3681 - accuracy: 0.5972 - val_loss: 0.8200 - val_
accuracy: 0.5935
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3157 - accuracy: 0.6204 - val_loss: 0.7523 - val_
accuracy: 0.5888
Epoch 186/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2897 - accuracy: 0.6435 - val_loss: 0.7213 - val_
accuracy: 0.5654
Epoch 187/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3638 - accuracy: 0.6204 - val_loss: 0.9375 - val_
accuracy: 0.5748
Epoch 188/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3179 - accuracy: 0.6458 - val_loss: 0.9643 - val_
accuracy: 0.5701
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3748 - accuracy: 0.6181 - val_loss: 0.7999 - val_
accuracy: 0.5561
Epoch 190/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2834 - accuracy: 0.5880 - val_loss: 0.8051 - val_
accuracy: 0.5794
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3192 - accuracy: 0.6134 - val_loss: 0.7311 - val_
accuracy: 0.5514
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3115 - accuracy: 0.6157 - val_loss: 0.8738 - val_
accuracy: 0.5514
Epoch 193/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2609 - accuracy: 0.5995 - val_loss: 0.9380 - val_
accuracy: 0.5421
Epoch 194/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3519 - accuracy: 0.5903 - val_loss: 0.8692 - val_
accuracy: 0.5467
Epoch 195/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3403 - accuracy: 0.6389 - val_loss: 0.8086 - val_
accuracy: 0.5467
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2903 - accuracy: 0.6019 - val_loss: 0.8742 - val_
accuracy: 0.5467
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2852 - accuracy: 0.5995 - val_loss: 0.8496 - val_
accuracy: 0.5374
Epoch 198/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3479 - accuracy: 0.5972 - val_loss: 1.0997 - val_
accuracy: 0.5187
Epoch 199/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3043 - accuracy: 0.5718 - val_loss: 1.0831 - val_
accuracy: 0.5140
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2564 - accuracy: 0.6019 - val_loss: 1.0270 - val_
accuracy: 0.5187
Epoch 201/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4167 - accuracy: 0.6273 - val_loss: 0.9248 - val_
accuracy: 0.5514
Epoch 202/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2507 - accuracy: 0.6042 - val_loss: 0.9725 - val_
accuracy: 0.5421
Epoch 203/1000
```

```
4/4 [=====] - 0s 11ms/step - loss: 0.2814 - accuracy: 0.5880 - val_loss: 0.9289 - val_accuracy: 0.5327
Epoch 204/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2588 - accuracy: 0.5856 - val_loss: 1.0021 - val_accuracy: 0.5187
Epoch 205/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3159 - accuracy: 0.5347 - val_loss: 1.0104 - val_accuracy: 0.5234
Epoch 206/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3109 - accuracy: 0.5347 - val_loss: 0.9876 - val_accuracy: 0.4953
Epoch 207/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2698 - accuracy: 0.5093 - val_loss: 1.0713 - val_accuracy: 0.4813
Epoch 208/1000
4/4 [=====] - 0s 10ms/step - loss: 0.2631 - accuracy: 0.5162 - val_loss: 1.1135 - val_accuracy: 0.4720
Epoch 209/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3866 - accuracy: 0.5648 - val_loss: 1.1960 - val_accuracy: 0.4813
Epoch 210/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3468 - accuracy: 0.5139 - val_loss: 1.1636 - val_accuracy: 0.4907
Epoch 211/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3093 - accuracy: 0.5278 - val_loss: 1.1509 - val_accuracy: 0.4860
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2717 - accuracy: 0.5139 - val_loss: 1.2691 - val_accuracy: 0.4860
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3089 - accuracy: 0.5486 - val_loss: 1.2132 - val_accuracy: 0.5140
Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2496 - accuracy: 0.5417 - val_loss: 1.1407 - val_accuracy: 0.5140
Epoch 215/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2616 - accuracy: 0.5417 - val_loss: 1.1510 - val_accuracy: 0.5280
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2535 - accuracy: 0.5671 - val_loss: 1.1893 - val_accuracy: 0.5140
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2432 - accuracy: 0.5417 - val_loss: 1.1981 - val_accuracy: 0.5280
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2681 - accuracy: 0.5463 - val_loss: 1.1219 - val_accuracy: 0.5093
Epoch 219/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2176 - accuracy: 0.5139 - val_loss: 1.3559 - val_accuracy: 0.4953
Epoch 220/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2583 - accuracy: 0.5278 - val_loss: 1.2112 - val_accuracy: 0.5187
Epoch 221/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3240 - accuracy: 0.5949 - val_loss: 1.0811 - val_accuracy: 0.5514
Epoch 222/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2541 - accuracy: 0.5671 - val_loss: 1.0109 - val_accuracy: 0.5421
Epoch 223/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2295 - accuracy: 0.5648 - val_loss: 1.0344 - val_accuracy: 0.5047
Epoch 224/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1947 - accuracy: 0.5463 - val_loss: 1.1421 - val_accuracy: 0.5234
Epoch 225/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2768 - accuracy: 0.5602 - val_loss: 1.2145 - val_accuracy: 0.5607
Epoch 226/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2661 - accuracy: 0.5509 - val_loss: 1.1489 - val_accuracy: 0.5093
Epoch 227/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2756 - accuracy: 0.5602 - val_loss: 1.1856 - val_accuracy: 0.5187
Epoch 228/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2566 - accuracy: 0.5556 - val_loss: 1.1226 - val_accuracy: 0.5093
Epoch 229/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2404 - accuracy: 0.5278 - val_loss: 1.1250 - val_accuracy: 0.5047
Epoch 230/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2863 - accuracy: 0.5347 - val_loss: 1.1515 - val_accuracy: 0.4860
Epoch 231/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2114 - accuracy: 0.5301 - val_loss: 1.1146 - val_accuracy: 0.5140
Epoch 232/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2329 - accuracy: 0.5185 - val_loss: 1.1536 - val_accuracy: 0.4953
```

Epoch 233/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2498 - accuracy: 0.5440 - val_loss: 1.2330 - val_accuracy: 0.5234
Epoch 234/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3376 - accuracy: 0.5532 - val_loss: 1.2462 - val_accuracy: 0.4813
Epoch 235/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2545 - accuracy: 0.5463 - val_loss: 1.3007 - val_accuracy: 0.4813
Epoch 236/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3096 - accuracy: 0.5347 - val_loss: 1.3510 - val_accuracy: 0.5047
Epoch 237/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2182 - accuracy: 0.5370 - val_loss: 1.2968 - val_accuracy: 0.4626
Epoch 238/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2846 - accuracy: 0.5463 - val_loss: 1.4368 - val_accuracy: 0.4907
Epoch 239/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2296 - accuracy: 0.6042 - val_loss: 1.4623 - val_accuracy: 0.4720
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2914 - accuracy: 0.5602 - val_loss: 1.5456 - val_accuracy: 0.5187
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2641 - accuracy: 0.5532 - val_loss: 1.4066 - val_accuracy: 0.5047
Epoch 242/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3291 - accuracy: 0.5509 - val_loss: 1.4751 - val_accuracy: 0.4953
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2063 - accuracy: 0.5556 - val_loss: 1.4677 - val_accuracy: 0.4720
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2447 - accuracy: 0.5417 - val_loss: 1.4927 - val_accuracy: 0.4907
Epoch 245/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2932 - accuracy: 0.5370 - val_loss: 1.2724 - val_accuracy: 0.4673
Epoch 246/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1790 - accuracy: 0.5787 - val_loss: 1.2604 - val_accuracy: 0.4766
Epoch 247/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1945 - accuracy: 0.5556 - val_loss: 1.2494 - val_accuracy: 0.4720
Epoch 248/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2216 - accuracy: 0.5648 - val_loss: 1.2765 - val_accuracy: 0.5000
Epoch 249/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2160 - accuracy: 0.5694 - val_loss: 1.4244 - val_accuracy: 0.4813
Epoch 250/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2641 - accuracy: 0.5718 - val_loss: 1.2636 - val_accuracy: 0.4486
Epoch 251/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2485 - accuracy: 0.5347 - val_loss: 1.3197 - val_accuracy: 0.4579
Epoch 252/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2094 - accuracy: 0.5741 - val_loss: 1.3045 - val_accuracy: 0.4626
Epoch 253/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1796 - accuracy: 0.5671 - val_loss: 1.2894 - val_accuracy: 0.4673
Epoch 254/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2178 - accuracy: 0.5556 - val_loss: 1.3394 - val_accuracy: 0.5000
Epoch 255/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1903 - accuracy: 0.6227 - val_loss: 1.2502 - val_accuracy: 0.5000
Epoch 256/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1867 - accuracy: 0.6319 - val_loss: 1.2206 - val_accuracy: 0.4907
Epoch 257/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1717 - accuracy: 0.5833 - val_loss: 1.2326 - val_accuracy: 0.5000
Epoch 258/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2036 - accuracy: 0.6088 - val_loss: 1.2116 - val_accuracy: 0.4953
Epoch 259/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1779 - accuracy: 0.6157 - val_loss: 1.3404 - val_accuracy: 0.4813
Epoch 260/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1828 - accuracy: 0.5648 - val_loss: 1.2622 - val_accuracy: 0.5000
Epoch 261/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2669 - accuracy: 0.5880 - val_loss: 1.3699 - val_accuracy: 0.5514
Epoch 262/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2380 - accuracy: 0.6597 - val_loss: 1.3640 - val_accuracy: 0.5000

```
accuracy: 0.5421
Epoch 263/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2788 - accuracy: 0.6019 - val_loss: 1.3600 - val_
accuracy: 0.5421
Epoch 264/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1972 - accuracy: 0.6412 - val_loss: 1.4031 - val_
accuracy: 0.5374
Epoch 265/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1649 - accuracy: 0.5856 - val_loss: 1.4024 - val_
accuracy: 0.5374
Epoch 266/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1986 - accuracy: 0.5972 - val_loss: 1.3934 - val_
accuracy: 0.5140
Epoch 267/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1902 - accuracy: 0.5856 - val_loss: 1.4023 - val_
accuracy: 0.5000
Epoch 268/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3307 - accuracy: 0.5509 - val_loss: 1.3785 - val_
accuracy: 0.4860
Epoch 269/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1752 - accuracy: 0.5625 - val_loss: 1.4401 - val_
accuracy: 0.4953
Epoch 270/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2128 - accuracy: 0.5694 - val_loss: 1.3972 - val_
accuracy: 0.4720
Epoch 271/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1710 - accuracy: 0.5255 - val_loss: 1.3741 - val_
accuracy: 0.4766
Epoch 272/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1844 - accuracy: 0.5440 - val_loss: 1.3022 - val_
accuracy: 0.5000
Epoch 273/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1923 - accuracy: 0.5648 - val_loss: 1.3298 - val_
accuracy: 0.5047
Epoch 274/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2328 - accuracy: 0.5440 - val_loss: 1.3403 - val_
accuracy: 0.5093
Epoch 275/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2029 - accuracy: 0.5671 - val_loss: 1.3752 - val_
accuracy: 0.4766
Epoch 276/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2018 - accuracy: 0.5856 - val_loss: 1.3968 - val_
accuracy: 0.4860
Epoch 277/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2537 - accuracy: 0.5579 - val_loss: 1.3969 - val_
accuracy: 0.4953
Epoch 278/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2129 - accuracy: 0.5324 - val_loss: 1.3152 - val_
accuracy: 0.4953
Epoch 279/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2505 - accuracy: 0.5069 - val_loss: 1.3499 - val_
accuracy: 0.5093
Epoch 280/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1718 - accuracy: 0.5255 - val_loss: 1.5087 - val_
accuracy: 0.4860
Epoch 281/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1940 - accuracy: 0.5370 - val_loss: 1.4593 - val_
accuracy: 0.4813
Epoch 282/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1884 - accuracy: 0.5671 - val_loss: 1.4061 - val_
accuracy: 0.4860
Epoch 283/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3488 - accuracy: 0.5394 - val_loss: 1.4742 - val_
accuracy: 0.4766
Epoch 284/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2112 - accuracy: 0.5926 - val_loss: 1.4104 - val_
accuracy: 0.4766
Epoch 285/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1869 - accuracy: 0.5579 - val_loss: 1.3876 - val_
accuracy: 0.4907
Epoch 286/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2870 - accuracy: 0.5718 - val_loss: 1.3840 - val_
accuracy: 0.5047
Epoch 287/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1874 - accuracy: 0.5833 - val_loss: 1.4325 - val_
accuracy: 0.5187
Epoch 288/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1833 - accuracy: 0.5532 - val_loss: 1.4596 - val_
accuracy: 0.5047
Epoch 289/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1510 - accuracy: 0.5116 - val_loss: 1.4604 - val_
accuracy: 0.4953
Epoch 290/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2650 - accuracy: 0.5579 - val_loss: 1.4579 - val_
accuracy: 0.4953
Epoch 291/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1708 - accuracy: 0.5162 - val_loss: 1.4586 - val_
accuracy: 0.4953
Epoch 292/1000
```

4/4 [=====] - 0s 12ms/step - loss: 0.1841 - accuracy: 0.5278 - val_loss: 1.4361 - val_accuracy: 0.5093
 Epoch 293/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.1864 - accuracy: 0.5394 - val_loss: 1.4613 - val_accuracy: 0.4953
 Epoch 294/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.1668 - accuracy: 0.5324 - val_loss: 1.3527 - val_accuracy: 0.5140
 Epoch 295/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.1947 - accuracy: 0.5463 - val_loss: 1.3504 - val_accuracy: 0.5234
 Epoch 296/1000
 4/4 [=====] - 0s 12ms/step - loss: 0.1933 - accuracy: 0.5463 - val_loss: 1.3884 - val_accuracy: 0.4907
 Epoch 297/1000
 4/4 [=====] - 0s 13ms/step - loss: 0.1630 - accuracy: 0.5417 - val_loss: 1.4658 - val_accuracy: 0.5000
 Epoch 298/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.1860 - accuracy: 0.5370 - val_loss: 1.4581 - val_accuracy: 0.4953
 Epoch 299/1000
 4/4 [=====] - 0s 20ms/step - loss: 0.2980 - accuracy: 0.5324 - val_loss: 1.3373 - val_accuracy: 0.5561
 Epoch 300/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.2160 - accuracy: 0.5694 - val_loss: 1.3059 - val_accuracy: 0.5654
 Epoch 301/1000
 4/4 [=====] - 0s 16ms/step - loss: 0.1611 - accuracy: 0.5532 - val_loss: 1.3543 - val_accuracy: 0.5374
 Epoch 302/1000
 4/4 [=====] - 0s 18ms/step - loss: 0.1528 - accuracy: 0.5394 - val_loss: 1.3578 - val_accuracy: 0.5514
 Epoch 303/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.1759 - accuracy: 0.5324 - val_loss: 1.3921 - val_accuracy: 0.5607
 Epoch 304/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.1508 - accuracy: 0.5556 - val_loss: 1.3635 - val_accuracy: 0.5654
 Epoch 305/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.2109 - accuracy: 0.5880 - val_loss: 1.4880 - val_accuracy: 0.5748
 Epoch 306/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.1888 - accuracy: 0.5625 - val_loss: 1.3707 - val_accuracy: 0.5701
 Epoch 307/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.2319 - accuracy: 0.5556 - val_loss: 1.3781 - val_accuracy: 0.5514
 Epoch 308/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.3119 - accuracy: 0.5741 - val_loss: 1.4029 - val_accuracy: 0.5514
 Epoch 309/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.1523 - accuracy: 0.5810 - val_loss: 1.3457 - val_accuracy: 0.5467
 Epoch 310/1000
 4/4 [=====] - 0s 14ms/step - loss: 0.2309 - accuracy: 0.5718 - val_loss: 1.3431 - val_accuracy: 0.5140
 Epoch 311/1000
 4/4 [=====] - 0s 15ms/step - loss: 0.1785 - accuracy: 0.5532 - val_loss: 1.2667 - val_accuracy: 0.5374
 Epoch 312/1000
 1/4 [====>.....] - ETA: 0s - loss: 0.2025 - accuracy: 0.5469 Restoring model weights from the end of the best epoch: 162.
 4/4 [=====] - 0s 15ms/step - loss: 0.1953 - accuracy: 0.5231 - val_loss: 1.3974 - val_accuracy: 0.5374
 Epoch 312: early stopping
 7/7 [=====] - 0s 2ms/step - loss: 0.8140 - accuracy: 0.6262
 Model: "sequential_108"

Layer (type)	Output Shape	Param #
dense_432 (Dense)	(None, 50)	350
batch_normalization_324 (BatchNormalization)	(None, 50)	200
activation_324 (Activation)	(None, 50)	0
dense_433 (Dense)	(None, 50)	2550
batch_normalization_325 (BatchNormalization)	(None, 50)	200
activation_325 (Activation)	(None, 50)	0
dense_434 (Dense)	(None, 10)	510
batch_normalization_326 (BatchNormalization)	(None, 10)	40

```
activation_326 (Activation) (None, 10)
```

```
0
```

```
dense_435 (Dense) (None, 2)
```

```
22
```

```
=====
Total params: 3,872
Trainable params: 3,652
Non-trainable params: 220
```

```
=====
Epoch 1/1000
4/4 [=====] - 1s 60ms/step - loss: 6.2040 - accuracy: 0.4931 - val_loss: 4.5390 - val_accuracy: 0.4860
Epoch 2/1000
4/4 [=====] - 0s 16ms/step - loss: 5.2476 - accuracy: 0.5162 - val_loss: 4.4882 - val_accuracy: 0.4112
Epoch 3/1000
4/4 [=====] - 0s 16ms/step - loss: 5.1012 - accuracy: 0.4606 - val_loss: 4.4307 - val_accuracy: 0.3645
Epoch 4/1000
4/4 [=====] - 0s 21ms/step - loss: 4.6518 - accuracy: 0.4329 - val_loss: 4.3623 - val_accuracy: 0.3131
Epoch 5/1000
4/4 [=====] - 0s 19ms/step - loss: 4.5297 - accuracy: 0.4236 - val_loss: 3.8873 - val_accuracy: 0.3084
Epoch 6/1000
4/4 [=====] - 0s 18ms/step - loss: 4.5085 - accuracy: 0.4306 - val_loss: 3.4604 - val_accuracy: 0.3037
Epoch 7/1000
4/4 [=====] - 0s 20ms/step - loss: 4.1883 - accuracy: 0.4329 - val_loss: 3.0869 - val_accuracy: 0.2850
Epoch 8/1000
4/4 [=====] - 0s 16ms/step - loss: 4.2608 - accuracy: 0.4213 - val_loss: 2.9122 - val_accuracy: 0.3318
Epoch 9/1000
4/4 [=====] - 0s 15ms/step - loss: 4.1318 - accuracy: 0.4259 - val_loss: 2.8632 - val_accuracy: 0.3364
Epoch 10/1000
4/4 [=====] - 0s 16ms/step - loss: 4.2844 - accuracy: 0.4167 - val_loss: 2.6497 - val_accuracy: 0.3692
Epoch 11/1000
4/4 [=====] - 0s 15ms/step - loss: 4.1457 - accuracy: 0.4144 - val_loss: 2.4297 - val_accuracy: 0.3738
Epoch 12/1000
4/4 [=====] - 0s 17ms/step - loss: 3.9469 - accuracy: 0.4375 - val_loss: 2.1589 - val_accuracy: 0.4065
Epoch 13/1000
4/4 [=====] - 0s 15ms/step - loss: 3.9538 - accuracy: 0.4421 - val_loss: 1.9596 - val_accuracy: 0.4019
Epoch 14/1000
4/4 [=====] - 0s 16ms/step - loss: 3.8798 - accuracy: 0.4444 - val_loss: 1.8349 - val_accuracy: 0.4112
Epoch 15/1000
4/4 [=====] - 0s 15ms/step - loss: 3.8431 - accuracy: 0.4421 - val_loss: 1.7736 - val_accuracy: 0.4299
Epoch 16/1000
4/4 [=====] - 0s 16ms/step - loss: 3.6458 - accuracy: 0.4306 - val_loss: 1.7459 - val_accuracy: 0.4112
Epoch 17/1000
4/4 [=====] - 0s 15ms/step - loss: 3.5647 - accuracy: 0.4213 - val_loss: 1.6562 - val_accuracy: 0.4206
Epoch 18/1000
4/4 [=====] - 0s 14ms/step - loss: 3.6244 - accuracy: 0.4468 - val_loss: 1.6166 - val_accuracy: 0.4346
Epoch 19/1000
4/4 [=====] - 0s 16ms/step - loss: 3.6025 - accuracy: 0.4514 - val_loss: 1.5644 - val_accuracy: 0.4439
Epoch 20/1000
4/4 [=====] - 0s 16ms/step - loss: 3.5218 - accuracy: 0.4421 - val_loss: 1.5430 - val_accuracy: 0.4346
Epoch 21/1000
4/4 [=====] - 0s 17ms/step - loss: 3.6048 - accuracy: 0.4329 - val_loss: 1.5290 - val_accuracy: 0.4393
Epoch 22/1000
4/4 [=====] - 0s 17ms/step - loss: 3.5467 - accuracy: 0.4722 - val_loss: 1.5339 - val_accuracy: 0.4579
Epoch 23/1000
4/4 [=====] - 0s 17ms/step - loss: 3.2469 - accuracy: 0.4583 - val_loss: 1.5449 - val_accuracy: 0.4533
Epoch 24/1000
4/4 [=====] - 0s 16ms/step - loss: 3.2785 - accuracy: 0.4769 - val_loss: 1.5051 - val_accuracy: 0.4533
Epoch 25/1000
4/4 [=====] - 0s 17ms/step - loss: 3.1528 - accuracy: 0.4861 - val_loss: 1.4635 - val_accuracy: 0.4486
Epoch 26/1000
4/4 [=====] - 0s 16ms/step - loss: 2.9947 - accuracy: 0.4722 - val_loss: 1.4543 - val_accuracy: 0.4579
Epoch 27/1000
4/4 [=====] - 0s 16ms/step - loss: 3.0191 - accuracy: 0.4838 - val_loss: 1.4441 - val_accuracy: 0.4579
```

```
accuracy: 0.4720
Epoch 28/1000
4/4 [=====] - 0s 16ms/step - loss: 2.8925 - accuracy: 0.4676 - val_loss: 1.4325 - val_accuracy: 0.4766
Epoch 29/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8560 - accuracy: 0.4699 - val_loss: 1.4215 - val_accuracy: 0.4813
Epoch 30/1000
4/4 [=====] - 0s 14ms/step - loss: 2.8639 - accuracy: 0.4884 - val_loss: 1.4072 - val_accuracy: 0.4720
Epoch 31/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7480 - accuracy: 0.4815 - val_loss: 1.3875 - val_accuracy: 0.4720
Epoch 32/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7257 - accuracy: 0.4884 - val_loss: 1.3738 - val_accuracy: 0.4720
Epoch 33/1000
4/4 [=====] - 0s 14ms/step - loss: 2.7318 - accuracy: 0.4745 - val_loss: 1.3544 - val_accuracy: 0.4860
Epoch 34/1000
4/4 [=====] - 0s 14ms/step - loss: 2.3822 - accuracy: 0.4792 - val_loss: 1.3426 - val_accuracy: 0.4813
Epoch 35/1000
4/4 [=====] - 0s 13ms/step - loss: 2.3450 - accuracy: 0.4792 - val_loss: 1.3302 - val_accuracy: 0.4720
Epoch 36/1000
4/4 [=====] - 0s 14ms/step - loss: 2.0888 - accuracy: 0.4792 - val_loss: 1.3294 - val_accuracy: 0.4673
Epoch 37/1000
4/4 [=====] - 0s 15ms/step - loss: 1.5836 - accuracy: 0.4769 - val_loss: 1.3154 - val_accuracy: 0.4673
Epoch 38/1000
4/4 [=====] - 0s 15ms/step - loss: 1.4919 - accuracy: 0.4745 - val_loss: 1.3051 - val_accuracy: 0.4579
Epoch 39/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4332 - accuracy: 0.4745 - val_loss: 1.2658 - val_accuracy: 0.4533
Epoch 40/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4122 - accuracy: 0.5023 - val_loss: 1.2799 - val_accuracy: 0.4486
Epoch 41/1000
4/4 [=====] - 0s 14ms/step - loss: 1.3322 - accuracy: 0.4815 - val_loss: 1.2694 - val_accuracy: 0.4486
Epoch 42/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2726 - accuracy: 0.4838 - val_loss: 1.2365 - val_accuracy: 0.4533
Epoch 43/1000
4/4 [=====] - 0s 14ms/step - loss: 1.2570 - accuracy: 0.4907 - val_loss: 1.2253 - val_accuracy: 0.4486
Epoch 44/1000
4/4 [=====] - 0s 15ms/step - loss: 1.1473 - accuracy: 0.4977 - val_loss: 1.2663 - val_accuracy: 0.4533
Epoch 45/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0814 - accuracy: 0.5023 - val_loss: 1.2271 - val_accuracy: 0.4579
Epoch 46/1000
4/4 [=====] - 0s 14ms/step - loss: 1.1489 - accuracy: 0.4954 - val_loss: 1.2053 - val_accuracy: 0.4579
Epoch 47/1000
4/4 [=====] - 0s 14ms/step - loss: 1.0615 - accuracy: 0.5069 - val_loss: 1.1960 - val_accuracy: 0.4579
Epoch 48/1000
4/4 [=====] - 0s 13ms/step - loss: 1.0104 - accuracy: 0.5301 - val_loss: 1.2021 - val_accuracy: 0.4626
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9990 - accuracy: 0.5208 - val_loss: 1.1818 - val_accuracy: 0.4533
Epoch 50/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8825 - accuracy: 0.4977 - val_loss: 1.1675 - val_accuracy: 0.4533
Epoch 51/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8582 - accuracy: 0.5093 - val_loss: 1.1219 - val_accuracy: 0.4533
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8913 - accuracy: 0.5023 - val_loss: 1.1578 - val_accuracy: 0.4533
Epoch 53/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9182 - accuracy: 0.4977 - val_loss: 1.1472 - val_accuracy: 0.4626
Epoch 54/1000
4/4 [=====] - 0s 16ms/step - loss: 0.8811 - accuracy: 0.5324 - val_loss: 1.1255 - val_accuracy: 0.4720
Epoch 55/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8654 - accuracy: 0.5208 - val_loss: 1.1120 - val_accuracy: 0.4813
Epoch 56/1000
4/4 [=====] - 0s 13ms/step - loss: 0.8053 - accuracy: 0.5394 - val_loss: 1.0801 - val_accuracy: 0.4813
Epoch 57/1000
```

```
4/4 [=====] - 0s 15ms/step - loss: 0.8150 - accuracy: 0.5440 - val_loss: 1.0498 - val_accuracy: 0.4813
Epoch 58/1000
4/4 [=====] - 0s 14ms/step - loss: 0.8473 - accuracy: 0.5440 - val_loss: 1.0230 - val_accuracy: 0.4813
Epoch 59/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7718 - accuracy: 0.5370 - val_loss: 1.0242 - val_accuracy: 0.4813
Epoch 60/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7418 - accuracy: 0.5440 - val_loss: 1.0206 - val_accuracy: 0.4860
Epoch 61/1000
4/4 [=====] - 0s 13ms/step - loss: 0.7553 - accuracy: 0.5532 - val_loss: 1.0118 - val_accuracy: 0.4813
Epoch 62/1000
4/4 [=====] - 0s 14ms/step - loss: 0.7911 - accuracy: 0.5532 - val_loss: 0.9852 - val_accuracy: 0.4813
Epoch 63/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6618 - accuracy: 0.5417 - val_loss: 0.9782 - val_accuracy: 0.4766
Epoch 64/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6821 - accuracy: 0.5370 - val_loss: 0.9688 - val_accuracy: 0.4860
Epoch 65/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6498 - accuracy: 0.5417 - val_loss: 0.9602 - val_accuracy: 0.4766
Epoch 66/1000
4/4 [=====] - 0s 17ms/step - loss: 0.7464 - accuracy: 0.5417 - val_loss: 0.9485 - val_accuracy: 0.4860
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6275 - accuracy: 0.5463 - val_loss: 0.9505 - val_accuracy: 0.4813
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6340 - accuracy: 0.5417 - val_loss: 0.9152 - val_accuracy: 0.4860
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5970 - accuracy: 0.5417 - val_loss: 0.9258 - val_accuracy: 0.4860
Epoch 70/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5915 - accuracy: 0.5231 - val_loss: 0.9177 - val_accuracy: 0.4860
Epoch 71/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6298 - accuracy: 0.5231 - val_loss: 0.8859 - val_accuracy: 0.4299
Epoch 72/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5778 - accuracy: 0.5139 - val_loss: 0.8803 - val_accuracy: 0.4346
Epoch 73/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6243 - accuracy: 0.5116 - val_loss: 0.8990 - val_accuracy: 0.4252
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6932 - accuracy: 0.5509 - val_loss: 0.8494 - val_accuracy: 0.4252
Epoch 75/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5791 - accuracy: 0.5648 - val_loss: 0.8349 - val_accuracy: 0.4206
Epoch 76/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6190 - accuracy: 0.5463 - val_loss: 0.8252 - val_accuracy: 0.4206
Epoch 77/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5577 - accuracy: 0.5278 - val_loss: 0.8120 - val_accuracy: 0.4206
Epoch 78/1000
4/4 [=====] - 0s 14ms/step - loss: 0.6362 - accuracy: 0.5185 - val_loss: 0.8028 - val_accuracy: 0.4112
Epoch 79/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5943 - accuracy: 0.5926 - val_loss: 0.7894 - val_accuracy: 0.4206
Epoch 80/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5758 - accuracy: 0.5069 - val_loss: 0.7860 - val_accuracy: 0.4159
Epoch 81/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5468 - accuracy: 0.5046 - val_loss: 0.7720 - val_accuracy: 0.4206
Epoch 82/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5313 - accuracy: 0.5347 - val_loss: 0.8049 - val_accuracy: 0.4346
Epoch 83/1000
4/4 [=====] - 0s 19ms/step - loss: 0.5546 - accuracy: 0.5347 - val_loss: 0.7956 - val_accuracy: 0.4299
Epoch 84/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5600 - accuracy: 0.5278 - val_loss: 0.7862 - val_accuracy: 0.4346
Epoch 85/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5089 - accuracy: 0.5625 - val_loss: 0.7807 - val_accuracy: 0.4393
Epoch 86/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5051 - accuracy: 0.5440 - val_loss: 0.7731 - val_accuracy: 0.4393
```

Epoch 87/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5204 - accuracy: 0.5509 - val_loss: 0.7650 - val_accuracy: 0.4346
Epoch 88/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5883 - accuracy: 0.5625 - val_loss: 0.7550 - val_accuracy: 0.4393
Epoch 89/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5455 - accuracy: 0.5741 - val_loss: 0.7453 - val_accuracy: 0.4439
Epoch 90/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5215 - accuracy: 0.5764 - val_loss: 0.7340 - val_accuracy: 0.4393
Epoch 91/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5119 - accuracy: 0.5694 - val_loss: 0.7090 - val_accuracy: 0.4346
Epoch 92/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4979 - accuracy: 0.5648 - val_loss: 0.6999 - val_accuracy: 0.4299
Epoch 93/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5608 - accuracy: 0.5833 - val_loss: 0.7152 - val_accuracy: 0.4159
Epoch 94/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4946 - accuracy: 0.5093 - val_loss: 0.7129 - val_accuracy: 0.4206
Epoch 95/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4868 - accuracy: 0.5093 - val_loss: 0.7108 - val_accuracy: 0.4206
Epoch 96/1000
4/4 [=====] - 0s 13ms/step - loss: 0.6291 - accuracy: 0.5185 - val_loss: 0.7057 - val_accuracy: 0.4206
Epoch 97/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4785 - accuracy: 0.5324 - val_loss: 0.7005 - val_accuracy: 0.4299
Epoch 98/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5013 - accuracy: 0.5162 - val_loss: 0.6972 - val_accuracy: 0.4252
Epoch 99/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4875 - accuracy: 0.5255 - val_loss: 0.7168 - val_accuracy: 0.4252
Epoch 100/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4836 - accuracy: 0.5116 - val_loss: 0.7098 - val_accuracy: 0.4346
Epoch 101/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4670 - accuracy: 0.5139 - val_loss: 0.7067 - val_accuracy: 0.4206
Epoch 102/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5831 - accuracy: 0.5231 - val_loss: 0.7081 - val_accuracy: 0.4346
Epoch 103/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5256 - accuracy: 0.5185 - val_loss: 0.7020 - val_accuracy: 0.4486
Epoch 104/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4738 - accuracy: 0.5231 - val_loss: 0.7252 - val_accuracy: 0.4533
Epoch 105/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5241 - accuracy: 0.5046 - val_loss: 0.6748 - val_accuracy: 0.4486
Epoch 106/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4841 - accuracy: 0.4954 - val_loss: 0.6825 - val_accuracy: 0.4393
Epoch 107/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5028 - accuracy: 0.5023 - val_loss: 0.7067 - val_accuracy: 0.4486
Epoch 108/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5053 - accuracy: 0.5278 - val_loss: 0.6327 - val_accuracy: 0.4439
Epoch 109/1000
4/4 [=====] - 0s 15ms/step - loss: 0.6488 - accuracy: 0.5231 - val_loss: 0.6587 - val_accuracy: 0.4533
Epoch 110/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5200 - accuracy: 0.5231 - val_loss: 0.6381 - val_accuracy: 0.4579
Epoch 111/1000
4/4 [=====] - 0s 17ms/step - loss: 0.5035 - accuracy: 0.5301 - val_loss: 0.6934 - val_accuracy: 0.4439
Epoch 112/1000
4/4 [=====] - 0s 18ms/step - loss: 0.6230 - accuracy: 0.5301 - val_loss: 0.6797 - val_accuracy: 0.4299
Epoch 113/1000
4/4 [=====] - 0s 15ms/step - loss: 0.5823 - accuracy: 0.5185 - val_loss: 0.6808 - val_accuracy: 0.4393
Epoch 114/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5563 - accuracy: 0.5301 - val_loss: 0.6987 - val_accuracy: 0.4486
Epoch 115/1000
4/4 [=====] - 0s 14ms/step - loss: 0.5121 - accuracy: 0.5324 - val_loss: 0.7115 - val_accuracy: 0.4486
Epoch 116/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4865 - accuracy: 0.5278 - val_loss: 0.7079 - val_accuracy: 0.4486

```
accuracy: 0.4579
Epoch 117/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4343 - accuracy: 0.5208 - val_loss: 0.6855 - val_accuracy: 0.4579
Epoch 118/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4286 - accuracy: 0.5185 - val_loss: 0.7247 - val_accuracy: 0.4439
Epoch 119/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4401 - accuracy: 0.5116 - val_loss: 0.7092 - val_accuracy: 0.4486
Epoch 120/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4617 - accuracy: 0.5231 - val_loss: 0.7007 - val_accuracy: 0.4346
Epoch 121/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4475 - accuracy: 0.5370 - val_loss: 0.7044 - val_accuracy: 0.4486
Epoch 122/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4577 - accuracy: 0.5347 - val_loss: 0.6973 - val_accuracy: 0.4439
Epoch 123/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4897 - accuracy: 0.5347 - val_loss: 0.6959 - val_accuracy: 0.4486
Epoch 124/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4883 - accuracy: 0.5509 - val_loss: 0.7969 - val_accuracy: 0.4486
Epoch 125/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4211 - accuracy: 0.5417 - val_loss: 0.7443 - val_accuracy: 0.4673
Epoch 126/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4807 - accuracy: 0.5324 - val_loss: 0.7549 - val_accuracy: 0.4579
Epoch 127/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3817 - accuracy: 0.5278 - val_loss: 0.7971 - val_accuracy: 0.4626
Epoch 128/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4324 - accuracy: 0.5301 - val_loss: 0.7833 - val_accuracy: 0.4486
Epoch 129/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4645 - accuracy: 0.5231 - val_loss: 0.7574 - val_accuracy: 0.4533
Epoch 130/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3785 - accuracy: 0.5347 - val_loss: 0.8140 - val_accuracy: 0.4626
Epoch 131/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4144 - accuracy: 0.5278 - val_loss: 0.8108 - val_accuracy: 0.4533
Epoch 132/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3796 - accuracy: 0.5301 - val_loss: 0.8110 - val_accuracy: 0.4439
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4516 - accuracy: 0.5440 - val_loss: 0.7623 - val_accuracy: 0.4673
Epoch 134/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4244 - accuracy: 0.5486 - val_loss: 0.8350 - val_accuracy: 0.4626
Epoch 135/1000
4/4 [=====] - 0s 13ms/step - loss: 0.5167 - accuracy: 0.5579 - val_loss: 0.8450 - val_accuracy: 0.4626
Epoch 136/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4545 - accuracy: 0.5231 - val_loss: 0.8522 - val_accuracy: 0.4766
Epoch 137/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4384 - accuracy: 0.5370 - val_loss: 0.8033 - val_accuracy: 0.4813
Epoch 138/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4340 - accuracy: 0.5162 - val_loss: 0.7751 - val_accuracy: 0.4766
Epoch 139/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4298 - accuracy: 0.5370 - val_loss: 0.8699 - val_accuracy: 0.4626
Epoch 140/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3918 - accuracy: 0.5648 - val_loss: 0.8478 - val_accuracy: 0.4673
Epoch 141/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4279 - accuracy: 0.5602 - val_loss: 0.8242 - val_accuracy: 0.4673
Epoch 142/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3571 - accuracy: 0.5602 - val_loss: 0.8695 - val_accuracy: 0.4766
Epoch 143/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4589 - accuracy: 0.5486 - val_loss: 0.8542 - val_accuracy: 0.4626
Epoch 144/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3996 - accuracy: 0.5509 - val_loss: 0.8426 - val_accuracy: 0.4533
Epoch 145/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3883 - accuracy: 0.5486 - val_loss: 0.8796 - val_accuracy: 0.4673
Epoch 146/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 0.4620 - accuracy: 0.5394 - val_loss: 0.8419 - val_accuracy: 0.4533
Epoch 147/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4359 - accuracy: 0.5347 - val_loss: 0.8694 - val_accuracy: 0.4626
Epoch 148/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3885 - accuracy: 0.5440 - val_loss: 0.8716 - val_accuracy: 0.4860
Epoch 149/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3359 - accuracy: 0.5602 - val_loss: 0.8412 - val_accuracy: 0.4907
Epoch 150/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3695 - accuracy: 0.5764 - val_loss: 0.8825 - val_accuracy: 0.4953
Epoch 151/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4213 - accuracy: 0.5556 - val_loss: 0.8803 - val_accuracy: 0.5047
Epoch 152/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3679 - accuracy: 0.5370 - val_loss: 0.9388 - val_accuracy: 0.5187
Epoch 153/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4068 - accuracy: 0.5648 - val_loss: 0.9020 - val_accuracy: 0.5047
Epoch 154/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3429 - accuracy: 0.5394 - val_loss: 0.8747 - val_accuracy: 0.5000
Epoch 155/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3824 - accuracy: 0.5602 - val_loss: 0.7732 - val_accuracy: 0.5280
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3834 - accuracy: 0.5602 - val_loss: 0.8553 - val_accuracy: 0.5187
Epoch 157/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3358 - accuracy: 0.5463 - val_loss: 0.9923 - val_accuracy: 0.5140
Epoch 158/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3827 - accuracy: 0.5370 - val_loss: 0.9931 - val_accuracy: 0.5280
Epoch 159/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4093 - accuracy: 0.5509 - val_loss: 1.1004 - val_accuracy: 0.5047
Epoch 160/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3631 - accuracy: 0.5440 - val_loss: 1.0985 - val_accuracy: 0.4953
Epoch 161/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3968 - accuracy: 0.5579 - val_loss: 1.0349 - val_accuracy: 0.4907
Epoch 162/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3438 - accuracy: 0.5370 - val_loss: 1.0254 - val_accuracy: 0.4813
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3441 - accuracy: 0.5394 - val_loss: 1.0031 - val_accuracy: 0.4813
Epoch 164/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4016 - accuracy: 0.5255 - val_loss: 0.9706 - val_accuracy: 0.4860
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3330 - accuracy: 0.5255 - val_loss: 0.9691 - val_accuracy: 0.4860
Epoch 166/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4598 - accuracy: 0.5579 - val_loss: 0.9237 - val_accuracy: 0.4720
Epoch 167/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3543 - accuracy: 0.5741 - val_loss: 1.0174 - val_accuracy: 0.4907
Epoch 168/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4431 - accuracy: 0.5417 - val_loss: 0.9488 - val_accuracy: 0.5140
Epoch 169/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3765 - accuracy: 0.5370 - val_loss: 0.9393 - val_accuracy: 0.5140
Epoch 170/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4126 - accuracy: 0.5532 - val_loss: 0.8939 - val_accuracy: 0.5187
Epoch 171/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3584 - accuracy: 0.5417 - val_loss: 0.8368 - val_accuracy: 0.5234
Epoch 172/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3617 - accuracy: 0.5486 - val_loss: 0.8284 - val_accuracy: 0.5234
Epoch 173/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3542 - accuracy: 0.5301 - val_loss: 0.8281 - val_accuracy: 0.5140
Epoch 174/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3252 - accuracy: 0.5278 - val_loss: 0.8585 - val_accuracy: 0.5140
Epoch 175/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3581 - accuracy: 0.5486 - val_loss: 0.9001 - val_accuracy: 0.5000
```

Epoch 176/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3654 - accuracy: 0.5394 - val_loss: 1.0107 - val_accuracy: 0.4907
Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4390 - accuracy: 0.5347 - val_loss: 0.9497 - val_accuracy: 0.4813
Epoch 178/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3344 - accuracy: 0.5278 - val_loss: 0.9947 - val_accuracy: 0.4860
Epoch 179/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4133 - accuracy: 0.5694 - val_loss: 0.9613 - val_accuracy: 0.4953
Epoch 180/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3505 - accuracy: 0.5417 - val_loss: 1.0768 - val_accuracy: 0.4907
Epoch 181/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3552 - accuracy: 0.5324 - val_loss: 1.0406 - val_accuracy: 0.4907
Epoch 182/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4015 - accuracy: 0.5556 - val_loss: 0.9917 - val_accuracy: 0.4813
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3306 - accuracy: 0.5625 - val_loss: 0.9879 - val_accuracy: 0.4907
Epoch 184/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3698 - accuracy: 0.5625 - val_loss: 1.0224 - val_accuracy: 0.4860
Epoch 185/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3763 - accuracy: 0.5301 - val_loss: 0.9935 - val_accuracy: 0.4813
Epoch 186/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3787 - accuracy: 0.5625 - val_loss: 0.9810 - val_accuracy: 0.4953
Epoch 187/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3803 - accuracy: 0.5856 - val_loss: 1.0693 - val_accuracy: 0.4860
Epoch 188/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3844 - accuracy: 0.5764 - val_loss: 1.0036 - val_accuracy: 0.5000
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3848 - accuracy: 0.5718 - val_loss: 0.9938 - val_accuracy: 0.4907
Epoch 190/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3472 - accuracy: 0.5949 - val_loss: 0.9648 - val_accuracy: 0.4953
Epoch 191/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2868 - accuracy: 0.5764 - val_loss: 0.9815 - val_accuracy: 0.5000
Epoch 192/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3022 - accuracy: 0.5625 - val_loss: 0.9667 - val_accuracy: 0.4813
Epoch 193/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2980 - accuracy: 0.5648 - val_loss: 0.9701 - val_accuracy: 0.4907
Epoch 194/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3100 - accuracy: 0.5486 - val_loss: 1.0193 - val_accuracy: 0.4860
Epoch 195/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4071 - accuracy: 0.5532 - val_loss: 1.0078 - val_accuracy: 0.4907
Epoch 196/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2590 - accuracy: 0.5347 - val_loss: 1.0137 - val_accuracy: 0.5000
Epoch 197/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2921 - accuracy: 0.5579 - val_loss: 1.0250 - val_accuracy: 0.5047
Epoch 198/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2594 - accuracy: 0.5694 - val_loss: 1.0357 - val_accuracy: 0.4953
Epoch 199/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3549 - accuracy: 0.5833 - val_loss: 1.0545 - val_accuracy: 0.5093
Epoch 200/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2998 - accuracy: 0.5370 - val_loss: 1.0319 - val_accuracy: 0.4953
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3365 - accuracy: 0.5718 - val_loss: 0.9864 - val_accuracy: 0.5093
Epoch 202/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2833 - accuracy: 0.5741 - val_loss: 1.0085 - val_accuracy: 0.5000
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3656 - accuracy: 0.5579 - val_loss: 1.0358 - val_accuracy: 0.5047
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3047 - accuracy: 0.5394 - val_loss: 1.0349 - val_accuracy: 0.4953
Epoch 205/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2643 - accuracy: 0.5625 - val_loss: 1.0670 - val_accuracy: 0.5000

```
accuracy: 0.5047
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2475 - accuracy: 0.5856 - val_loss: 1.0684 - val_accuracy: 0.4953
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3273 - accuracy: 0.5463 - val_loss: 1.1013 - val_accuracy: 0.5047
Epoch 208/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2513 - accuracy: 0.5903 - val_loss: 1.1426 - val_accuracy: 0.5047
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3354 - accuracy: 0.5463 - val_loss: 1.1384 - val_accuracy: 0.4907
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2469 - accuracy: 0.5532 - val_loss: 1.1188 - val_accuracy: 0.5140
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3147 - accuracy: 0.5741 - val_loss: 1.1107 - val_accuracy: 0.5000
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2623 - accuracy: 0.5694 - val_loss: 0.9982 - val_accuracy: 0.5280
Epoch 213/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2421 - accuracy: 0.6019 - val_loss: 1.1195 - val_accuracy: 0.5047
Epoch 214/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2946 - accuracy: 0.5856 - val_loss: 1.1577 - val_accuracy: 0.5280
Epoch 215/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2926 - accuracy: 0.5764 - val_loss: 1.1673 - val_accuracy: 0.5327
Epoch 216/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2604 - accuracy: 0.5787 - val_loss: 1.1252 - val_accuracy: 0.5421
Epoch 217/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3436 - accuracy: 0.5764 - val_loss: 1.1451 - val_accuracy: 0.5421
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2832 - accuracy: 0.5880 - val_loss: 1.1843 - val_accuracy: 0.5374
Epoch 219/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3216 - accuracy: 0.5972 - val_loss: 1.1069 - val_accuracy: 0.5654
Epoch 220/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3108 - accuracy: 0.5903 - val_loss: 1.0836 - val_accuracy: 0.5607
Epoch 221/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3363 - accuracy: 0.5880 - val_loss: 1.1143 - val_accuracy: 0.5514
Epoch 222/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2641 - accuracy: 0.5972 - val_loss: 1.0920 - val_accuracy: 0.5701
Epoch 223/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2394 - accuracy: 0.5880 - val_loss: 1.1857 - val_accuracy: 0.5467
Epoch 224/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3054 - accuracy: 0.5926 - val_loss: 1.1275 - val_accuracy: 0.5654
Epoch 225/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2500 - accuracy: 0.5972 - val_loss: 1.2079 - val_accuracy: 0.5561
Epoch 226/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2618 - accuracy: 0.6227 - val_loss: 1.2204 - val_accuracy: 0.5280
Epoch 227/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2437 - accuracy: 0.6458 - val_loss: 1.1695 - val_accuracy: 0.5234
Epoch 228/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2715 - accuracy: 0.6088 - val_loss: 1.2059 - val_accuracy: 0.5607
Epoch 229/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3275 - accuracy: 0.6204 - val_loss: 1.2313 - val_accuracy: 0.5467
Epoch 230/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2479 - accuracy: 0.6157 - val_loss: 1.2077 - val_accuracy: 0.5561
Epoch 231/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2776 - accuracy: 0.6157 - val_loss: 1.2324 - val_accuracy: 0.5421
Epoch 232/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2298 - accuracy: 0.6273 - val_loss: 1.1821 - val_accuracy: 0.5561
Epoch 233/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3425 - accuracy: 0.6273 - val_loss: 1.1696 - val_accuracy: 0.5374
Epoch 234/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2696 - accuracy: 0.6042 - val_loss: 1.1732 - val_accuracy: 0.5514
Epoch 235/1000
```

```
4/4 [=====] - 0s 12ms/step - loss: 0.2347 - accuracy: 0.6319 - val_loss: 1.1973 - val_accuracy: 0.5421
Epoch 236/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2765 - accuracy: 0.6319 - val_loss: 1.2042 - val_accuracy: 0.5561
Epoch 237/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2368 - accuracy: 0.6181 - val_loss: 1.1162 - val_accuracy: 0.5654
Epoch 238/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2406 - accuracy: 0.6412 - val_loss: 1.1658 - val_accuracy: 0.5654
Epoch 239/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3190 - accuracy: 0.6481 - val_loss: 1.2424 - val_accuracy: 0.5607
Epoch 240/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2701 - accuracy: 0.6181 - val_loss: 1.2623 - val_accuracy: 0.5514
Epoch 241/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3079 - accuracy: 0.6157 - val_loss: 1.1850 - val_accuracy: 0.5561
Epoch 242/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2357 - accuracy: 0.6204 - val_loss: 1.2194 - val_accuracy: 0.5421
Epoch 243/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2638 - accuracy: 0.6343 - val_loss: 1.2356 - val_accuracy: 0.5327
Epoch 244/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2446 - accuracy: 0.6088 - val_loss: 1.2078 - val_accuracy: 0.5374
Epoch 245/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2936 - accuracy: 0.6319 - val_loss: 1.2301 - val_accuracy: 0.5280
Epoch 246/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2549 - accuracy: 0.6366 - val_loss: 1.2373 - val_accuracy: 0.5421
Epoch 247/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2575 - accuracy: 0.6227 - val_loss: 1.2345 - val_accuracy: 0.5467
Epoch 248/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2192 - accuracy: 0.6343 - val_loss: 1.2607 - val_accuracy: 0.5467
Epoch 249/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2133 - accuracy: 0.6389 - val_loss: 1.2574 - val_accuracy: 0.5654
Epoch 250/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2275 - accuracy: 0.6296 - val_loss: 1.1610 - val_accuracy: 0.5607
Epoch 251/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3644 - accuracy: 0.6435 - val_loss: 1.1256 - val_accuracy: 0.5748
Epoch 252/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2293 - accuracy: 0.6343 - val_loss: 1.1687 - val_accuracy: 0.5654
Epoch 253/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2365 - accuracy: 0.6505 - val_loss: 1.2424 - val_accuracy: 0.5654
Epoch 254/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2127 - accuracy: 0.6435 - val_loss: 1.1760 - val_accuracy: 0.5654
Epoch 255/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2404 - accuracy: 0.6644 - val_loss: 1.1665 - val_accuracy: 0.5794
Epoch 256/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2953 - accuracy: 0.6389 - val_loss: 1.1696 - val_accuracy: 0.5748
Epoch 257/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2219 - accuracy: 0.6644 - val_loss: 1.2400 - val_accuracy: 0.5701
Epoch 258/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2988 - accuracy: 0.6319 - val_loss: 1.2468 - val_accuracy: 0.5654
Epoch 259/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2602 - accuracy: 0.6366 - val_loss: 1.2526 - val_accuracy: 0.5561
Epoch 260/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2888 - accuracy: 0.6343 - val_loss: 1.1879 - val_accuracy: 0.5467
Epoch 261/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2290 - accuracy: 0.6644 - val_loss: 1.2634 - val_accuracy: 0.5421
Epoch 262/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2445 - accuracy: 0.6759 - val_loss: 1.2801 - val_accuracy: 0.5514
Epoch 263/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2318 - accuracy: 0.6852 - val_loss: 1.3182 - val_accuracy: 0.5327
Epoch 264/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2989 - accuracy: 0.6944 - val_loss: 1.3326 - val_accuracy: 0.5748
```

Epoch 265/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3185 - accuracy: 0.6852 - val_loss: 1.2976 - val_accuracy: 0.5561
Epoch 266/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2331 - accuracy: 0.6389 - val_loss: 1.2187 - val_accuracy: 0.5607
Epoch 267/1000
4/4 [=====] - 0s 21ms/step - loss: 0.2562 - accuracy: 0.6597 - val_loss: 1.2479 - val_accuracy: 0.5654
Epoch 268/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2542 - accuracy: 0.6852 - val_loss: 1.1715 - val_accuracy: 0.5841
Epoch 269/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2352 - accuracy: 0.6921 - val_loss: 1.1772 - val_accuracy: 0.5841
Epoch 270/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1983 - accuracy: 0.6574 - val_loss: 1.2548 - val_accuracy: 0.5794
Epoch 271/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1964 - accuracy: 0.6481 - val_loss: 1.2291 - val_accuracy: 0.5794
Epoch 272/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2845 - accuracy: 0.6505 - val_loss: 1.2313 - val_accuracy: 0.5794
Epoch 273/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2356 - accuracy: 0.6782 - val_loss: 1.2016 - val_accuracy: 0.5654
Epoch 274/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2715 - accuracy: 0.6759 - val_loss: 1.3098 - val_accuracy: 0.5794
Epoch 275/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3588 - accuracy: 0.6644 - val_loss: 1.2630 - val_accuracy: 0.5701
Epoch 276/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2828 - accuracy: 0.6505 - val_loss: 1.3336 - val_accuracy: 0.5701
Epoch 277/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2736 - accuracy: 0.6574 - val_loss: 1.3828 - val_accuracy: 0.5467
Epoch 278/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2902 - accuracy: 0.6574 - val_loss: 1.4104 - val_accuracy: 0.5561
Epoch 279/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2511 - accuracy: 0.6458 - val_loss: 1.3326 - val_accuracy: 0.5467
Epoch 280/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3232 - accuracy: 0.6019 - val_loss: 1.2461 - val_accuracy: 0.5514
Epoch 281/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2653 - accuracy: 0.6412 - val_loss: 1.1532 - val_accuracy: 0.5561
Epoch 282/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1974 - accuracy: 0.6296 - val_loss: 1.2529 - val_accuracy: 0.5514
Epoch 283/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3549 - accuracy: 0.6389 - val_loss: 1.2302 - val_accuracy: 0.5654
Epoch 284/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3613 - accuracy: 0.6296 - val_loss: 1.3176 - val_accuracy: 0.5514
Epoch 285/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2635 - accuracy: 0.5880 - val_loss: 1.3181 - val_accuracy: 0.5467
Epoch 286/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2059 - accuracy: 0.6019 - val_loss: 1.3441 - val_accuracy: 0.5421
Epoch 287/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2973 - accuracy: 0.6042 - val_loss: 1.1983 - val_accuracy: 0.5561
Epoch 288/1000
4/4 [=====] - 0s 18ms/step - loss: 0.2347 - accuracy: 0.6389 - val_loss: 1.1570 - val_accuracy: 0.5654
Epoch 289/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3117 - accuracy: 0.6204 - val_loss: 1.2070 - val_accuracy: 0.5607
Epoch 290/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2022 - accuracy: 0.6227 - val_loss: 1.1884 - val_accuracy: 0.5748
Epoch 291/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2107 - accuracy: 0.6157 - val_loss: 1.3468 - val_accuracy: 0.5514
Epoch 292/1000
4/4 [=====] - 0s 15ms/step - loss: 0.3129 - accuracy: 0.6528 - val_loss: 1.2894 - val_accuracy: 0.5421
Epoch 293/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1890 - accuracy: 0.5926 - val_loss: 1.3593 - val_accuracy: 0.5467
Epoch 294/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2056 - accuracy: 0.5810 - val_loss: 1.3774 - val_accuracy: 0.5467

```
accuracy: 0.5514
Epoch 295/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3249 - accuracy: 0.6343 - val_loss: 1.3299 - val_
accuracy: 0.5561
Epoch 296/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2430 - accuracy: 0.6343 - val_loss: 1.3502 - val_
accuracy: 0.5561
Epoch 297/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1862 - accuracy: 0.6042 - val_loss: 1.2394 - val_
accuracy: 0.5701
Epoch 298/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1646 - accuracy: 0.6134 - val_loss: 1.2937 - val_
accuracy: 0.5607
Epoch 299/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2251 - accuracy: 0.6227 - val_loss: 1.3288 - val_
accuracy: 0.5514
Epoch 300/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2368 - accuracy: 0.6481 - val_loss: 1.2633 - val_
accuracy: 0.5701
Epoch 301/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2367 - accuracy: 0.6620 - val_loss: 1.1484 - val_
accuracy: 0.5888
Epoch 302/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2275 - accuracy: 0.6644 - val_loss: 1.2670 - val_
accuracy: 0.5701
Epoch 303/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2086 - accuracy: 0.6366 - val_loss: 1.2903 - val_
accuracy: 0.5701
Epoch 304/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3445 - accuracy: 0.6759 - val_loss: 1.3709 - val_
accuracy: 0.5748
Epoch 305/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3159 - accuracy: 0.6806 - val_loss: 1.3301 - val_
accuracy: 0.5654
Epoch 306/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2319 - accuracy: 0.6991 - val_loss: 1.3286 - val_
accuracy: 0.5654
Epoch 307/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2215 - accuracy: 0.6690 - val_loss: 1.2433 - val_
accuracy: 0.5654
Epoch 308/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2050 - accuracy: 0.7292 - val_loss: 1.1578 - val_
accuracy: 0.5374
Epoch 309/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2434 - accuracy: 0.7106 - val_loss: 1.3318 - val_
accuracy: 0.5467
Epoch 310/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2506 - accuracy: 0.7130 - val_loss: 1.3805 - val_
accuracy: 0.5327
Epoch 311/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1728 - accuracy: 0.7014 - val_loss: 1.3618 - val_
accuracy: 0.5467
Epoch 312/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2088 - accuracy: 0.6829 - val_loss: 1.4242 - val_
accuracy: 0.5421
Epoch 313/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1973 - accuracy: 0.6829 - val_loss: 1.3349 - val_
accuracy: 0.5467
Epoch 314/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2083 - accuracy: 0.6852 - val_loss: 1.3121 - val_
accuracy: 0.5467
Epoch 315/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1848 - accuracy: 0.6736 - val_loss: 1.2716 - val_
accuracy: 0.5234
Epoch 316/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1720 - accuracy: 0.6806 - val_loss: 1.3053 - val_
accuracy: 0.5234
Epoch 317/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1595 - accuracy: 0.6759 - val_loss: 1.2296 - val_
accuracy: 0.5421
Epoch 318/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2245 - accuracy: 0.6690 - val_loss: 1.3141 - val_
accuracy: 0.5327
Epoch 319/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1922 - accuracy: 0.6412 - val_loss: 1.2819 - val_
accuracy: 0.5421
Epoch 320/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1594 - accuracy: 0.6620 - val_loss: 1.2857 - val_
accuracy: 0.5374
Epoch 321/1000
4/4 [=====] - 0s 16ms/step - loss: 0.2121 - accuracy: 0.6736 - val_loss: 1.2729 - val_
accuracy: 0.5514
Epoch 322/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1890 - accuracy: 0.6667 - val_loss: 1.2911 - val_
accuracy: 0.5467
Epoch 323/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1962 - accuracy: 0.6782 - val_loss: 1.3549 - val_
accuracy: 0.5421
Epoch 324/1000
```

```
4/4 [=====] - 0s 15ms/step - loss: 0.2584 - accuracy: 0.6829 - val_loss: 1.3313 - val_accuracy: 0.5514
Epoch 325/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2768 - accuracy: 0.6944 - val_loss: 1.4581 - val_accuracy: 0.5421
Epoch 326/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2611 - accuracy: 0.6806 - val_loss: 1.3934 - val_accuracy: 0.5327
Epoch 327/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2187 - accuracy: 0.6296 - val_loss: 1.3727 - val_accuracy: 0.5374
Epoch 328/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1575 - accuracy: 0.6597 - val_loss: 1.3238 - val_accuracy: 0.5514
Epoch 329/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1869 - accuracy: 0.6458 - val_loss: 1.3298 - val_accuracy: 0.5234
Epoch 330/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1455 - accuracy: 0.6319 - val_loss: 1.3099 - val_accuracy: 0.5561
Epoch 331/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2169 - accuracy: 0.6667 - val_loss: 1.3474 - val_accuracy: 0.5327
Epoch 332/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1398 - accuracy: 0.6644 - val_loss: 1.2353 - val_accuracy: 0.5514
Epoch 333/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1906 - accuracy: 0.6713 - val_loss: 1.2617 - val_accuracy: 0.5607
Epoch 334/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1588 - accuracy: 0.6528 - val_loss: 1.2706 - val_accuracy: 0.5467
Epoch 335/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1419 - accuracy: 0.6875 - val_loss: 1.3492 - val_accuracy: 0.5514
Epoch 336/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2204 - accuracy: 0.6574 - val_loss: 1.2720 - val_accuracy: 0.5514
Epoch 337/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1871 - accuracy: 0.6319 - val_loss: 1.2366 - val_accuracy: 0.5467
Epoch 338/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2940 - accuracy: 0.7060 - val_loss: 1.2495 - val_accuracy: 0.5561
Epoch 339/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2619 - accuracy: 0.6736 - val_loss: 1.2126 - val_accuracy: 0.5701
Epoch 340/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2533 - accuracy: 0.6528 - val_loss: 1.1570 - val_accuracy: 0.5514
Epoch 341/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1999 - accuracy: 0.6759 - val_loss: 1.2790 - val_accuracy: 0.5467
Epoch 342/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2964 - accuracy: 0.6829 - val_loss: 1.2346 - val_accuracy: 0.5514
Epoch 343/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1809 - accuracy: 0.6759 - val_loss: 1.2838 - val_accuracy: 0.5607
Epoch 344/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2061 - accuracy: 0.6620 - val_loss: 1.4183 - val_accuracy: 0.5467
Epoch 345/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2560 - accuracy: 0.6667 - val_loss: 1.3925 - val_accuracy: 0.5467
Epoch 346/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2034 - accuracy: 0.7315 - val_loss: 1.2597 - val_accuracy: 0.5561
Epoch 347/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1873 - accuracy: 0.7106 - val_loss: 1.3769 - val_accuracy: 0.5841
Epoch 348/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1780 - accuracy: 0.7338 - val_loss: 1.3423 - val_accuracy: 0.5935
Epoch 349/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1930 - accuracy: 0.7407 - val_loss: 1.4493 - val_accuracy: 0.5701
Epoch 350/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1518 - accuracy: 0.7315 - val_loss: 1.4823 - val_accuracy: 0.5841
Epoch 351/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1731 - accuracy: 0.7407 - val_loss: 1.2924 - val_accuracy: 0.6028
Epoch 352/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1736 - accuracy: 0.7523 - val_loss: 1.3645 - val_accuracy: 0.6121
Epoch 353/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1839 - accuracy: 0.7176 - val_loss: 1.5014 - val_accuracy: 0.6168
```

Epoch 354/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1757 - accuracy: 0.7384 - val_loss: 1.4419 - val_accuracy: 0.6449
Epoch 355/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3044 - accuracy: 0.7593 - val_loss: 1.5072 - val_accuracy: 0.6402
Epoch 356/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1975 - accuracy: 0.7454 - val_loss: 1.4203 - val_accuracy: 0.6542
Epoch 357/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2148 - accuracy: 0.7523 - val_loss: 1.3108 - val_accuracy: 0.6542
Epoch 358/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2962 - accuracy: 0.7523 - val_loss: 1.2666 - val_accuracy: 0.6355
Epoch 359/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2745 - accuracy: 0.7245 - val_loss: 1.2910 - val_accuracy: 0.6215
Epoch 360/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2029 - accuracy: 0.7130 - val_loss: 1.1950 - val_accuracy: 0.6262
Epoch 361/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1524 - accuracy: 0.7315 - val_loss: 1.2469 - val_accuracy: 0.6355
Epoch 362/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1922 - accuracy: 0.6968 - val_loss: 1.1900 - val_accuracy: 0.6121
Epoch 363/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2007 - accuracy: 0.6690 - val_loss: 1.2711 - val_accuracy: 0.6075
Epoch 364/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2179 - accuracy: 0.7014 - val_loss: 1.2592 - val_accuracy: 0.5935
Epoch 365/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1884 - accuracy: 0.6921 - val_loss: 1.3235 - val_accuracy: 0.5701
Epoch 366/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1603 - accuracy: 0.6667 - val_loss: 1.2688 - val_accuracy: 0.5888
Epoch 367/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2274 - accuracy: 0.6713 - val_loss: 1.2185 - val_accuracy: 0.5888
Epoch 368/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1868 - accuracy: 0.6713 - val_loss: 1.1910 - val_accuracy: 0.5888
Epoch 369/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2368 - accuracy: 0.6829 - val_loss: 1.1669 - val_accuracy: 0.5935
Epoch 370/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1395 - accuracy: 0.6898 - val_loss: 1.3458 - val_accuracy: 0.6028
Epoch 371/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1977 - accuracy: 0.6921 - val_loss: 1.4178 - val_accuracy: 0.5981
Epoch 372/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2163 - accuracy: 0.6875 - val_loss: 1.3121 - val_accuracy: 0.5935
Epoch 373/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1631 - accuracy: 0.6875 - val_loss: 1.3149 - val_accuracy: 0.5935
Epoch 374/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1648 - accuracy: 0.6921 - val_loss: 1.2811 - val_accuracy: 0.5841
Epoch 375/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1976 - accuracy: 0.7269 - val_loss: 1.2224 - val_accuracy: 0.5794
Epoch 376/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1348 - accuracy: 0.6944 - val_loss: 1.2925 - val_accuracy: 0.5561
Epoch 377/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1652 - accuracy: 0.6968 - val_loss: 1.2855 - val_accuracy: 0.5748
Epoch 378/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2220 - accuracy: 0.7130 - val_loss: 1.3450 - val_accuracy: 0.5514
Epoch 379/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1411 - accuracy: 0.6991 - val_loss: 1.1472 - val_accuracy: 0.5654
Epoch 380/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1884 - accuracy: 0.6898 - val_loss: 1.1623 - val_accuracy: 0.5748
Epoch 381/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1469 - accuracy: 0.6968 - val_loss: 1.1883 - val_accuracy: 0.5607
Epoch 382/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1498 - accuracy: 0.7060 - val_loss: 1.1555 - val_accuracy: 0.5701
Epoch 383/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1880 - accuracy: 0.7199 - val_loss: 1.3756 - val_accuracy: 0.5701

```
accuracy: 0.5561
Epoch 384/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1689 - accuracy: 0.6898 - val_loss: 1.3835 - val_
accuracy: 0.5701
Epoch 385/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1637 - accuracy: 0.6759 - val_loss: 1.3538 - val_
accuracy: 0.5701
Epoch 386/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1476 - accuracy: 0.6782 - val_loss: 1.4260 - val_
accuracy: 0.5467
Epoch 387/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2321 - accuracy: 0.6806 - val_loss: 1.4072 - val_
accuracy: 0.5514
Epoch 388/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2854 - accuracy: 0.7106 - val_loss: 1.2239 - val_
accuracy: 0.5607
Epoch 389/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1438 - accuracy: 0.7014 - val_loss: 1.2531 - val_
accuracy: 0.5654
Epoch 390/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1222 - accuracy: 0.7106 - val_loss: 1.1964 - val_
accuracy: 0.5654
Epoch 391/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1835 - accuracy: 0.7153 - val_loss: 1.2918 - val_
accuracy: 0.5654
Epoch 392/1000
4/4 [=====] - 0s 17ms/step - loss: 0.2732 - accuracy: 0.7060 - val_loss: 1.3347 - val_
accuracy: 0.5701
Epoch 393/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1494 - accuracy: 0.6921 - val_loss: 1.3378 - val_
accuracy: 0.5701
Epoch 394/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1317 - accuracy: 0.6713 - val_loss: 1.3328 - val_
accuracy: 0.5654
Epoch 395/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1364 - accuracy: 0.7037 - val_loss: 1.3075 - val_
accuracy: 0.5514
Epoch 396/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1331 - accuracy: 0.6458 - val_loss: 1.3351 - val_
accuracy: 0.5607
Epoch 397/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1727 - accuracy: 0.6574 - val_loss: 1.3232 - val_
accuracy: 0.5748
Epoch 398/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1226 - accuracy: 0.6667 - val_loss: 1.2569 - val_
accuracy: 0.5794
Epoch 399/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1362 - accuracy: 0.7060 - val_loss: 1.3836 - val_
accuracy: 0.6215
Epoch 400/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1688 - accuracy: 0.7292 - val_loss: 1.4167 - val_
accuracy: 0.6168
Epoch 401/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1182 - accuracy: 0.7315 - val_loss: 1.5040 - val_
accuracy: 0.6121
Epoch 402/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1307 - accuracy: 0.7292 - val_loss: 1.4137 - val_
accuracy: 0.6168
Epoch 403/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1579 - accuracy: 0.7338 - val_loss: 1.4934 - val_
accuracy: 0.6121
Epoch 404/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2387 - accuracy: 0.7338 - val_loss: 1.5126 - val_
accuracy: 0.6308
Epoch 405/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2287 - accuracy: 0.7106 - val_loss: 1.4682 - val_
accuracy: 0.6121
Epoch 406/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1821 - accuracy: 0.7569 - val_loss: 1.4797 - val_
accuracy: 0.6121
Epoch 407/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3335 - accuracy: 0.7569 - val_loss: 1.4514 - val_
accuracy: 0.6308
Epoch 408/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1717 - accuracy: 0.7593 - val_loss: 1.4911 - val_
accuracy: 0.6262
Epoch 409/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1763 - accuracy: 0.7361 - val_loss: 1.3603 - val_
accuracy: 0.5794
Epoch 410/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2464 - accuracy: 0.7431 - val_loss: 1.3833 - val_
accuracy: 0.5935
Epoch 411/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3385 - accuracy: 0.7153 - val_loss: 1.2731 - val_
accuracy: 0.6121
Epoch 412/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2024 - accuracy: 0.7315 - val_loss: 1.3130 - val_
accuracy: 0.6121
Epoch 413/1000
```

```
4/4 [=====] - 0s 13ms/step - loss: 0.2232 - accuracy: 0.7269 - val_loss: 1.3095 - val_accuracy: 0.6168
Epoch 414/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1423 - accuracy: 0.7106 - val_loss: 1.2628 - val_accuracy: 0.6121
Epoch 415/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1693 - accuracy: 0.7338 - val_loss: 1.5307 - val_accuracy: 0.6121
Epoch 416/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1774 - accuracy: 0.7153 - val_loss: 1.5870 - val_accuracy: 0.6028
Epoch 417/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1965 - accuracy: 0.6991 - val_loss: 1.5269 - val_accuracy: 0.5607
Epoch 418/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1362 - accuracy: 0.7014 - val_loss: 1.5480 - val_accuracy: 0.5748
Epoch 419/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2053 - accuracy: 0.7014 - val_loss: 1.5450 - val_accuracy: 0.6121
Epoch 420/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1768 - accuracy: 0.6968 - val_loss: 1.4598 - val_accuracy: 0.6075
Epoch 421/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1708 - accuracy: 0.7083 - val_loss: 1.4815 - val_accuracy: 0.5981
Epoch 422/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1763 - accuracy: 0.6898 - val_loss: 1.3313 - val_accuracy: 0.6121
Epoch 423/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2188 - accuracy: 0.7222 - val_loss: 1.4850 - val_accuracy: 0.6168
Epoch 424/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1782 - accuracy: 0.7292 - val_loss: 1.4350 - val_accuracy: 0.6355
Epoch 425/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2271 - accuracy: 0.7245 - val_loss: 1.7009 - val_accuracy: 0.6168
Epoch 426/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2100 - accuracy: 0.7222 - val_loss: 1.5712 - val_accuracy: 0.6215
Epoch 427/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1748 - accuracy: 0.7292 - val_loss: 1.5974 - val_accuracy: 0.6028
Epoch 428/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2755 - accuracy: 0.7222 - val_loss: 1.4261 - val_accuracy: 0.6168
Epoch 429/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2075 - accuracy: 0.7662 - val_loss: 1.4542 - val_accuracy: 0.6495
Epoch 430/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1240 - accuracy: 0.7963 - val_loss: 1.4716 - val_accuracy: 0.6355
Epoch 431/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1983 - accuracy: 0.7662 - val_loss: 1.5406 - val_accuracy: 0.6449
Epoch 432/1000
4/4 [=====] - 0s 15ms/step - loss: 0.2191 - accuracy: 0.7917 - val_loss: 1.4201 - val_accuracy: 0.6636
Epoch 433/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1546 - accuracy: 0.7870 - val_loss: 1.4228 - val_accuracy: 0.6682
Epoch 434/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1724 - accuracy: 0.7894 - val_loss: 1.4700 - val_accuracy: 0.6636
Epoch 435/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1677 - accuracy: 0.8125 - val_loss: 1.4613 - val_accuracy: 0.6776
Epoch 436/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2018 - accuracy: 0.7940 - val_loss: 1.4075 - val_accuracy: 0.6822
Epoch 437/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2335 - accuracy: 0.7963 - val_loss: 1.4658 - val_accuracy: 0.6449
Epoch 438/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1845 - accuracy: 0.7500 - val_loss: 1.4049 - val_accuracy: 0.6636
Epoch 439/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1627 - accuracy: 0.7824 - val_loss: 1.2940 - val_accuracy: 0.6589
Epoch 440/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1332 - accuracy: 0.7801 - val_loss: 1.3126 - val_accuracy: 0.6589
Epoch 441/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2150 - accuracy: 0.7778 - val_loss: 1.4128 - val_accuracy: 0.6542
Epoch 442/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1944 - accuracy: 0.7616 - val_loss: 1.3037 - val_accuracy: 0.6495
```

Epoch 443/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2009 - accuracy: 0.7639 - val_loss: 1.3290 - val_accuracy: 0.6402
Epoch 444/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2097 - accuracy: 0.7523 - val_loss: 1.4001 - val_accuracy: 0.6495
Epoch 445/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1879 - accuracy: 0.7847 - val_loss: 1.3112 - val_accuracy: 0.6682
Epoch 446/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1525 - accuracy: 0.8009 - val_loss: 1.4105 - val_accuracy: 0.6589
Epoch 447/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2017 - accuracy: 0.7917 - val_loss: 1.3043 - val_accuracy: 0.6869
Epoch 448/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2894 - accuracy: 0.8125 - val_loss: 1.2958 - val_accuracy: 0.6916
Epoch 449/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2051 - accuracy: 0.8380 - val_loss: 1.3741 - val_accuracy: 0.6682
Epoch 450/1000
4/4 [=====] - 0s 20ms/step - loss: 0.2508 - accuracy: 0.7986 - val_loss: 1.3251 - val_accuracy: 0.6729
Epoch 451/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1535 - accuracy: 0.8148 - val_loss: 1.4075 - val_accuracy: 0.6682
Epoch 452/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2396 - accuracy: 0.7986 - val_loss: 1.4105 - val_accuracy: 0.6402
Epoch 453/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2032 - accuracy: 0.8056 - val_loss: 1.5069 - val_accuracy: 0.6869
Epoch 454/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2236 - accuracy: 0.8125 - val_loss: 1.3712 - val_accuracy: 0.6869
Epoch 455/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1963 - accuracy: 0.8148 - val_loss: 1.5108 - val_accuracy: 0.6916
Epoch 456/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1780 - accuracy: 0.8218 - val_loss: 1.5586 - val_accuracy: 0.6869
Epoch 457/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1702 - accuracy: 0.8171 - val_loss: 1.5320 - val_accuracy: 0.6589
Epoch 458/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1454 - accuracy: 0.7917 - val_loss: 1.4725 - val_accuracy: 0.6776
Epoch 459/1000
4/4 [=====] - 0s 17ms/step - loss: 0.1800 - accuracy: 0.8218 - val_loss: 1.5534 - val_accuracy: 0.7056
Epoch 460/1000
4/4 [=====] - 0s 17ms/step - loss: 0.1703 - accuracy: 0.8310 - val_loss: 1.5846 - val_accuracy: 0.7103
Epoch 461/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1606 - accuracy: 0.8796 - val_loss: 1.5401 - val_accuracy: 0.7103
Epoch 462/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1510 - accuracy: 0.8565 - val_loss: 1.5359 - val_accuracy: 0.7009
Epoch 463/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1591 - accuracy: 0.8333 - val_loss: 1.6311 - val_accuracy: 0.7009
Epoch 464/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2531 - accuracy: 0.8472 - val_loss: 1.5556 - val_accuracy: 0.6729
Epoch 465/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1349 - accuracy: 0.8102 - val_loss: 1.5047 - val_accuracy: 0.6916
Epoch 466/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1593 - accuracy: 0.8079 - val_loss: 1.5380 - val_accuracy: 0.6402
Epoch 467/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1457 - accuracy: 0.7755 - val_loss: 1.5822 - val_accuracy: 0.6308
Epoch 468/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1154 - accuracy: 0.7685 - val_loss: 1.5680 - val_accuracy: 0.6262
Epoch 469/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1689 - accuracy: 0.7500 - val_loss: 1.5421 - val_accuracy: 0.6262
Epoch 470/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1789 - accuracy: 0.7708 - val_loss: 1.4907 - val_accuracy: 0.6262
Epoch 471/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2198 - accuracy: 0.7685 - val_loss: 1.4696 - val_accuracy: 0.6168
Epoch 472/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1505 - accuracy: 0.7824 - val_loss: 1.6222 - val_accuracy: 0.6222

```
accuracy: 0.6215
Epoch 473/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1312 - accuracy: 0.7847 - val_loss: 1.6018 - val_
accuracy: 0.6215
Epoch 474/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1815 - accuracy: 0.7361 - val_loss: 1.6011 - val_
accuracy: 0.6075
Epoch 475/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1596 - accuracy: 0.7616 - val_loss: 1.4936 - val_
accuracy: 0.6168
Epoch 476/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1436 - accuracy: 0.7454 - val_loss: 1.6604 - val_
accuracy: 0.6075
Epoch 477/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2337 - accuracy: 0.7384 - val_loss: 1.6915 - val_
accuracy: 0.6121
Epoch 478/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1226 - accuracy: 0.7384 - val_loss: 1.6272 - val_
accuracy: 0.6262
Epoch 479/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2662 - accuracy: 0.7546 - val_loss: 1.6614 - val_
accuracy: 0.6121
Epoch 480/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1868 - accuracy: 0.7315 - val_loss: 1.6501 - val_
accuracy: 0.5981
Epoch 481/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1143 - accuracy: 0.7292 - val_loss: 1.6261 - val_
accuracy: 0.5935
Epoch 482/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2037 - accuracy: 0.7338 - val_loss: 1.6191 - val_
accuracy: 0.5794
Epoch 483/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2083 - accuracy: 0.7153 - val_loss: 1.6240 - val_
accuracy: 0.5888
Epoch 484/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1325 - accuracy: 0.7176 - val_loss: 1.6254 - val_
accuracy: 0.5935
Epoch 485/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1559 - accuracy: 0.7245 - val_loss: 1.7174 - val_
accuracy: 0.5841
Epoch 486/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2416 - accuracy: 0.7060 - val_loss: 1.5981 - val_
accuracy: 0.5888
Epoch 487/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2070 - accuracy: 0.7199 - val_loss: 1.7744 - val_
accuracy: 0.6028
Epoch 488/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1566 - accuracy: 0.7731 - val_loss: 1.7377 - val_
accuracy: 0.6075
Epoch 489/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3129 - accuracy: 0.7292 - val_loss: 1.8348 - val_
accuracy: 0.6028
Epoch 490/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2745 - accuracy: 0.7338 - val_loss: 1.8565 - val_
accuracy: 0.6075
Epoch 491/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2246 - accuracy: 0.7523 - val_loss: 1.7774 - val_
accuracy: 0.5981
Epoch 492/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1626 - accuracy: 0.7361 - val_loss: 1.8249 - val_
accuracy: 0.5888
Epoch 493/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2989 - accuracy: 0.7523 - val_loss: 1.8207 - val_
accuracy: 0.6028
Epoch 494/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1261 - accuracy: 0.7824 - val_loss: 1.8059 - val_
accuracy: 0.5935
Epoch 495/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1868 - accuracy: 0.7662 - val_loss: 1.7912 - val_
accuracy: 0.6028
Epoch 496/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2060 - accuracy: 0.7824 - val_loss: 1.8084 - val_
accuracy: 0.5935
Epoch 497/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1583 - accuracy: 0.7569 - val_loss: 1.8090 - val_
accuracy: 0.5981
Epoch 498/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1741 - accuracy: 0.7546 - val_loss: 1.6626 - val_
accuracy: 0.6168
Epoch 499/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1958 - accuracy: 0.7662 - val_loss: 1.6351 - val_
accuracy: 0.6215
Epoch 500/1000
4/4 [=====] - 0s 14ms/step - loss: 0.2197 - accuracy: 0.7569 - val_loss: 1.6705 - val_
accuracy: 0.6355
Epoch 501/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1660 - accuracy: 0.7847 - val_loss: 1.7517 - val_
accuracy: 0.6215
Epoch 502/1000
```

```
4/4 [=====] - 0s 14ms/step - loss: 0.1531 - accuracy: 0.7546 - val_loss: 1.6927 - val_accuracy: 0.6121
Epoch 503/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1708 - accuracy: 0.7639 - val_loss: 1.8322 - val_accuracy: 0.6215
Epoch 504/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1410 - accuracy: 0.7546 - val_loss: 1.8980 - val_accuracy: 0.6028
Epoch 505/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1292 - accuracy: 0.7315 - val_loss: 1.8141 - val_accuracy: 0.5981
Epoch 506/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1154 - accuracy: 0.7176 - val_loss: 1.7077 - val_accuracy: 0.6168
Epoch 507/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0990 - accuracy: 0.7431 - val_loss: 1.6251 - val_accuracy: 0.6075
Epoch 508/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1200 - accuracy: 0.7245 - val_loss: 1.6363 - val_accuracy: 0.6121
Epoch 509/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1228 - accuracy: 0.7569 - val_loss: 1.6820 - val_accuracy: 0.6121
Epoch 510/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1502 - accuracy: 0.7338 - val_loss: 1.7198 - val_accuracy: 0.6075
Epoch 511/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1553 - accuracy: 0.7153 - val_loss: 1.6696 - val_accuracy: 0.6262
Epoch 512/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1266 - accuracy: 0.7523 - val_loss: 1.6778 - val_accuracy: 0.6308
Epoch 513/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2684 - accuracy: 0.7454 - val_loss: 1.7505 - val_accuracy: 0.6168
Epoch 514/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2490 - accuracy: 0.7361 - val_loss: 1.7106 - val_accuracy: 0.6168
Epoch 515/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2638 - accuracy: 0.7199 - val_loss: 1.7458 - val_accuracy: 0.6121
Epoch 516/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3116 - accuracy: 0.7546 - val_loss: 1.6981 - val_accuracy: 0.6075
Epoch 517/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1902 - accuracy: 0.7662 - val_loss: 1.6906 - val_accuracy: 0.6168
Epoch 518/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1572 - accuracy: 0.7361 - val_loss: 1.5979 - val_accuracy: 0.5981
Epoch 519/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1340 - accuracy: 0.7130 - val_loss: 1.5726 - val_accuracy: 0.5935
Epoch 520/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2079 - accuracy: 0.7176 - val_loss: 1.5713 - val_accuracy: 0.5935
Epoch 521/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1549 - accuracy: 0.7130 - val_loss: 1.6236 - val_accuracy: 0.6028
Epoch 522/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1312 - accuracy: 0.7153 - val_loss: 1.6543 - val_accuracy: 0.6028
Epoch 523/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2240 - accuracy: 0.7338 - val_loss: 1.6265 - val_accuracy: 0.5981
Epoch 524/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1129 - accuracy: 0.7176 - val_loss: 1.7084 - val_accuracy: 0.5935
Epoch 525/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2748 - accuracy: 0.7106 - val_loss: 1.6576 - val_accuracy: 0.6121
Epoch 526/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1464 - accuracy: 0.7338 - val_loss: 1.6019 - val_accuracy: 0.6121
Epoch 527/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2447 - accuracy: 0.7338 - val_loss: 1.6348 - val_accuracy: 0.6168
Epoch 528/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1525 - accuracy: 0.7176 - val_loss: 1.6988 - val_accuracy: 0.6075
Epoch 529/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1649 - accuracy: 0.7431 - val_loss: 1.5682 - val_accuracy: 0.6121
Epoch 530/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1443 - accuracy: 0.7593 - val_loss: 1.6276 - val_accuracy: 0.6121
Epoch 531/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1487 - accuracy: 0.7292 - val_loss: 1.6390 - val_accuracy: 0.6075
```

Epoch 532/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1152 - accuracy: 0.7384 - val_loss: 1.6509 - val_accuracy: 0.6168
Epoch 533/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1691 - accuracy: 0.7569 - val_loss: 1.8475 - val_accuracy: 0.5935
Epoch 534/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1814 - accuracy: 0.7361 - val_loss: 1.6542 - val_accuracy: 0.6121
Epoch 535/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1577 - accuracy: 0.7338 - val_loss: 1.6649 - val_accuracy: 0.6168
Epoch 536/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1050 - accuracy: 0.7431 - val_loss: 1.6921 - val_accuracy: 0.6028
Epoch 537/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1828 - accuracy: 0.7431 - val_loss: 1.7021 - val_accuracy: 0.5841
Epoch 538/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1841 - accuracy: 0.7431 - val_loss: 1.8223 - val_accuracy: 0.5935
Epoch 539/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1080 - accuracy: 0.7569 - val_loss: 1.8232 - val_accuracy: 0.5794
Epoch 540/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1880 - accuracy: 0.7500 - val_loss: 1.8281 - val_accuracy: 0.5794
Epoch 541/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2635 - accuracy: 0.7500 - val_loss: 1.5717 - val_accuracy: 0.5701
Epoch 542/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1419 - accuracy: 0.7361 - val_loss: 1.5395 - val_accuracy: 0.5654
Epoch 543/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1263 - accuracy: 0.7106 - val_loss: 1.6254 - val_accuracy: 0.5981
Epoch 544/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2034 - accuracy: 0.7546 - val_loss: 1.6191 - val_accuracy: 0.5935
Epoch 545/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1114 - accuracy: 0.7292 - val_loss: 1.7156 - val_accuracy: 0.5935
Epoch 546/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1141 - accuracy: 0.7384 - val_loss: 1.7142 - val_accuracy: 0.5607
Epoch 547/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1486 - accuracy: 0.7523 - val_loss: 1.6001 - val_accuracy: 0.5654
Epoch 548/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1471 - accuracy: 0.7269 - val_loss: 1.7616 - val_accuracy: 0.5748
Epoch 549/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1009 - accuracy: 0.7222 - val_loss: 1.5327 - val_accuracy: 0.5748
Epoch 550/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2220 - accuracy: 0.7431 - val_loss: 1.6451 - val_accuracy: 0.5888
Epoch 551/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1174 - accuracy: 0.7315 - val_loss: 1.8180 - val_accuracy: 0.5748
Epoch 552/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1420 - accuracy: 0.7384 - val_loss: 1.7553 - val_accuracy: 0.5841
Epoch 553/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1566 - accuracy: 0.7361 - val_loss: 1.6647 - val_accuracy: 0.6028
Epoch 554/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1562 - accuracy: 0.7431 - val_loss: 1.8369 - val_accuracy: 0.5981
Epoch 555/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1152 - accuracy: 0.7338 - val_loss: 1.8497 - val_accuracy: 0.5981
Epoch 556/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2119 - accuracy: 0.7523 - val_loss: 1.8240 - val_accuracy: 0.6262
Epoch 557/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2352 - accuracy: 0.7477 - val_loss: 1.8497 - val_accuracy: 0.5981
Epoch 558/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2607 - accuracy: 0.7477 - val_loss: 1.9044 - val_accuracy: 0.6262
Epoch 559/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2226 - accuracy: 0.7384 - val_loss: 1.8463 - val_accuracy: 0.6168
Epoch 560/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1736 - accuracy: 0.7338 - val_loss: 1.8616 - val_accuracy: 0.6028
Epoch 561/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1362 - accuracy: 0.7546 - val_loss: 1.8046 - val_accuracy: 0.6168

```
accuracy: 0.6121
Epoch 562/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2244 - accuracy: 0.7477 - val_loss: 1.7850 - val_
accuracy: 0.6355
Epoch 563/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2069 - accuracy: 0.7546 - val_loss: 1.6277 - val_
accuracy: 0.6449
Epoch 564/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1478 - accuracy: 0.7755 - val_loss: 1.6015 - val_
accuracy: 0.6355
Epoch 565/1000
4/4 [=====] - 0s 16ms/step - loss: 0.1597 - accuracy: 0.7593 - val_loss: 1.5704 - val_
accuracy: 0.6402
Epoch 566/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2599 - accuracy: 0.7477 - val_loss: 1.6778 - val_
accuracy: 0.6121
Epoch 567/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2219 - accuracy: 0.7315 - val_loss: 1.7379 - val_
accuracy: 0.6028
Epoch 568/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1494 - accuracy: 0.7454 - val_loss: 1.7753 - val_
accuracy: 0.6028
Epoch 569/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1029 - accuracy: 0.7431 - val_loss: 1.7886 - val_
accuracy: 0.5935
Epoch 570/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1103 - accuracy: 0.7245 - val_loss: 1.7863 - val_
accuracy: 0.5888
Epoch 571/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2177 - accuracy: 0.6944 - val_loss: 1.7993 - val_
accuracy: 0.5794
Epoch 572/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1867 - accuracy: 0.7269 - val_loss: 1.7865 - val_
accuracy: 0.5888
Epoch 573/1000
4/4 [=====] - 0s 12ms/step - loss: 0.0951 - accuracy: 0.7292 - val_loss: 1.8049 - val_
accuracy: 0.5841
Epoch 574/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2534 - accuracy: 0.7292 - val_loss: 1.9500 - val_
accuracy: 0.6075
Epoch 575/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1424 - accuracy: 0.7315 - val_loss: 1.8417 - val_
accuracy: 0.6028
Epoch 576/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0908 - accuracy: 0.7569 - val_loss: 1.8430 - val_
accuracy: 0.5935
Epoch 577/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1255 - accuracy: 0.7106 - val_loss: 1.8946 - val_
accuracy: 0.6028
Epoch 578/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1430 - accuracy: 0.7222 - val_loss: 1.8611 - val_
accuracy: 0.6168
Epoch 579/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1417 - accuracy: 0.7361 - val_loss: 1.8553 - val_
accuracy: 0.6262
Epoch 580/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1422 - accuracy: 0.7176 - val_loss: 1.8099 - val_
accuracy: 0.6215
Epoch 581/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1020 - accuracy: 0.7315 - val_loss: 1.7678 - val_
accuracy: 0.6075
Epoch 582/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2148 - accuracy: 0.7245 - val_loss: 1.7703 - val_
accuracy: 0.6121
Epoch 583/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1662 - accuracy: 0.7546 - val_loss: 1.7511 - val_
accuracy: 0.6028
Epoch 584/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1545 - accuracy: 0.7315 - val_loss: 1.7528 - val_
accuracy: 0.6075
Epoch 585/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2520 - accuracy: 0.7338 - val_loss: 1.8101 - val_
accuracy: 0.6075
Epoch 586/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1386 - accuracy: 0.7477 - val_loss: 1.7361 - val_
accuracy: 0.6075
Epoch 587/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2549 - accuracy: 0.7338 - val_loss: 1.9429 - val_
accuracy: 0.6121
Epoch 588/1000
4/4 [=====] - 0s 11ms/step - loss: 0.1409 - accuracy: 0.7338 - val_loss: 1.8127 - val_
accuracy: 0.6075
Epoch 589/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2420 - accuracy: 0.7454 - val_loss: 1.7577 - val_
accuracy: 0.6075
Epoch 590/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2349 - accuracy: 0.7616 - val_loss: 1.8561 - val_
accuracy: 0.6075
Epoch 591/1000
```

```

4/4 [=====] - 0s 12ms/step - loss: 0.1063 - accuracy: 0.7361 - val_loss: 1.8294 - val_accuracy: 0.6075
Epoch 592/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1693 - accuracy: 0.7245 - val_loss: 1.6628 - val_accuracy: 0.6121
Epoch 593/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1627 - accuracy: 0.7407 - val_loss: 1.6835 - val_accuracy: 0.5981
Epoch 594/1000
4/4 [=====] - 0s 13ms/step - loss: 0.1488 - accuracy: 0.7616 - val_loss: 1.5896 - val_accuracy: 0.6262
Epoch 595/1000
4/4 [=====] - 0s 13ms/step - loss: 0.0983 - accuracy: 0.7593 - val_loss: 1.5938 - val_accuracy: 0.6121
Epoch 596/1000
4/4 [=====] - 0s 17ms/step - loss: 0.2302 - accuracy: 0.7639 - val_loss: 1.5641 - val_accuracy: 0.6028
Epoch 597/1000
4/4 [=====] - 0s 17ms/step - loss: 0.2190 - accuracy: 0.8241 - val_loss: 1.4919 - val_accuracy: 0.6402
Epoch 598/1000
4/4 [=====] - 0s 14ms/step - loss: 0.1715 - accuracy: 0.8264 - val_loss: 1.5362 - val_accuracy: 0.6308
Epoch 599/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2055 - accuracy: 0.8171 - val_loss: 1.5757 - val_accuracy: 0.6121
Epoch 600/1000
4/4 [=====] - 0s 15ms/step - loss: 0.1978 - accuracy: 0.8079 - val_loss: 1.5727 - val_accuracy: 0.6589
Epoch 601/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1330 - accuracy: 0.7986 - val_loss: 1.5514 - val_accuracy: 0.6449
Epoch 602/1000
4/4 [=====] - 0s 12ms/step - loss: 0.0885 - accuracy: 0.8056 - val_loss: 1.5409 - val_accuracy: 0.6589
Epoch 603/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1087 - accuracy: 0.7870 - val_loss: 1.4863 - val_accuracy: 0.6776
Epoch 604/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2184 - accuracy: 0.8264 - val_loss: 1.5808 - val_accuracy: 0.6449
Epoch 605/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1568 - accuracy: 0.8125 - val_loss: 1.6448 - val_accuracy: 0.6495
Epoch 606/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1659 - accuracy: 0.8079 - val_loss: 1.6573 - val_accuracy: 0.6682
Epoch 607/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1603 - accuracy: 0.8125 - val_loss: 1.7731 - val_accuracy: 0.6542
Epoch 608/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1803 - accuracy: 0.8125 - val_loss: 1.6945 - val_accuracy: 0.6682
Epoch 609/1000
4/4 [=====] - 0s 12ms/step - loss: 0.1060 - accuracy: 0.8333 - val_loss: 1.6181 - val_accuracy: 0.6636
Epoch 610/1000
1/4 [====>.....] - ETA: 0s - loss: 0.1913 - accuracy: 0.7891Restoring model weights from the end of the best epoch: 460.
4/4 [=====] - 0s 15ms/step - loss: 0.1324 - accuracy: 0.8218 - val_loss: 1.6866 - val_accuracy: 0.6355
Epoch 610: early stopping
7/7 [=====] - 0s 2ms/step - loss: 1.5635 - accuracy: 0.7103
Model: "sequential_109"

```

Layer (type)	Output Shape	Param #
dense_436 (Dense)	(None, 50)	350
batch_normalization_327 (BatchNormalization)	(None, 50)	200
activation_327 (Activation)	(None, 50)	0
dense_437 (Dense)	(None, 50)	2550
batch_normalization_328 (BatchNormalization)	(None, 50)	200
activation_328 (Activation)	(None, 50)	0
dense_438 (Dense)	(None, 10)	510
batch_normalization_329 (BatchNormalization)	(None, 10)	40
activation_329 (Activation)	(None, 10)	0
dense_439 (Dense)	(None, 2)	22

```
=====
Total params: 3,872
Trainable params: 3,652
Non-trainable params: 220
```

```
Epoch 1/1000
4/4 [=====] - 1s 58ms/step - loss: 5.2868 - accuracy: 0.4769 - val_loss: 7.4515 - val_accuracy: 0.4393
Epoch 2/1000
4/4 [=====] - 0s 13ms/step - loss: 4.4492 - accuracy: 0.4954 - val_loss: 6.2331 - val_accuracy: 0.4860
Epoch 3/1000
4/4 [=====] - 0s 14ms/step - loss: 4.3474 - accuracy: 0.5023 - val_loss: 5.2934 - val_accuracy: 0.4907
Epoch 4/1000
4/4 [=====] - 0s 13ms/step - loss: 4.2107 - accuracy: 0.5278 - val_loss: 4.4210 - val_accuracy: 0.4907
Epoch 5/1000
4/4 [=====] - 0s 13ms/step - loss: 4.2164 - accuracy: 0.5231 - val_loss: 3.7778 - val_accuracy: 0.4860
Epoch 6/1000
4/4 [=====] - 0s 14ms/step - loss: 4.1549 - accuracy: 0.5185 - val_loss: 3.3877 - val_accuracy: 0.4953
Epoch 7/1000
4/4 [=====] - 0s 13ms/step - loss: 3.9609 - accuracy: 0.5440 - val_loss: 3.0360 - val_accuracy: 0.4813
Epoch 8/1000
4/4 [=====] - 0s 13ms/step - loss: 4.0653 - accuracy: 0.5463 - val_loss: 2.8293 - val_accuracy: 0.4860
Epoch 9/1000
4/4 [=====] - 0s 12ms/step - loss: 3.9109 - accuracy: 0.5185 - val_loss: 2.7023 - val_accuracy: 0.5234
Epoch 10/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8819 - accuracy: 0.5694 - val_loss: 2.6495 - val_accuracy: 0.5234
Epoch 11/1000
4/4 [=====] - 0s 11ms/step - loss: 3.8483 - accuracy: 0.5486 - val_loss: 2.4871 - val_accuracy: 0.5140
Epoch 12/1000
4/4 [=====] - 0s 12ms/step - loss: 3.8552 - accuracy: 0.5625 - val_loss: 2.3947 - val_accuracy: 0.5467
Epoch 13/1000
4/4 [=====] - 0s 12ms/step - loss: 3.7264 - accuracy: 0.5602 - val_loss: 2.3543 - val_accuracy: 0.5421
Epoch 14/1000
4/4 [=====] - 0s 11ms/step - loss: 3.7271 - accuracy: 0.5509 - val_loss: 2.3287 - val_accuracy: 0.5421
Epoch 15/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5974 - accuracy: 0.5810 - val_loss: 2.3065 - val_accuracy: 0.5514
Epoch 16/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5847 - accuracy: 0.5556 - val_loss: 2.2682 - val_accuracy: 0.5701
Epoch 17/1000
4/4 [=====] - 0s 12ms/step - loss: 3.6207 - accuracy: 0.5486 - val_loss: 2.2408 - val_accuracy: 0.5888
Epoch 18/1000
4/4 [=====] - 0s 12ms/step - loss: 3.5222 - accuracy: 0.5440 - val_loss: 2.1940 - val_accuracy: 0.5888
Epoch 19/1000
4/4 [=====] - 0s 12ms/step - loss: 3.4542 - accuracy: 0.5718 - val_loss: 2.1656 - val_accuracy: 0.5888
Epoch 20/1000
4/4 [=====] - 0s 13ms/step - loss: 3.4286 - accuracy: 0.5486 - val_loss: 2.1459 - val_accuracy: 0.5935
Epoch 21/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3458 - accuracy: 0.5579 - val_loss: 2.1245 - val_accuracy: 0.5981
Epoch 22/1000
4/4 [=====] - 0s 12ms/step - loss: 3.3483 - accuracy: 0.5625 - val_loss: 2.1059 - val_accuracy: 0.5981
Epoch 23/1000
4/4 [=====] - 0s 12ms/step - loss: 3.4016 - accuracy: 0.5602 - val_loss: 2.0895 - val_accuracy: 0.5888
Epoch 24/1000
4/4 [=====] - 0s 12ms/step - loss: 3.1977 - accuracy: 0.5532 - val_loss: 2.0448 - val_accuracy: 0.5888
Epoch 25/1000
4/4 [=====] - 0s 12ms/step - loss: 3.2099 - accuracy: 0.5532 - val_loss: 2.0316 - val_accuracy: 0.5841
Epoch 26/1000
4/4 [=====] - 0s 12ms/step - loss: 3.1776 - accuracy: 0.5440 - val_loss: 2.0420 - val_accuracy: 0.5841
Epoch 27/1000
4/4 [=====] - 0s 12ms/step - loss: 3.1474 - accuracy: 0.5347 - val_loss: 2.0313 - val_accuracy: 0.5794
Epoch 28/1000
4/4 [=====] - 0s 12ms/step - loss: 3.0443 - accuracy: 0.5486 - val_loss: 2.0233 - val_accuracy: 0.5841
```

```
accuracy: 0.5841
Epoch 29/1000
4/4 [=====] - 0s 13ms/step - loss: 3.0251 - accuracy: 0.5579 - val_loss: 1.9928 - val_accuracy: 0.5794
Epoch 30/1000
4/4 [=====] - 0s 13ms/step - loss: 2.8993 - accuracy: 0.5463 - val_loss: 1.9853 - val_accuracy: 0.5794
Epoch 31/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8767 - accuracy: 0.5463 - val_loss: 1.9935 - val_accuracy: 0.5794
Epoch 32/1000
4/4 [=====] - 0s 12ms/step - loss: 2.8613 - accuracy: 0.5532 - val_loss: 1.9598 - val_accuracy: 0.5794
Epoch 33/1000
4/4 [=====] - 0s 12ms/step - loss: 2.7517 - accuracy: 0.5602 - val_loss: 1.9650 - val_accuracy: 0.6028
Epoch 34/1000
4/4 [=====] - 0s 11ms/step - loss: 2.3596 - accuracy: 0.5810 - val_loss: 1.9751 - val_accuracy: 0.6028
Epoch 35/1000
4/4 [=====] - 0s 12ms/step - loss: 2.4149 - accuracy: 0.5810 - val_loss: 1.9356 - val_accuracy: 0.6168
Epoch 36/1000
4/4 [=====] - 0s 11ms/step - loss: 2.4429 - accuracy: 0.5787 - val_loss: 1.8989 - val_accuracy: 0.6168
Epoch 37/1000
4/4 [=====] - 0s 12ms/step - loss: 2.3414 - accuracy: 0.5764 - val_loss: 1.8449 - val_accuracy: 0.6215
Epoch 38/1000
4/4 [=====] - 0s 11ms/step - loss: 2.2087 - accuracy: 0.6157 - val_loss: 1.8289 - val_accuracy: 0.6168
Epoch 39/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1729 - accuracy: 0.5810 - val_loss: 1.8133 - val_accuracy: 0.6262
Epoch 40/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1714 - accuracy: 0.5903 - val_loss: 1.7956 - val_accuracy: 0.6215
Epoch 41/1000
4/4 [=====] - 0s 13ms/step - loss: 2.2337 - accuracy: 0.5810 - val_loss: 1.8035 - val_accuracy: 0.6308
Epoch 42/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1926 - accuracy: 0.5972 - val_loss: 1.7432 - val_accuracy: 0.6262
Epoch 43/1000
4/4 [=====] - 0s 12ms/step - loss: 2.1702 - accuracy: 0.6042 - val_loss: 1.7582 - val_accuracy: 0.6262
Epoch 44/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0193 - accuracy: 0.6204 - val_loss: 1.7401 - val_accuracy: 0.6262
Epoch 45/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0729 - accuracy: 0.5949 - val_loss: 1.7324 - val_accuracy: 0.6215
Epoch 46/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9971 - accuracy: 0.6250 - val_loss: 1.6905 - val_accuracy: 0.6308
Epoch 47/1000
4/4 [=====] - 0s 12ms/step - loss: 1.9273 - accuracy: 0.6065 - val_loss: 1.6834 - val_accuracy: 0.6262
Epoch 48/1000
4/4 [=====] - 0s 12ms/step - loss: 2.0308 - accuracy: 0.6273 - val_loss: 1.6610 - val_accuracy: 0.6262
Epoch 49/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7941 - accuracy: 0.6574 - val_loss: 1.6596 - val_accuracy: 0.6308
Epoch 50/1000
4/4 [=====] - 0s 13ms/step - loss: 1.7971 - accuracy: 0.6505 - val_loss: 1.7247 - val_accuracy: 0.6308
Epoch 51/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8359 - accuracy: 0.6343 - val_loss: 1.6888 - val_accuracy: 0.6308
Epoch 52/1000
4/4 [=====] - 0s 13ms/step - loss: 1.8532 - accuracy: 0.6273 - val_loss: 1.6687 - val_accuracy: 0.6308
Epoch 53/1000
4/4 [=====] - 0s 12ms/step - loss: 1.8084 - accuracy: 0.6343 - val_loss: 1.6482 - val_accuracy: 0.6262
Epoch 54/1000
4/4 [=====] - 0s 11ms/step - loss: 1.8142 - accuracy: 0.6296 - val_loss: 1.6328 - val_accuracy: 0.6215
Epoch 55/1000
4/4 [=====] - 0s 11ms/step - loss: 1.7709 - accuracy: 0.6319 - val_loss: 1.6442 - val_accuracy: 0.6262
Epoch 56/1000
4/4 [=====] - 0s 12ms/step - loss: 1.7500 - accuracy: 0.6319 - val_loss: 1.6255 - val_accuracy: 0.6262
Epoch 57/1000
4/4 [=====] - 0s 11ms/step - loss: 1.7274 - accuracy: 0.6528 - val_loss: 1.6431 - val_accuracy: 0.6121
Epoch 58/1000
```

```
4/4 [=====] - 0s 11ms/step - loss: 1.6500 - accuracy: 0.6366 - val_loss: 1.6195 - val_accuracy: 0.6168
Epoch 59/1000
4/4 [=====] - 0s 11ms/step - loss: 1.6163 - accuracy: 0.6389 - val_loss: 1.5949 - val_accuracy: 0.6262
Epoch 60/1000
4/4 [=====] - 0s 11ms/step - loss: 1.5544 - accuracy: 0.6505 - val_loss: 1.5500 - val_accuracy: 0.6262
Epoch 61/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5854 - accuracy: 0.6157 - val_loss: 1.5523 - val_accuracy: 0.6308
Epoch 62/1000
4/4 [=====] - 0s 14ms/step - loss: 1.4609 - accuracy: 0.6273 - val_loss: 1.4163 - val_accuracy: 0.6355
Epoch 63/1000
4/4 [=====] - 0s 12ms/step - loss: 1.5347 - accuracy: 0.6088 - val_loss: 1.3861 - val_accuracy: 0.6308
Epoch 64/1000
4/4 [=====] - 0s 12ms/step - loss: 1.4137 - accuracy: 0.6042 - val_loss: 1.3287 - val_accuracy: 0.6262
Epoch 65/1000
4/4 [=====] - 0s 12ms/step - loss: 1.3661 - accuracy: 0.6319 - val_loss: 1.3795 - val_accuracy: 0.6308
Epoch 66/1000
4/4 [=====] - 0s 12ms/step - loss: 1.2711 - accuracy: 0.6412 - val_loss: 1.3604 - val_accuracy: 0.6308
Epoch 67/1000
4/4 [=====] - 0s 13ms/step - loss: 1.2282 - accuracy: 0.6227 - val_loss: 1.3286 - val_accuracy: 0.6495
Epoch 68/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1597 - accuracy: 0.6296 - val_loss: 1.3424 - val_accuracy: 0.6449
Epoch 69/1000
4/4 [=====] - 0s 13ms/step - loss: 1.1659 - accuracy: 0.6366 - val_loss: 1.3462 - val_accuracy: 0.6589
Epoch 70/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0879 - accuracy: 0.6412 - val_loss: 1.2933 - val_accuracy: 0.6589
Epoch 71/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0300 - accuracy: 0.6528 - val_loss: 1.2752 - val_accuracy: 0.6589
Epoch 72/1000
4/4 [=====] - 0s 12ms/step - loss: 0.9678 - accuracy: 0.6389 - val_loss: 1.2624 - val_accuracy: 0.6542
Epoch 73/1000
4/4 [=====] - 0s 12ms/step - loss: 1.0497 - accuracy: 0.6389 - val_loss: 1.2531 - val_accuracy: 0.6495
Epoch 74/1000
4/4 [=====] - 0s 13ms/step - loss: 0.9091 - accuracy: 0.6389 - val_loss: 1.2040 - val_accuracy: 0.6589
Epoch 75/1000
4/4 [=====] - 0s 12ms/step - loss: 0.8895 - accuracy: 0.6088 - val_loss: 1.1411 - val_accuracy: 0.6495
Epoch 76/1000
4/4 [=====] - 0s 12ms/step - loss: 0.7682 - accuracy: 0.5903 - val_loss: 1.0840 - val_accuracy: 0.6449
Epoch 77/1000
4/4 [=====] - 0s 11ms/step - loss: 0.8338 - accuracy: 0.5926 - val_loss: 0.9549 - val_accuracy: 0.6355
Epoch 78/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6879 - accuracy: 0.5972 - val_loss: 1.0471 - val_accuracy: 0.6495
Epoch 79/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6791 - accuracy: 0.6551 - val_loss: 1.0306 - val_accuracy: 0.6355
Epoch 80/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6467 - accuracy: 0.6134 - val_loss: 1.0129 - val_accuracy: 0.6308
Epoch 81/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6466 - accuracy: 0.6481 - val_loss: 0.9855 - val_accuracy: 0.6308
Epoch 82/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6248 - accuracy: 0.5833 - val_loss: 0.7300 - val_accuracy: 0.6402
Epoch 83/1000
4/4 [=====] - 0s 11ms/step - loss: 0.6994 - accuracy: 0.5440 - val_loss: 0.7254 - val_accuracy: 0.6121
Epoch 84/1000
4/4 [=====] - 0s 11ms/step - loss: 0.5615 - accuracy: 0.5741 - val_loss: 0.7912 - val_accuracy: 0.5981
Epoch 85/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5812 - accuracy: 0.6111 - val_loss: 0.7669 - val_accuracy: 0.6215
Epoch 86/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5974 - accuracy: 0.6273 - val_loss: 0.7189 - val_accuracy: 0.6028
Epoch 87/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5903 - accuracy: 0.6065 - val_loss: 0.7020 - val_accuracy: 0.6215
```

Epoch 88/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5635 - accuracy: 0.6042 - val_loss: 0.6876 - val_accuracy: 0.6075
Epoch 89/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5279 - accuracy: 0.5880 - val_loss: 0.7132 - val_accuracy: 0.5748
Epoch 90/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4758 - accuracy: 0.5972 - val_loss: 0.7379 - val_accuracy: 0.5841
Epoch 91/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4944 - accuracy: 0.5810 - val_loss: 0.7472 - val_accuracy: 0.5748
Epoch 92/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4917 - accuracy: 0.5903 - val_loss: 0.7248 - val_accuracy: 0.5748
Epoch 93/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4945 - accuracy: 0.5741 - val_loss: 0.7065 - val_accuracy: 0.5607
Epoch 94/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5489 - accuracy: 0.5625 - val_loss: 0.6746 - val_accuracy: 0.5794
Epoch 95/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5031 - accuracy: 0.5880 - val_loss: 0.6680 - val_accuracy: 0.5841
Epoch 96/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4945 - accuracy: 0.6019 - val_loss: 0.6772 - val_accuracy: 0.5888
Epoch 97/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4467 - accuracy: 0.6065 - val_loss: 0.6659 - val_accuracy: 0.5514
Epoch 98/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4559 - accuracy: 0.5741 - val_loss: 0.6818 - val_accuracy: 0.5327
Epoch 99/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4212 - accuracy: 0.5787 - val_loss: 0.6508 - val_accuracy: 0.5701
Epoch 100/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4347 - accuracy: 0.6111 - val_loss: 0.6443 - val_accuracy: 0.5561
Epoch 101/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4486 - accuracy: 0.5926 - val_loss: 0.6641 - val_accuracy: 0.5748
Epoch 102/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3777 - accuracy: 0.5949 - val_loss: 0.6675 - val_accuracy: 0.5888
Epoch 103/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4050 - accuracy: 0.5949 - val_loss: 0.7079 - val_accuracy: 0.5935
Epoch 104/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4060 - accuracy: 0.5926 - val_loss: 0.7345 - val_accuracy: 0.5935
Epoch 105/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4102 - accuracy: 0.6134 - val_loss: 0.7566 - val_accuracy: 0.5888
Epoch 106/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4100 - accuracy: 0.6019 - val_loss: 0.7967 - val_accuracy: 0.5561
Epoch 107/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4129 - accuracy: 0.5880 - val_loss: 0.7709 - val_accuracy: 0.5794
Epoch 108/1000
4/4 [=====] - 0s 15ms/step - loss: 0.4264 - accuracy: 0.5856 - val_loss: 0.7595 - val_accuracy: 0.5794
Epoch 109/1000
4/4 [=====] - 0s 14ms/step - loss: 0.4333 - accuracy: 0.5648 - val_loss: 0.7179 - val_accuracy: 0.5841
Epoch 110/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3620 - accuracy: 0.5579 - val_loss: 0.7521 - val_accuracy: 0.5981
Epoch 111/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3797 - accuracy: 0.6088 - val_loss: 0.7544 - val_accuracy: 0.6449
Epoch 112/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3728 - accuracy: 0.6343 - val_loss: 0.7685 - val_accuracy: 0.6215
Epoch 113/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3781 - accuracy: 0.6227 - val_loss: 0.7645 - val_accuracy: 0.6075
Epoch 114/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4468 - accuracy: 0.6042 - val_loss: 0.7612 - val_accuracy: 0.5794
Epoch 115/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4338 - accuracy: 0.6111 - val_loss: 0.7978 - val_accuracy: 0.5701
Epoch 116/1000
4/4 [=====] - 0s 16ms/step - loss: 0.4505 - accuracy: 0.6204 - val_loss: 0.7357 - val_accuracy: 0.5841
Epoch 117/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4139 - accuracy: 0.6389 - val_loss: 0.7633 - val_accuracy: 0.5841

```
accuracy: 0.5748
Epoch 118/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4284 - accuracy: 0.5995 - val_loss: 0.7649 - val_accuracy: 0.5888
Epoch 119/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3983 - accuracy: 0.6065 - val_loss: 0.7686 - val_accuracy: 0.5981
Epoch 120/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4755 - accuracy: 0.5995 - val_loss: 0.8055 - val_accuracy: 0.6075
Epoch 121/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3489 - accuracy: 0.6366 - val_loss: 0.8609 - val_accuracy: 0.6402
Epoch 122/1000
4/4 [=====] - 0s 14ms/step - loss: 0.3712 - accuracy: 0.7153 - val_loss: 0.8828 - val_accuracy: 0.6402
Epoch 123/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3463 - accuracy: 0.7199 - val_loss: 0.8781 - val_accuracy: 0.6402
Epoch 124/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3520 - accuracy: 0.7176 - val_loss: 0.8710 - val_accuracy: 0.6449
Epoch 125/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3745 - accuracy: 0.7546 - val_loss: 0.8701 - val_accuracy: 0.6542
Epoch 126/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3435 - accuracy: 0.7361 - val_loss: 0.8474 - val_accuracy: 0.5935
Epoch 127/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3498 - accuracy: 0.6690 - val_loss: 0.8458 - val_accuracy: 0.6028
Epoch 128/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3552 - accuracy: 0.6644 - val_loss: 0.8963 - val_accuracy: 0.5981
Epoch 129/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3602 - accuracy: 0.6690 - val_loss: 0.8974 - val_accuracy: 0.5981
Epoch 130/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3365 - accuracy: 0.6644 - val_loss: 0.8947 - val_accuracy: 0.5935
Epoch 131/1000
4/4 [=====] - 0s 12ms/step - loss: 0.5295 - accuracy: 0.6759 - val_loss: 0.9389 - val_accuracy: 0.5888
Epoch 132/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3846 - accuracy: 0.6852 - val_loss: 0.9397 - val_accuracy: 0.5841
Epoch 133/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3419 - accuracy: 0.6875 - val_loss: 0.9980 - val_accuracy: 0.5981
Epoch 134/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3730 - accuracy: 0.7176 - val_loss: 0.9428 - val_accuracy: 0.5935
Epoch 135/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3608 - accuracy: 0.6829 - val_loss: 0.9388 - val_accuracy: 0.5981
Epoch 136/1000
4/4 [=====] - 0s 16ms/step - loss: 0.3721 - accuracy: 0.6759 - val_loss: 0.9370 - val_accuracy: 0.5981
Epoch 137/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3415 - accuracy: 0.6852 - val_loss: 0.9340 - val_accuracy: 0.5888
Epoch 138/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3175 - accuracy: 0.6991 - val_loss: 0.9310 - val_accuracy: 0.5935
Epoch 139/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3694 - accuracy: 0.6875 - val_loss: 0.9310 - val_accuracy: 0.5841
Epoch 140/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3250 - accuracy: 0.6898 - val_loss: 0.9325 - val_accuracy: 0.5935
Epoch 141/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3898 - accuracy: 0.6806 - val_loss: 0.9066 - val_accuracy: 0.6121
Epoch 142/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4403 - accuracy: 0.6782 - val_loss: 0.9339 - val_accuracy: 0.6075
Epoch 143/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3534 - accuracy: 0.6759 - val_loss: 0.8446 - val_accuracy: 0.5981
Epoch 144/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3977 - accuracy: 0.6620 - val_loss: 0.8638 - val_accuracy: 0.5981
Epoch 145/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3425 - accuracy: 0.6944 - val_loss: 0.9075 - val_accuracy: 0.5888
Epoch 146/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3983 - accuracy: 0.6528 - val_loss: 0.9444 - val_accuracy: 0.6308
Epoch 147/1000
```

```
4/4 [=====] - 0s 11ms/step - loss: 0.4160 - accuracy: 0.6759 - val_loss: 0.8969 - val_accuracy: 0.6355
Epoch 148/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3704 - accuracy: 0.6852 - val_loss: 0.9071 - val_accuracy: 0.6542
Epoch 149/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3592 - accuracy: 0.7037 - val_loss: 0.8965 - val_accuracy: 0.6495
Epoch 150/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3761 - accuracy: 0.7130 - val_loss: 0.8631 - val_accuracy: 0.6262
Epoch 151/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3386 - accuracy: 0.6921 - val_loss: 0.9027 - val_accuracy: 0.6355
Epoch 152/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3843 - accuracy: 0.6968 - val_loss: 0.9060 - val_accuracy: 0.6308
Epoch 153/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3438 - accuracy: 0.6991 - val_loss: 0.9681 - val_accuracy: 0.6075
Epoch 154/1000
4/4 [=====] - 0s 12ms/step - loss: 0.4238 - accuracy: 0.6644 - val_loss: 0.9992 - val_accuracy: 0.6075
Epoch 155/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3246 - accuracy: 0.6389 - val_loss: 0.9715 - val_accuracy: 0.5841
Epoch 156/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3244 - accuracy: 0.6435 - val_loss: 1.0207 - val_accuracy: 0.5654
Epoch 157/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3507 - accuracy: 0.6343 - val_loss: 1.0476 - val_accuracy: 0.5561
Epoch 158/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3448 - accuracy: 0.6412 - val_loss: 1.0486 - val_accuracy: 0.5888
Epoch 159/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3430 - accuracy: 0.6620 - val_loss: 1.0501 - val_accuracy: 0.5280
Epoch 160/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3310 - accuracy: 0.6736 - val_loss: 0.9696 - val_accuracy: 0.5467
Epoch 161/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3002 - accuracy: 0.6505 - val_loss: 1.0506 - val_accuracy: 0.5327
Epoch 162/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3354 - accuracy: 0.6157 - val_loss: 1.0353 - val_accuracy: 0.5701
Epoch 163/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4082 - accuracy: 0.6366 - val_loss: 1.0306 - val_accuracy: 0.5421
Epoch 164/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3367 - accuracy: 0.6644 - val_loss: 1.0572 - val_accuracy: 0.5421
Epoch 165/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3574 - accuracy: 0.6806 - val_loss: 0.9357 - val_accuracy: 0.5467
Epoch 166/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3776 - accuracy: 0.6782 - val_loss: 1.0639 - val_accuracy: 0.5514
Epoch 167/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3121 - accuracy: 0.6690 - val_loss: 1.0566 - val_accuracy: 0.5514
Epoch 168/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3524 - accuracy: 0.6366 - val_loss: 1.0689 - val_accuracy: 0.5467
Epoch 169/1000
4/4 [=====] - 0s 11ms/step - loss: 0.4526 - accuracy: 0.6435 - val_loss: 1.0545 - val_accuracy: 0.5514
Epoch 170/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3749 - accuracy: 0.6111 - val_loss: 1.0505 - val_accuracy: 0.5561
Epoch 171/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3643 - accuracy: 0.6736 - val_loss: 0.9981 - val_accuracy: 0.5280
Epoch 172/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3012 - accuracy: 0.7014 - val_loss: 0.9983 - val_accuracy: 0.5327
Epoch 173/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3232 - accuracy: 0.6991 - val_loss: 1.0887 - val_accuracy: 0.5234
Epoch 174/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3396 - accuracy: 0.6898 - val_loss: 1.1461 - val_accuracy: 0.5280
Epoch 175/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3698 - accuracy: 0.6644 - val_loss: 1.0962 - val_accuracy: 0.5187
Epoch 176/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3261 - accuracy: 0.6273 - val_loss: 1.0755 - val_accuracy: 0.5561
```

Epoch 177/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3197 - accuracy: 0.6412 - val_loss: 1.0149 - val_accuracy: 0.5467
Epoch 178/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3946 - accuracy: 0.7199 - val_loss: 0.9674 - val_accuracy: 0.5701
Epoch 179/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2875 - accuracy: 0.7153 - val_loss: 0.9546 - val_accuracy: 0.5654
Epoch 180/1000
4/4 [=====] - 0s 13ms/step - loss: 0.3078 - accuracy: 0.7569 - val_loss: 0.9808 - val_accuracy: 0.5514
Epoch 181/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2907 - accuracy: 0.7338 - val_loss: 1.1215 - val_accuracy: 0.5654
Epoch 182/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2887 - accuracy: 0.6968 - val_loss: 1.0672 - val_accuracy: 0.5888
Epoch 183/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2935 - accuracy: 0.7153 - val_loss: 1.1238 - val_accuracy: 0.5607
Epoch 184/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3003 - accuracy: 0.7176 - val_loss: 1.1030 - val_accuracy: 0.5841
Epoch 185/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2944 - accuracy: 0.8056 - val_loss: 1.1131 - val_accuracy: 0.5981
Epoch 186/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2860 - accuracy: 0.8079 - val_loss: 1.0993 - val_accuracy: 0.5841
Epoch 187/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2806 - accuracy: 0.7708 - val_loss: 1.1133 - val_accuracy: 0.5794
Epoch 188/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3417 - accuracy: 0.7523 - val_loss: 1.0649 - val_accuracy: 0.5654
Epoch 189/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2788 - accuracy: 0.7222 - val_loss: 1.0574 - val_accuracy: 0.5561
Epoch 190/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3225 - accuracy: 0.7037 - val_loss: 1.1522 - val_accuracy: 0.5607
Epoch 191/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3101 - accuracy: 0.7338 - val_loss: 1.0965 - val_accuracy: 0.5561
Epoch 192/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3258 - accuracy: 0.7199 - val_loss: 1.1588 - val_accuracy: 0.5654
Epoch 193/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3395 - accuracy: 0.7153 - val_loss: 1.0343 - val_accuracy: 0.5514
Epoch 194/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3082 - accuracy: 0.7222 - val_loss: 1.0673 - val_accuracy: 0.5467
Epoch 195/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3144 - accuracy: 0.7500 - val_loss: 0.9946 - val_accuracy: 0.5327
Epoch 196/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3032 - accuracy: 0.7130 - val_loss: 1.2080 - val_accuracy: 0.5654
Epoch 197/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3094 - accuracy: 0.6667 - val_loss: 1.2087 - val_accuracy: 0.5654
Epoch 198/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2969 - accuracy: 0.6898 - val_loss: 1.2348 - val_accuracy: 0.5374
Epoch 199/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2863 - accuracy: 0.7269 - val_loss: 1.2523 - val_accuracy: 0.5374
Epoch 200/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2730 - accuracy: 0.7037 - val_loss: 1.2408 - val_accuracy: 0.5421
Epoch 201/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3068 - accuracy: 0.6944 - val_loss: 1.2899 - val_accuracy: 0.5467
Epoch 202/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2717 - accuracy: 0.7199 - val_loss: 1.2183 - val_accuracy: 0.5514
Epoch 203/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2952 - accuracy: 0.7685 - val_loss: 1.1898 - val_accuracy: 0.5561
Epoch 204/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2772 - accuracy: 0.7153 - val_loss: 1.1420 - val_accuracy: 0.5561
Epoch 205/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3034 - accuracy: 0.7361 - val_loss: 1.1166 - val_accuracy: 0.5607
Epoch 206/1000
4/4 [=====] - 0s 13ms/step - loss: 0.4299 - accuracy: 0.7338 - val_loss: 1.1285 - val_accuracy: 0.5607

```

accuracy: 0.5654
Epoch 207/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2609 - accuracy: 0.7593 - val_loss: 1.1697 - val_
accuracy: 0.5467
Epoch 208/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2759 - accuracy: 0.7384 - val_loss: 1.1638 - val_
accuracy: 0.5421
Epoch 209/1000
4/4 [=====] - 0s 13ms/step - loss: 0.2554 - accuracy: 0.7060 - val_loss: 1.1878 - val_
accuracy: 0.5561
Epoch 210/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3287 - accuracy: 0.6991 - val_loss: 1.1557 - val_
accuracy: 0.5374
Epoch 211/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3585 - accuracy: 0.6713 - val_loss: 1.2237 - val_
accuracy: 0.5607
Epoch 212/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3822 - accuracy: 0.6574 - val_loss: 1.1660 - val_
accuracy: 0.5374
Epoch 213/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3319 - accuracy: 0.6690 - val_loss: 1.0766 - val_
accuracy: 0.5514
Epoch 214/1000
4/4 [=====] - 0s 11ms/step - loss: 0.3360 - accuracy: 0.6806 - val_loss: 1.1516 - val_
accuracy: 0.5514
Epoch 215/1000
4/4 [=====] - 0s 11ms/step - loss: 0.2795 - accuracy: 0.6782 - val_loss: 1.1256 - val_
accuracy: 0.5654
Epoch 216/1000
4/4 [=====] - 0s 12ms/step - loss: 0.2995 - accuracy: 0.7037 - val_loss: 1.1501 - val_
accuracy: 0.5561
Epoch 217/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3055 - accuracy: 0.7037 - val_loss: 1.1645 - val_
accuracy: 0.5607
Epoch 218/1000
4/4 [=====] - 0s 12ms/step - loss: 0.3009 - accuracy: 0.7176 - val_loss: 1.2897 - val_
accuracy: 0.5467
Epoch 219/1000
1/4 [====>.....] - ETA: 0s - loss: 0.2333 - accuracy: 0.7109Restoring model weights from th
e end of the best epoch: 69.
4/4 [=====] - 0s 13ms/step - loss: 0.2992 - accuracy: 0.6968 - val_loss: 1.2137 - val_
accuracy: 0.5467
Epoch 219: early stopping
7/7 [=====] - 0s 2ms/step - loss: 1.3463 - accuracy: 0.6589

```

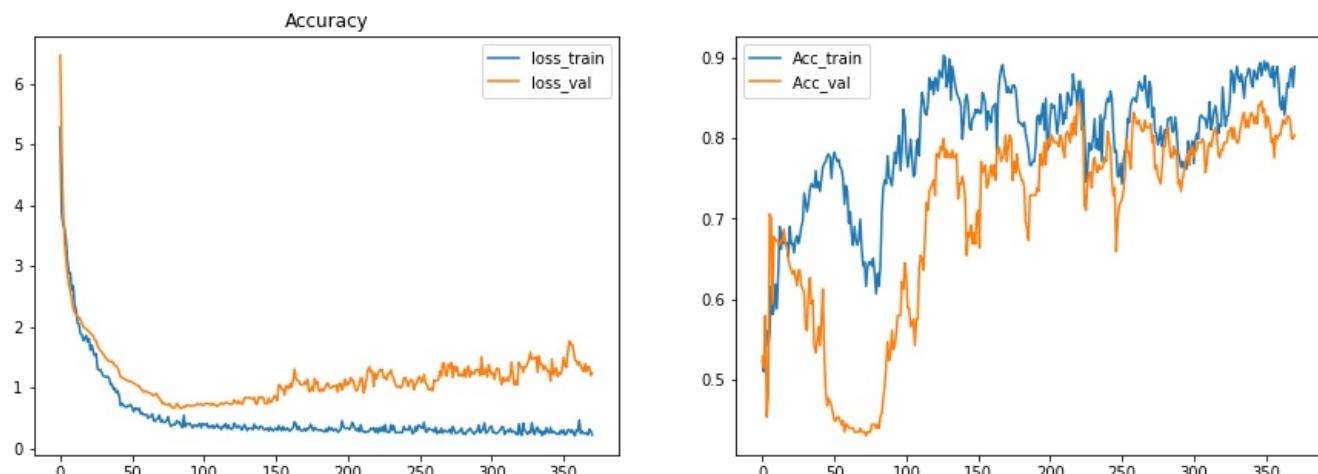
In [45]:

```

fig,axes = plt.subplots(1,2)
fig.set_figwidth(15)
fig.set_figheight(5)
axes[0].set_title('Loss')
axes[0].plot(besst_history.history['loss'], label = "loss_train")
axes[0].plot(besst_history.history['val_loss'], label = "loss_val ")
axes[0].legend()

axes[0].set_title('Accuracy')
axes[1].plot(besst_history.history['accuracy'], label = "Acc_train")
axes[1].plot(besst_history.history['val_accuracy'], label = "Acc_val ")
axes[1].legend()
plt.show()

```



In [190]:

```

models = []
models.append(('SVM rbf', model_1))
models.append(('SVM lin', model_2))
models.append(('LogReg', model_3))
models.append(('GradBoost', model_4))
models.append(('AdaBoost', model_5))
models.append(('Bagging', model_6))
models.append(('RForest', model_7))
models.append(('Dense', model_cat))

```

```

if 'grid_1.best_estimator_' in locals():

    models = []
    models.append(('SVM rbf', grid_1.best_estimator_))
    models.append(('SVM linear', grid_2.best_estimator_))
    models.append(('LogReg', grid_3.best_estimator_))
    models.append(('GradBoost ', grid_4.best_estimator_))
    models.append(('AdaBoost', grid_5.best_estimator_))
    models.append(('Bagging', grid_6.best_estimator_))
    models.append(('RForest', grid_7.best_estimator_))
    models.append(('Dense', model_cat))

```

Testowanie i predykcje:

Teraz zekspolorujmy jak sobie poradzili te modele. Załadowajmy i przepracujmy więc dane testowe, po czym sprawdzmy na metrykach Accuracy, Precision, Recall i F1 który klasyfikator będzie najlepszy

następnie zwizualizujemy krzywe ROC oraz Confusion matrix dla kazdego klasyfikatora, by lepiej ogarnąć jak wewnętrznie sobie radzą.

Zbiór testowy to **dane pochodzące od jednej osoby badanej** - ma to symulować prawdziwe warunki badania, gdzie będziemy spotykali się tylko z danymi jednej osoby.

Mожет być to jednak nieco zwodnicze w stosunku do całości

```

In [171]: path = r'.\Data\Test\Cat\test.mat'
          test_d = loadmat(path)
          list_of_variables = [test_d[i] for i in list(test_d.keys())[3:-2]]

          for i in range(len(list_of_variables)-1):
              data_df = np.hstack((list_of_variables[i],list_of_variables[i+1].reshape(test_d['Elc_power_core'].shape)))
              list_of_variables[i+1] = data_df

          data_df = list_of_variables[-1]
          df_test_cat_data = pd.DataFrame(data_df,columns=list(test_d.keys())[3:-2])
          df_test_cat_data

          X_test = df_test_cat_data.drop('test_Y',axis=1)
          y_test = df_test_cat_data['test_Y']

```

```

In [179]: from sklearn import metrics

lst_precision_score = []
lst_recall_score = []
lst_f1_score = []
lst_accuracy_score = []

for name, model in models:
    print()
    print(name)
    if name != 'Dense' and name != 'Dense_2':
        predictions = model.predict(X_test)
    else:
        predictions = np.argmax(model.predict(sc.transform(X_test)),axis=1)
        #predictions = model.predict(X_val)

    print("accuracy_score: {}".format(metrics.accuracy_score(y_test, predictions) ))
    print("precision_score: {}".format(metrics.precision_score(y_test, predictions) ))
    print("recall_score: {}".format(metrics.recall_score(y_test, predictions) ))
    print("f1_score: {}".format(metrics.f1_score(y_test, predictions) ))
    lst_accuracy_score.append(metrics.accuracy_score(y_test, predictions))
    lst_precision_score.append(metrics.precision_score(y_test, predictions))
    lst_recall_score.append(metrics.recall_score(y_test, predictions))
    lst_f1_score.append( metrics.f1_score(y_test, predictions))

```

```
SVM rbf
accuracy_score: 0.9215686274509803
precision_score: 0.9714285714285714
recall_score: 0.918918918918919
f1_score: 0.9444444444444445
```

```
SVM lin
accuracy_score: 0.9215686274509803
precision_score: 0.9459459459459459
recall_score: 0.9459459459459459
f1_score: 0.9459459459459459
```

```
LogReg
accuracy_score: 0.8823529411764706
precision_score: 0.918918918918919
recall_score: 0.918918918918919
f1_score: 0.918918918918919
```

```
GradBoost
accuracy_score: 0.7058823529411765
precision_score: 1.0
recall_score: 0.5945945945945946
f1_score: 0.7457627118644068
```

```
AdaBoost
accuracy_score: 0.7450980392156863
precision_score: 1.0
recall_score: 0.6486486486486487
f1_score: 0.7868852459016393
```

```
Bagging
accuracy_score: 0.7450980392156863
precision_score: 1.0
recall_score: 0.6486486486486487
f1_score: 0.7868852459016393
```

```
RForest
accuracy_score: 0.7450980392156863
precision_score: 1.0
recall_score: 0.6486486486486487
f1_score: 0.7868852459016393
```

```
Dense
accuracy_score: 0.8431372549019608
precision_score: 0.8536585365853658
recall_score: 0.9459459459459459
f1_score: 0.8974358974358975
```

```
In [65]: import pandas as pd
d = {'precision_score': precision_score,
      'recall_score': recall_score,
      'f1_score': f1_score,
      'accuracy_score' : accuracy_score
    }
df = pd.DataFrame(data=d)
df.insert(loc=0, column='Method', value=['SVM rbf','SVM linear','LogReg','GraBoost','AdaBoost','Bagging','RFore
df
```

```
Out[65]:
```

	Method	precision_score	recall_score	f1_score	accuracy_score
0	SVM rbf	0.971429	0.918919	0.944444	0.921569
1	SVM linear	0.945946	0.945946	0.945946	0.921569
2	LogReg	0.918919	0.918919	0.918919	0.882353
3	GraBoost	1.000000	0.594595	0.745763	0.705882
4	AdaBoost	1.000000	0.648649	0.786885	0.745098
5	Bagging	1.000000	0.648649	0.786885	0.745098
6	RForest	1.000000	0.648649	0.786885	0.745098
7	Dense	0.853659	0.945946	0.897436	0.843137

```
In [67]: from sklearn.metrics import confusion_matrix, roc_curve
import matplotlib.pyplot as plt

rainbow = cm.get_cmap('Spectral', 512).reversed()
newcmp = ListedColormap(rainbow(np.linspace(0.0, 0.9, 512)))
newcmp

for name, model in models:
# calculate the fpr and tpr for all thresholds of the classification
    if name != 'Dense':
        probs = model.predict_proba(X_test)
        predictions = model.predict(X_test)

    else:
```

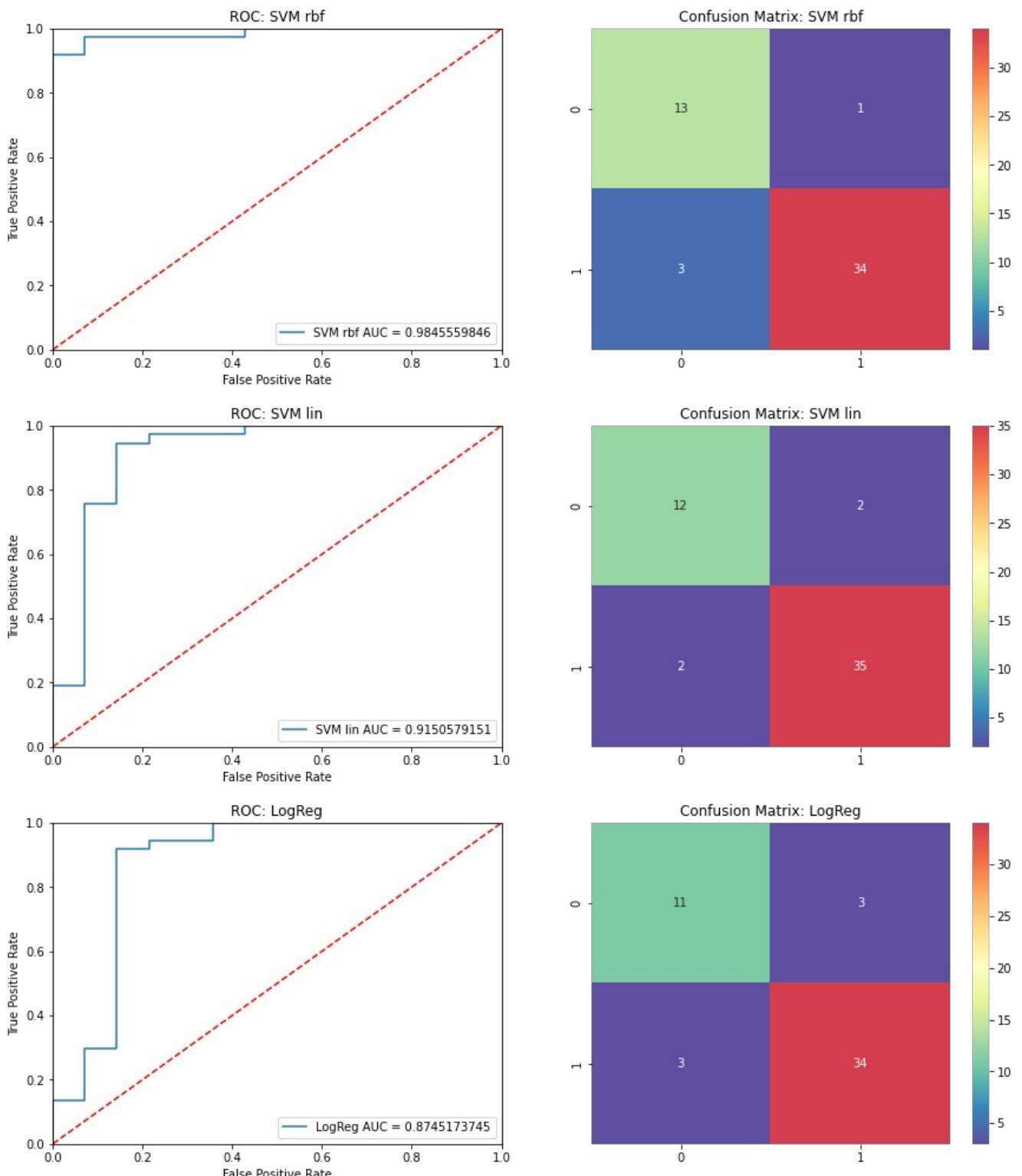
```

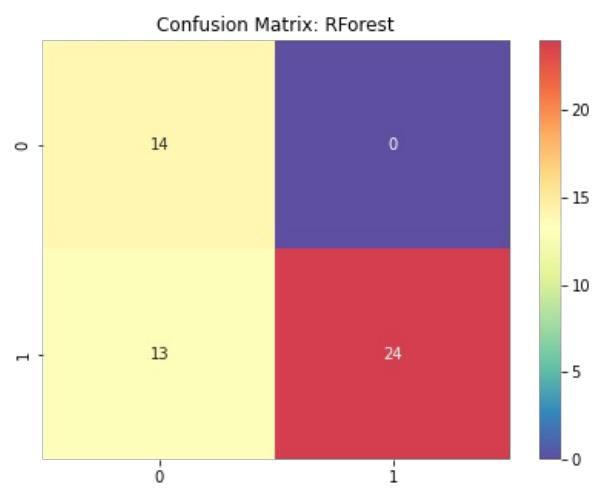
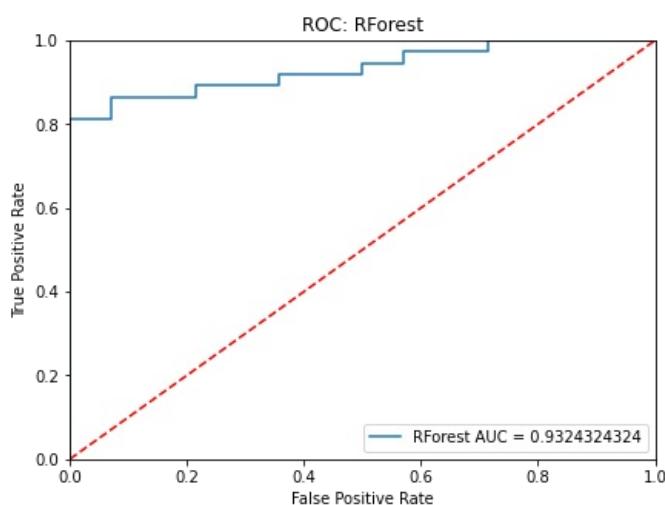
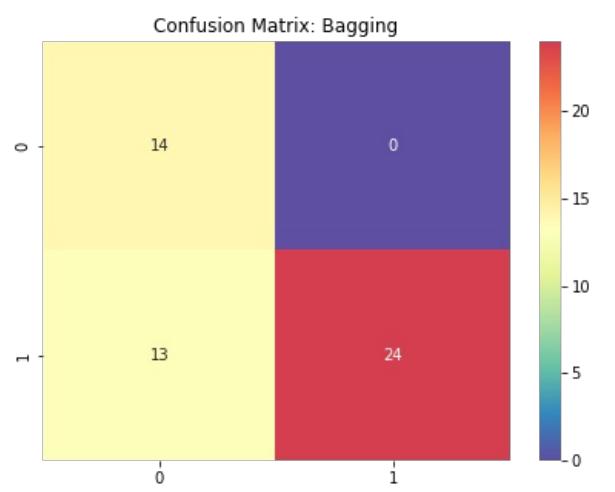
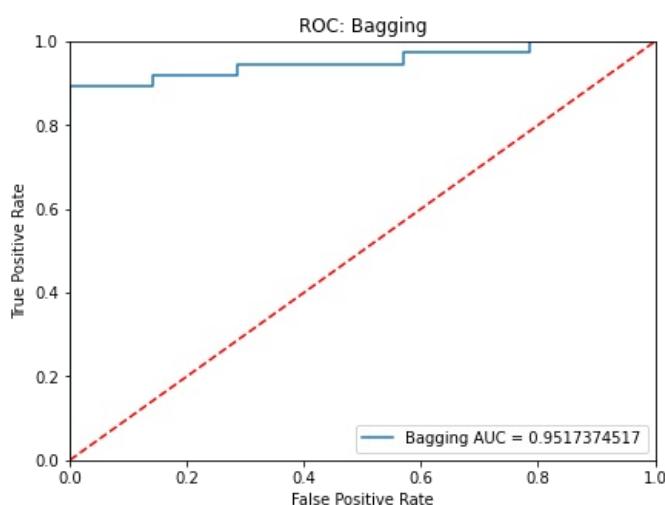
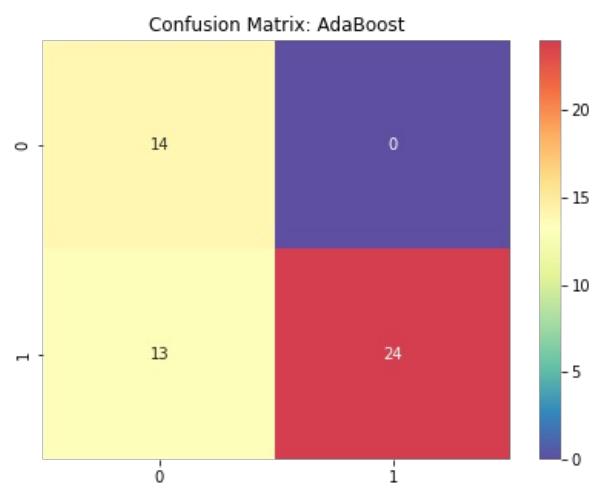
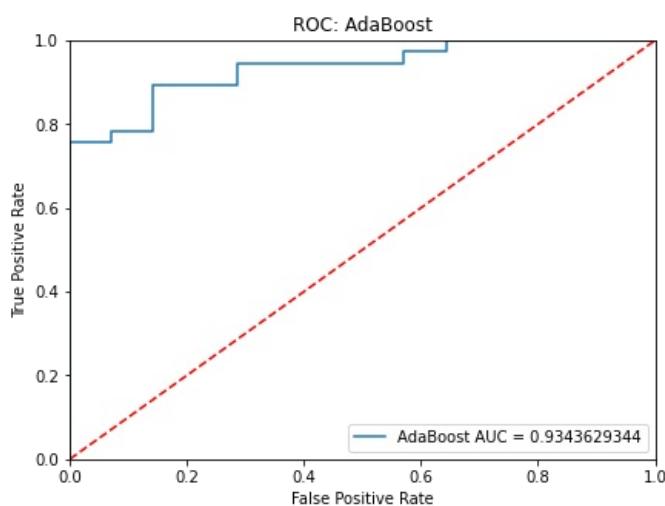
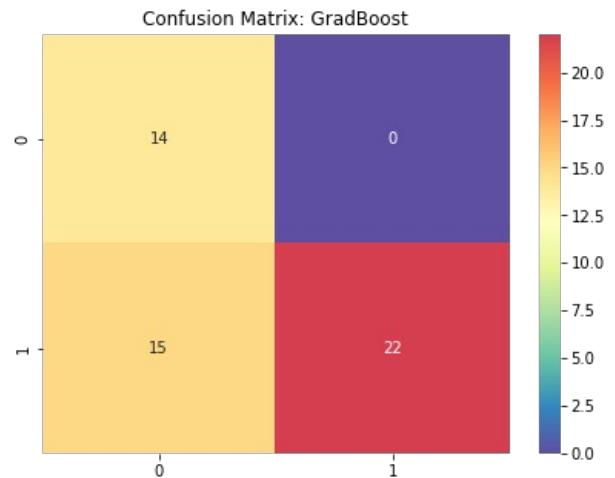
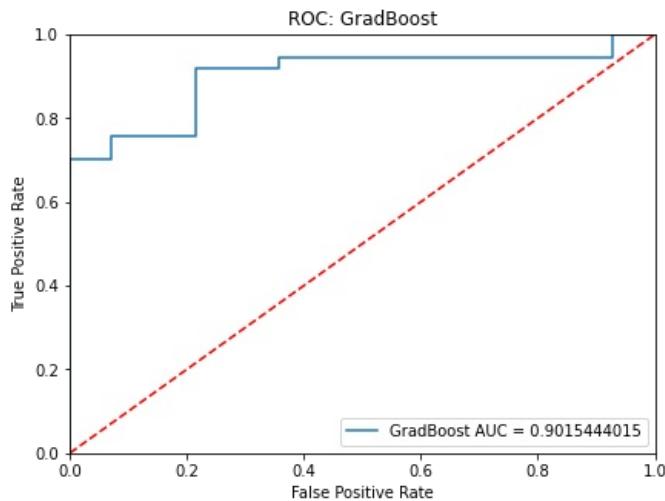
probs = model.predict(X_test)
predictions = np.argmax(model.predict(sc.transform(X_test)), axis=1)

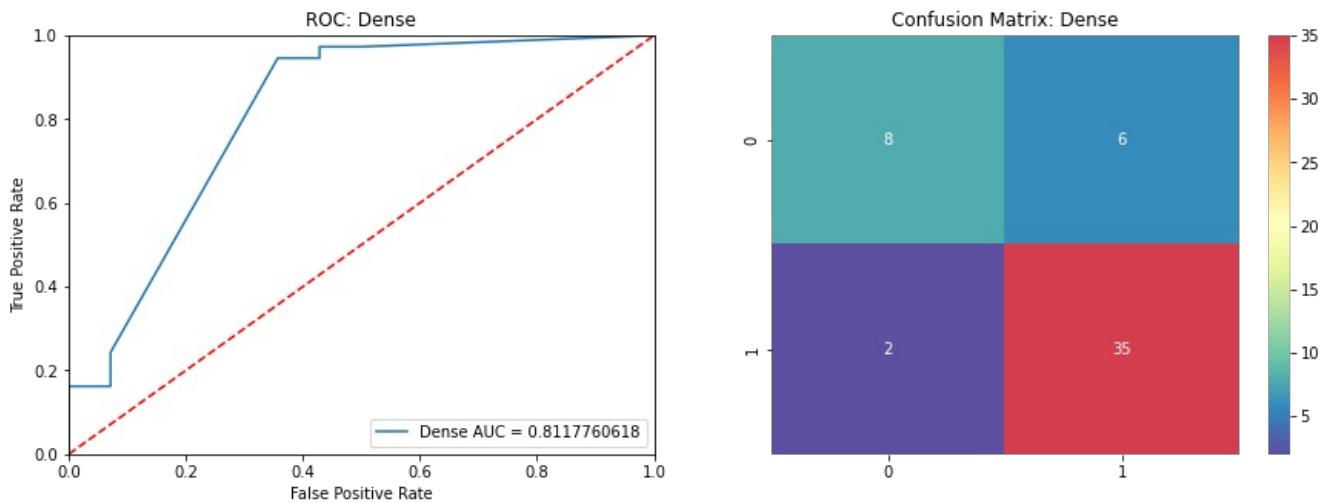
preds = probs[:,1]
fpr, tpr, threshold = roc_curve(y_test, preds)
roc_auc = metrics.auc(fpr, tpr)
fig,axes = plt.subplots(1,2)
fig.set_figwidth(15)
fig.set_figheight(5)
axes[0].set_title('ROC: {}'.format(name))
axes[0].plot(fpr, tpr, label = '%s AUC = %0.10f' % (name, roc_auc))
axes[0].legend(loc = 'lower right')
axes[0].plot([-0, 1], [0, 1], 'r--')
axes[0].set_xlim([-0, 1])
axes[0].set_ylim([-0, 1])
axes[0].set_ylabel('True Positive Rate')
axes[0].set_xlabel('False Positive Rate')

axes[1].set_title('Confusion Matrix: {}'.format(name))
sns.heatmap(confusion_matrix(y_test,predictions),ax=axes[1],annot=True,cmap=newcmp)
plt.show()

```







Zachowanie modelu Dense

nasz model Dense, był dość trudny do wyuczenia, także lepiej go zachować dla przyszłych pokoleń:

```
In [68]: model_cat.save(r'\Models\cat')
INFO:tensorflow:Assets written to: .\Models\cat\assets
```

Inferencja Mózgowych komponentów z obrazków

Te dane pochodzą z tego samego zbioru - można się więc spodziewać, że w podobny sposób będzie ich dotyczyło niezbalansowanie - tu jednak nie możemy sobie z tym w tak prosty sposób poradzić.

Ładowanie danych Obrazkowych

W zbiorze danych, posiadamy jeszcze Mapy topograficzne pokazujące, rozkład zmiany amplitud poszczególnych elektrod na skalpie dla poszczególnych komponentów. Pochodzą one z dokładnie tego samego zbioru i są identycznie poszeregowane.

Obrazki są podzielone na dwa foldery - jeden zawiera komponenty mózgowe (Brain_IC) a drugi artefakty (Not_Brain_IC). Komponenty i artefakty zostały manualnie rozpoznane i zalabelowane przez ekspertów w tej dziedzinie. Należy jednak nadmienić, że zadanie to jest ekstremalnie trudne, i nawet eksperci mają skuteczność jedynie do 90%.

Prócz tego, wybrany zbiór danych służy do badań Brain Connectivity, dotyczące komunikacji regionów mózgu, gdzie niektóre dalsze komponenty, mimo że w jasny sposób zawierają zarówno artefakt jak i sygnał dochodzący z mózgu są uznawane za porządane w analizie komunikacji.

Do innych badań, podobny klasyfikator musiałby być wyuczony ponownie.

```
In [1]: import numpy as np
import os
import PIL
import PIL.Image
import tensorflow as tf
from matplotlib import cm

from matplotlib.colors import ListedColormap, LinearSegmentedColormap

data_dir_train = r'\Data\aimages_train_best'

#Rozmiary obrazka są tak ustawione, żeby najlepiej uczyły się sieci.
img_height = 299
img_width = 299
batch_size = 32

train_ds = tf.keras.utils.image_dataset_from_directory(
    data_dir_train,
    validation_split=0.2,
    subset="training",
    seed=42,
    image_size=(img_height, img_width),
    batch_size=batch_size)

val_ds = tf.keras.utils.image_dataset_from_directory(
    data_dir_train,
    validation_split=0.2,
    subset="validation",
```

```
seed=42,
image_size=(img_height, img_width),
batch_size=batch_size)
```

```
Found 1423 files belonging to 2 classes.
Using 1139 files for training.
Found 1423 files belonging to 2 classes.
Using 284 files for validation.
```

Z nazw Folderu naszych danych, powinny zostać odczytane nazwy klas, sprawdźmy czy działa.

Mamy Brain_IC - które odpowiada komponentowi mózgowemu, oraz Not_brainIC odpowiadający artefaktowi.

```
In [2]: class_names = train_ds.class_names
```

```
Out[2]: ['BrainIC', 'Not_BrainIC']
```

Wizualizacja i uwagi o topografiach IC

Zobaczmy jak wyglądają z dwóch klas nasze komponenty. Wzięte są one z różnych datasetów, dlatego czasem będą obecne na nich elektrody a czasem nie. To co jednak mają wspólnie to kulsitą reprezentację aktywności mózgowej.

Z powodu też względnej stacjonarności, jakakolwiek **augmentacja obrazu będzie tu niewskazana** - nie mogę zmienić położenia obiektów bo one z natury są względnie stacjonarne, ani kształtu, czy koloru.

Możemy też zauważyc jak nardzo różnorodne są komponenty. W praktyce, zajmuje to bardzo długo, żeby wyuczyć człowieka rozpoznawać komponent mózgowy od artefaktualnego.

Zanim więc przejdziemy do właściwej klasyfikacji, należy powiedzieć nieco o samych komponentach IC.

- Rozkład ICA będzie dawał najbardziej jasne i prosto rozłożone komponenty na początku analizy, a mniej jasne pod koniec. Dla nas nie ma to wielkiego znaczenia bo komponenty są pomieszczone. To co jest ważne, że w dalszych komponentach **rozpoznanie artefaktu od komponentu mózgowego jest ekstremlanie trudne**. Szacuje się, że nawet doświadczeni eksperci nie są w stanie mieć poprawności rozpoznania większej niż 90%
- Pierwsze 2 lub 3 komponenty pochodzą zazwyczaj z ruchu oczu i tym samym powinny zostać odrzucone
- Szukając komponentów powinniśmy zwracać uwagę na dużą rozlaną plamę cieplną, która stopniowo maleje. Ewentualnymi komponentami będzie wyraźny efekt cieplej i zimnej strony. Należy jednak mieć na uwadze, że często takie komponenty oznaczają ruchy oczu
- komponenty w których aktywność jest skoncentrowana w jednym punkcie to najczęściej artefakty wynikające ze złego połączenia
- Szacuje się, że nawet eksperci mający lata doświadczenia w rozpoznawaniu komponentów z rozkładu ICA, są w stanie osiągnąć skuteczność 90%

```
In [3]: import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

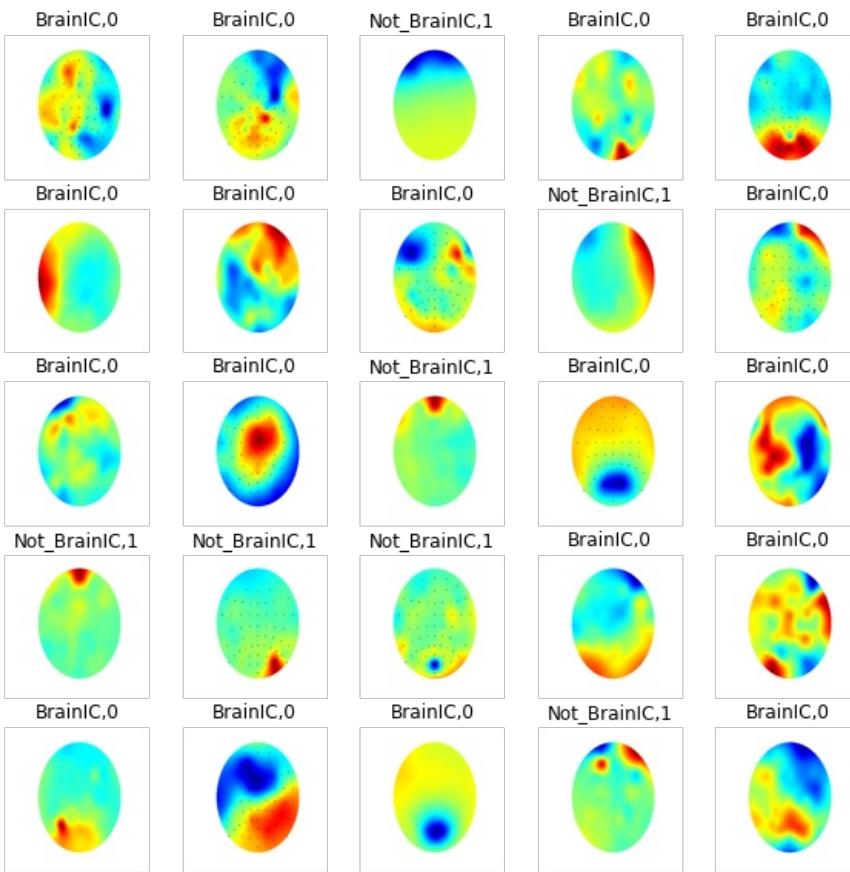
raw_data = list(train_ds.as_numpy_iterator())
raw_data_val = list(val_ds.as_numpy_iterator())

raw_data = [raw_data[i][-1] for i in range(len(raw_data))]
raw_data_val = [raw_data_val[i][-1] for i in range(len(raw_data_val))]
for i in range(len(raw_data)-1):
    hsta = np.hstack((raw_data[i], raw_data[i+1]))
    raw_data[i+1] = hsta

for j in range(len(raw_data_val)-1):
    hsta_val = np.hstack((raw_data_val[j], raw_data_val[j+1]))
    raw_data_val[j+1] = hsta_val

df_temp = pd.DataFrame(hsta, columns=['lab'])
df_temp = df_temp['lab'].apply(lambda x: class_names[0] if x==0 else class_names[1])

plt.figure(figsize=(10, 10))
for images, labels in train_ds.take(1):
    for i in range(25):
        ax = plt.subplot(5, 5, i + 1)
        plt.imshow(images[i].numpy().astype("uint8"))
        plt.title('{},{}'.format(class_names[labels[i]], labels[i]))
        plt.axis("off")
```

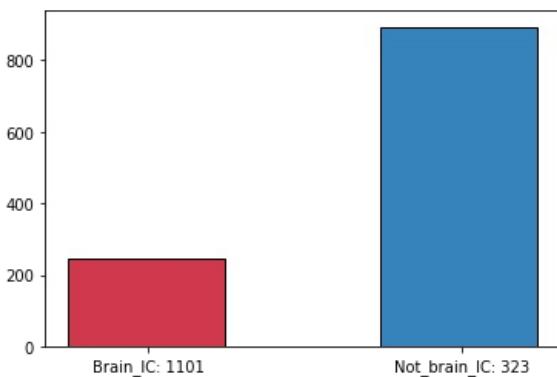


Weźmy teraz nazwy wszystkich klas i zobaczymy na ile są one zbalansowane

```
In [157]: fig, ax = plt.subplots()
data = np.random.rand(1000)

N, bins, patches = ax.hist(df_temp, edgecolor='black', linewidth=1,bins=3)
rainbow = cm.get_cmap('Spectral', 12).reversed()
newcmp = ListedColormap(rainbow(np.linspace(0.1, 0.9, 12)))
newcmp
for i in range(0,1):
    patches[i].set_facecolor(newcmp.colors[-1])
for i in range(1,3):
    patches[i].set_facecolor(newcmp.colors[0])

ax.set_xticks((0.17,0.84))
ax.set_xticklabels(['Brain_IC: {}'.format(len(w_class1)), 'Not_brain_IC: {}'.format(len(w_class0))])
plt.show()
```



Możemy zauważać silny efekt **niezbalansowania klas** jak więc sobie z tym poradzić?

Mamy kilka opcji:

- **1)** Oversampling do klasy Not_BrainIC: Tracimy dużo danych, nasz model może nie uczyć się w ładny sposób. Problemem jest też to, że klasy BrainIC zazwyczaj jest tak dużo, bo faktycznie mamy bardzo różnorodne komponenty mózgowe a jedynie kilka typów artefaktów.
- **2)** Ustawienie wag klas podczas uczenia modelu

Spróbujemy więc ważyć nasz model co do swoich przewidywań - jest to znacznie prostsze a może uda nam się uzyskać słuszne wyniki.

```
In [5]: from keras.regularizers import l1,l2
```

```

from keras.callbacks import History

from keras.layers import Dense,BatchNormalization,Flatten

from keras.models import Sequential
from keras.layers import Dense
from keras.callbacks import LearningRateScheduler
from keras.callbacks import ModelCheckpoint
from keras.callbacks import EarlyStopping
from keras.layers import Dropout
from keras.layers import Activation

from scipy.stats import reciprocal
from sklearn.model_selection import RandomizedSearchCV

from keras.callbacks import History
num_classes = 2
best_model = 1;
early_stopping2 = EarlyStopping(monitor='val_accuracy', patience=30, mode='max', verbose=1, restore_best_weights=True)
best_acc = 0.5
for _ in range(10):
    history_cnn = History()
    model = tf.keras.Sequential([
        tf.keras.layers.Rescaling(1./255),
        tf.keras.layers.Conv2D(10, 3, activation='relu',padding='same'),
        tf.keras.layers.MaxPooling2D(),
        tf.keras.layers.Conv2D(64, 3, activation='relu',padding='same'),
        tf.keras.layers.MaxPooling2D(),
        tf.keras.layers.Conv2D(128, 5, activation='relu',padding='same'),
        tf.keras.layers.MaxPooling2D(),
        tf.keras.layers.Conv2D(128, 5, activation='relu',padding='same'),
        tf.keras.layers.MaxPooling2D(),
        tf.keras.layers.Conv2D(128, 5, activation='relu',padding='same'),
        tf.keras.layers.MaxPooling2D(),
        tf.keras.layers.Conv2D(64, 3, activation='relu',padding='same'),
        tf.keras.layers.MaxPooling2D(),
        tf.keras.layers.Flatten(),

        tf.keras.layers.Dense(100, activation='relu',activity_regularizer=l2(0.01)),
        tf.keras.layers.BatchNormalization(),
        tf.keras.layers.Activation("relu"),
        tf.keras.layers.Dense(50, activation='relu',activity_regularizer=l2(0.01)),
        tf.keras.layers.BatchNormalization(),
        tf.keras.layers.Activation("relu",activity_regularizer=l2(0.01)),
        tf.keras.layers.Dense(10, activation='relu',activity_regularizer=l2(0.01)),
        tf.keras.layers.BatchNormalization(),
        tf.keras.layers.Activation("relu",activity_regularizer=l2(0.01)),
        tf.keras.layers.Dense(num_classes)
    ])
    class_weight = {0: 1.,1: 4}

    model.compile(
        optimizer='adam',
        loss='binary_crossentropy',
        metrics=['accuracy'])

    model.fit(
        train_ds,
        validation_data=val_ds,
        class_weight=class_weight,
        epochs=100,batch_size=128
        ,callbacks=[history_cnn,early_stopping2]
    )
    wynik = model.evaluate(val_ds)

    if wynik[1] > best_acc:
        best_history = history_cnn
        best_model = model
        best_acc = wynik[1]

model = best_model

Epoch 1/100
36/36 [=====] - 12s 118ms/step - loss: 11.2211 - accuracy: 0.7349 - val_loss: 1.9522 - val_accuracy: 0.7324
Epoch 2/100
36/36 [=====] - 3s 80ms/step - loss: 9.6062 - accuracy: 0.6567 - val_loss: 3.0061 - val_accuracy: 0.7324
Epoch 3/100
36/36 [=====] - 3s 79ms/step - loss: 8.9473 - accuracy: 0.7129 - val_loss: 2.9588 - val_accuracy: 0.7324
Epoch 4/100
36/36 [=====] - 3s 80ms/step - loss: 6.6929 - accuracy: 0.7068 - val_loss: 1.0435 - val_accuracy: 0.2746
Epoch 5/100
36/36 [=====] - 3s 80ms/step - loss: 6.2998 - accuracy: 0.6874 - val_loss: 13.0133 - val_accuracy: 0.7324
Epoch 6/100

```

```
36/36 [=====] - 3s 80ms/step - loss: 6.3153 - accuracy: 0.6163 - val_loss: 6.7397 - val_accuracy: 0.7324
Epoch 7/100
36/36 [=====] - 3s 80ms/step - loss: 3.8704 - accuracy: 0.6585 - val_loss: 2.4795 - val_accuracy: 0.4718
Epoch 8/100
36/36 [=====] - 3s 80ms/step - loss: 3.5620 - accuracy: 0.5970 - val_loss: 346.1852 - val_accuracy: 0.7324
Epoch 9/100
36/36 [=====] - 3s 79ms/step - loss: 7.0011 - accuracy: 0.6892 - val_loss: 78.2694 - val_accuracy: 0.7324
Epoch 10/100
36/36 [=====] - 3s 80ms/step - loss: 5.9697 - accuracy: 0.6400 - val_loss: 12.0658 - val_accuracy: 0.6162
Epoch 11/100
36/36 [=====] - 3s 80ms/step - loss: 5.5884 - accuracy: 0.6128 - val_loss: 54.8622 - val_accuracy: 0.7324
Epoch 12/100
36/36 [=====] - 3s 80ms/step - loss: 5.0377 - accuracy: 0.6251 - val_loss: 0.6206 - val_accuracy: 0.2676
Epoch 13/100
36/36 [=====] - 3s 80ms/step - loss: 1.9815 - accuracy: 0.2160 - val_loss: 0.6072 - val_accuracy: 0.2676
Epoch 14/100
36/36 [=====] - 3s 80ms/step - loss: 1.7603 - accuracy: 0.2160 - val_loss: 0.5956 - val_accuracy: 0.2676
Epoch 15/100
36/36 [=====] - 3s 80ms/step - loss: 1.6330 - accuracy: 0.2160 - val_loss: 0.5873 - val_accuracy: 0.2676
Epoch 16/100
36/36 [=====] - 3s 80ms/step - loss: 1.5447 - accuracy: 0.3889 - val_loss: 0.5888 - val_accuracy: 0.7324
Epoch 17/100
36/36 [=====] - 3s 80ms/step - loss: 1.4764 - accuracy: 0.7840 - val_loss: 0.5973 - val_accuracy: 0.7324
Epoch 18/100
36/36 [=====] - 3s 81ms/step - loss: 1.4208 - accuracy: 0.7840 - val_loss: 0.6140 - val_accuracy: 0.7324
Epoch 19/100
36/36 [=====] - 3s 80ms/step - loss: 1.3740 - accuracy: 0.7840 - val_loss: 0.6397 - val_accuracy: 0.7324
Epoch 20/100
36/36 [=====] - 3s 80ms/step - loss: 1.3353 - accuracy: 0.7840 - val_loss: 0.6656 - val_accuracy: 0.7324
Epoch 21/100
36/36 [=====] - 3s 80ms/step - loss: 1.3024 - accuracy: 0.7840 - val_loss: 0.7048 - val_accuracy: 0.7324
Epoch 22/100
36/36 [=====] - 3s 80ms/step - loss: 1.2749 - accuracy: 0.7840 - val_loss: 0.7618 - val_accuracy: 0.2676
Epoch 23/100
36/36 [=====] - 3s 80ms/step - loss: 1.2515 - accuracy: 0.7840 - val_loss: 0.8812 - val_accuracy: 0.2676
Epoch 24/100
36/36 [=====] - 3s 80ms/step - loss: 1.2320 - accuracy: 0.7840 - val_loss: 1.1662 - val_accuracy: 0.2676
Epoch 25/100
36/36 [=====] - 3s 80ms/step - loss: 1.2155 - accuracy: 0.7840 - val_loss: 1.4314 - val_accuracy: 0.2676
Epoch 26/100
36/36 [=====] - 3s 81ms/step - loss: 1.2022 - accuracy: 0.7840 - val_loss: 1.2925 - val_accuracy: 0.2676
Epoch 27/100
36/36 [=====] - 3s 80ms/step - loss: 1.1911 - accuracy: 0.7840 - val_loss: 1.1644 - val_accuracy: 0.2676
Epoch 28/100
36/36 [=====] - 3s 80ms/step - loss: 1.1824 - accuracy: 0.7840 - val_loss: 1.1045 - val_accuracy: 0.2676
Epoch 29/100
36/36 [=====] - 3s 80ms/step - loss: 1.1750 - accuracy: 0.7840 - val_loss: 0.9587 - val_accuracy: 0.2676
Epoch 30/100
36/36 [=====] - 3s 80ms/step - loss: 1.1695 - accuracy: 0.7840 - val_loss: 0.8111 - val_accuracy: 0.2676
Epoch 31/100
35/36 [=====]. - ETA: 0s - loss: 1.1718 - accuracy: 0.7812Restoring model weights from the end of the best epoch: 1.
36/36 [=====] - 3s 81ms/step - loss: 1.1649 - accuracy: 0.7840 - val_loss: 0.7419 - val_accuracy: 0.2676
Epoch 31: early stopping
9/9 [=====] - 0s 36ms/step - loss: 1.9522 - accuracy: 0.7324
Epoch 1/100
36/36 [=====] - 4s 86ms/step - loss: 10.2125 - accuracy: 0.6673 - val_loss: 5.8920 - val_accuracy: 0.2289
Epoch 2/100
36/36 [=====] - 3s 80ms/step - loss: 15.0696 - accuracy: 0.6234 - val_loss: 1.0587 - val_accuracy: 0.5246
Epoch 3/100
36/36 [=====] - 3s 80ms/step - loss: 7.3901 - accuracy: 0.6251 - val_loss: 4.0514 - val_accuracy: 0.5246
```

```
l_accuracy: 0.2711
Epoch 4/100
36/36 [=====] - 3s 80ms/step - loss: 7.5537 - accuracy: 0.6014 - val_loss: 3.9693 - va
l_accuracy: 0.7324
Epoch 5/100
36/36 [=====] - 3s 80ms/step - loss: 5.7158 - accuracy: 0.5988 - val_loss: 3.3308 - va
l_accuracy: 0.4894
Epoch 6/100
36/36 [=====] - 3s 80ms/step - loss: 7.3315 - accuracy: 0.5900 - val_loss: 38.5248 - v
al_accuracy: 0.7324
Epoch 7/100
36/36 [=====] - 3s 80ms/step - loss: 7.5726 - accuracy: 0.6207 - val_loss: 7.0027 - va
l_accuracy: 0.2782
Epoch 8/100
36/36 [=====] - 3s 81ms/step - loss: 5.6006 - accuracy: 0.5724 - val_loss: 1.5123 - va
l_accuracy: 0.4366
Epoch 9/100
36/36 [=====] - 3s 80ms/step - loss: 5.4228 - accuracy: 0.5733 - val_loss: 10.9245 - v
al_accuracy: 0.5986
Epoch 10/100
36/36 [=====] - 3s 81ms/step - loss: 4.9013 - accuracy: 0.5786 - val_loss: 17.5136 - v
al_accuracy: 0.7324
Epoch 11/100
36/36 [=====] - 3s 80ms/step - loss: 4.2844 - accuracy: 0.6207 - val_loss: 5.0234 - va
l_accuracy: 0.7042
Epoch 12/100
36/36 [=====] - 3s 80ms/step - loss: 3.9179 - accuracy: 0.5716 - val_loss: 1.3061 - va
l_accuracy: 0.5176
Epoch 13/100
36/36 [=====] - 3s 80ms/step - loss: 3.3824 - accuracy: 0.5742 - val_loss: 2.9355 - va
l_accuracy: 0.6056
Epoch 14/100
36/36 [=====] - 3s 81ms/step - loss: 3.0503 - accuracy: 0.5487 - val_loss: 3.4916 - va
l_accuracy: 0.5915
Epoch 15/100
36/36 [=====] - 3s 80ms/step - loss: 4.1240 - accuracy: 0.5680 - val_loss: 30.2019 - v
al_accuracy: 0.5282
Epoch 16/100
36/36 [=====] - 3s 81ms/step - loss: 4.3826 - accuracy: 0.6049 - val_loss: 4.3056 - va
l_accuracy: 0.4296
Epoch 17/100
36/36 [=====] - 3s 80ms/step - loss: 3.4127 - accuracy: 0.5584 - val_loss: 8.5724 - va
l_accuracy: 0.4507
Epoch 18/100
36/36 [=====] - 3s 81ms/step - loss: 3.0461 - accuracy: 0.6269 - val_loss: 19.0845 - v
al_accuracy: 0.4789
Epoch 19/100
36/36 [=====] - 3s 81ms/step - loss: 3.1757 - accuracy: 0.6471 - val_loss: 16.1659 - v
al_accuracy: 0.7430
Epoch 20/100
36/36 [=====] - 3s 80ms/step - loss: 2.5744 - accuracy: 0.6646 - val_loss: 3.7294 - va
l_accuracy: 0.7746
Epoch 21/100
36/36 [=====] - 3s 80ms/step - loss: 5.9943 - accuracy: 0.5628 - val_loss: 20.6930 - v
al_accuracy: 0.3556
Epoch 22/100
36/36 [=====] - 3s 80ms/step - loss: 7.1685 - accuracy: 0.5514 - val_loss: 6.1055 - va
l_accuracy: 0.4190
Epoch 23/100
36/36 [=====] - 3s 81ms/step - loss: 5.6125 - accuracy: 0.5874 - val_loss: 67.0974 - v
al_accuracy: 0.7324
Epoch 24/100
36/36 [=====] - 3s 81ms/step - loss: 4.4521 - accuracy: 0.6155 - val_loss: 19.7721 - v
al_accuracy: 0.7324
Epoch 25/100
36/36 [=====] - 3s 80ms/step - loss: 3.7596 - accuracy: 0.5996 - val_loss: 17.5852 - v
al_accuracy: 0.7289
Epoch 26/100
36/36 [=====] - 3s 80ms/step - loss: 3.8763 - accuracy: 0.5285 - val_loss: 13.2014 - v
al_accuracy: 0.7359
Epoch 27/100
36/36 [=====] - 3s 80ms/step - loss: 3.3264 - accuracy: 0.5277 - val_loss: 11.8095 - v
al_accuracy: 0.7077
Epoch 28/100
36/36 [=====] - 3s 80ms/step - loss: 3.0388 - accuracy: 0.5575 - val_loss: 23.0171 - v
al_accuracy: 0.6972
Epoch 29/100
36/36 [=====] - 3s 82ms/step - loss: 3.2845 - accuracy: 0.5865 - val_loss: 9.3738 - va
l_accuracy: 0.4683
Epoch 30/100
36/36 [=====] - 3s 81ms/step - loss: 3.0389 - accuracy: 0.5716 - val_loss: 4.8104 - va
l_accuracy: 0.5493
Epoch 31/100
36/36 [=====] - 3s 80ms/step - loss: 2.8884 - accuracy: 0.5601 - val_loss: 0.9707 - va
l_accuracy: 0.5141
Epoch 32/100
36/36 [=====] - 3s 81ms/step - loss: 3.8863 - accuracy: 0.5154 - val_loss: 30.1594 - v
al_accuracy: 0.7324
Epoch 33/100
```

```
36/36 [=====] - 3s 86ms/step - loss: 4.3342 - accuracy: 0.5478 - val_loss: 7.6086 - val_accuracy: 0.6690
Epoch 34/100
36/36 [=====] - 3s 85ms/step - loss: 5.9396 - accuracy: 0.5882 - val_loss: 38.9082 - val_accuracy: 0.6937
Epoch 35/100
36/36 [=====] - 3s 83ms/step - loss: 4.0377 - accuracy: 0.5795 - val_loss: 1.1279 - val_accuracy: 0.4014
Epoch 36/100
36/36 [=====] - 3s 83ms/step - loss: 3.9159 - accuracy: 0.5347 - val_loss: 6.5956 - val_accuracy: 0.6408
Epoch 37/100
36/36 [=====] - 3s 82ms/step - loss: 2.7150 - accuracy: 0.5593 - val_loss: 3.5211 - val_accuracy: 0.4261
Epoch 38/100
36/36 [=====] - 3s 85ms/step - loss: 2.4171 - accuracy: 0.5900 - val_loss: 1.7666 - val_accuracy: 0.3697
Epoch 39/100
36/36 [=====] - 3s 84ms/step - loss: 2.6546 - accuracy: 0.5522 - val_loss: 3.6631 - val_accuracy: 0.5246
Epoch 40/100
36/36 [=====] - 3s 84ms/step - loss: 2.2130 - accuracy: 0.5795 - val_loss: 0.5642 - val_accuracy: 0.2817
Epoch 41/100
36/36 [=====] - 3s 85ms/step - loss: 2.0764 - accuracy: 0.5654 - val_loss: 2.7843 - val_accuracy: 0.2711
Epoch 42/100
36/36 [=====] - 3s 83ms/step - loss: 3.0418 - accuracy: 0.5566 - val_loss: 14.6798 - val_accuracy: 0.6514
Epoch 43/100
36/36 [=====] - 3s 84ms/step - loss: 4.6978 - accuracy: 0.4802 - val_loss: 12.0176 - val_accuracy: 0.2676
Epoch 44/100
36/36 [=====] - 3s 83ms/step - loss: 4.9629 - accuracy: 0.5171 - val_loss: 5.2422 - val_accuracy: 0.4296
Epoch 45/100
36/36 [=====] - 3s 83ms/step - loss: 2.7742 - accuracy: 0.5522 - val_loss: 1.0580 - val_accuracy: 0.5704
Epoch 46/100
36/36 [=====] - 3s 83ms/step - loss: 2.9007 - accuracy: 0.5558 - val_loss: 29.7540 - val_accuracy: 0.2887
Epoch 47/100
36/36 [=====] - 3s 82ms/step - loss: 2.8973 - accuracy: 0.5233 - val_loss: 2.4759 - val_accuracy: 0.3521
Epoch 48/100
36/36 [=====] - 3s 82ms/step - loss: 3.4298 - accuracy: 0.5680 - val_loss: 6.5820 - val_accuracy: 0.7394
Epoch 49/100
36/36 [=====] - 3s 82ms/step - loss: 2.4250 - accuracy: 0.5742 - val_loss: 0.7646 - val_accuracy: 0.4577
Epoch 50/100
35/36 [=====].] - ETA: 0s - loss: 1.7488 - accuracy: 0.5955Restoring model weights from the end of the best epoch: 20.
36/36 [=====] - 3s 82ms/step - loss: 1.7475 - accuracy: 0.5935 - val_loss: 0.6617 - val_accuracy: 0.2923
Epoch 50: early stopping
9/9 [=====] - 0s 36ms/step - loss: 3.7294 - accuracy: 0.7746
Epoch 1/100
36/36 [=====] - 5s 88ms/step - loss: 9.1767 - accuracy: 0.4126 - val_loss: 1.4289 - val_accuracy: 0.3415
Epoch 2/100
36/36 [=====] - 3s 82ms/step - loss: 5.3304 - accuracy: 0.4530 - val_loss: 2.3954 - val_accuracy: 0.2711
Epoch 3/100
36/36 [=====] - 3s 83ms/step - loss: 6.2764 - accuracy: 0.4065 - val_loss: 1.8837 - val_accuracy: 0.5282
Epoch 4/100
36/36 [=====] - 3s 81ms/step - loss: 4.5265 - accuracy: 0.4249 - val_loss: 1.8672 - val_accuracy: 0.3380
Epoch 5/100
36/36 [=====] - 3s 83ms/step - loss: 3.9783 - accuracy: 0.3696 - val_loss: 2.6524 - val_accuracy: 0.7289
Epoch 6/100
36/36 [=====] - 3s 83ms/step - loss: 8.0285 - accuracy: 0.4548 - val_loss: 6.2285 - val_accuracy: 0.6127
Epoch 7/100
36/36 [=====] - 3s 82ms/step - loss: 6.5453 - accuracy: 0.4969 - val_loss: 16.6287 - val_accuracy: 0.2676
Epoch 8/100
36/36 [=====] - 3s 81ms/step - loss: 6.3032 - accuracy: 0.4811 - val_loss: 3.5359 - val_accuracy: 0.6373
Epoch 9/100
36/36 [=====] - 3s 82ms/step - loss: 4.2416 - accuracy: 0.4794 - val_loss: 24.8596 - val_accuracy: 0.7324
Epoch 10/100
36/36 [=====] - 3s 80ms/step - loss: 4.5704 - accuracy: 0.4530 - val_loss: 4.7627 - val_accuracy: 0.5387
Epoch 11/100
36/36 [=====] - 3s 82ms/step - loss: 3.7412 - accuracy: 0.4425 - val_loss: 11.1628 - val_accuracy: 0.6220
```

```
al_accuracy: 0.5739
Epoch 12/100
36/36 [=====] - 3s 81ms/step - loss: 5.4024 - accuracy: 0.4425 - val_loss: 16.3652 - val_accuracy: 0.2817
Epoch 13/100
36/36 [=====] - 3s 80ms/step - loss: 4.6498 - accuracy: 0.3696 - val_loss: 5.6801 - val_accuracy: 0.5000
Epoch 14/100
36/36 [=====] - 3s 81ms/step - loss: 4.5899 - accuracy: 0.3802 - val_loss: 10.3772 - val_accuracy: 0.4190
Epoch 15/100
36/36 [=====] - 3s 80ms/step - loss: 4.2658 - accuracy: 0.3810 - val_loss: 37.5607 - val_accuracy: 0.2676
Epoch 16/100
36/36 [=====] - 3s 80ms/step - loss: 3.9099 - accuracy: 0.4267 - val_loss: 10.7091 - val_accuracy: 0.2782
Epoch 17/100
36/36 [=====] - 3s 80ms/step - loss: 3.2798 - accuracy: 0.4267 - val_loss: 4.8606 - val_accuracy: 0.5423
Epoch 18/100
36/36 [=====] - 3s 81ms/step - loss: 3.4421 - accuracy: 0.4162 - val_loss: 11.8966 - val_accuracy: 0.4296
Epoch 19/100
36/36 [=====] - 3s 80ms/step - loss: 3.1558 - accuracy: 0.4636 - val_loss: 13.6497 - val_accuracy: 0.4120
Epoch 20/100
36/36 [=====] - 3s 79ms/step - loss: 3.6950 - accuracy: 0.4750 - val_loss: 53.5598 - val_accuracy: 0.5951
Epoch 21/100
36/36 [=====] - 3s 80ms/step - loss: 3.2985 - accuracy: 0.4328 - val_loss: 58.4856 - val_accuracy: 0.6549
Epoch 22/100
36/36 [=====] - 3s 80ms/step - loss: 3.2383 - accuracy: 0.4258 - val_loss: 15.6447 - val_accuracy: 0.4894
Epoch 23/100
36/36 [=====] - 3s 80ms/step - loss: 4.5653 - accuracy: 0.3775 - val_loss: 19.2280 - val_accuracy: 0.2782
Epoch 24/100
36/36 [=====] - 3s 81ms/step - loss: 4.5905 - accuracy: 0.3749 - val_loss: 59.1447 - val_accuracy: 0.3838
Epoch 25/100
36/36 [=====] - 3s 81ms/step - loss: 3.1121 - accuracy: 0.3644 - val_loss: 9.1730 - val_accuracy: 0.5634
Epoch 26/100
36/36 [=====] - 3s 80ms/step - loss: 3.5931 - accuracy: 0.4135 - val_loss: 31.9420 - val_accuracy: 0.4577
Epoch 27/100
36/36 [=====] - 3s 82ms/step - loss: 3.9195 - accuracy: 0.3784 - val_loss: 16.8652 - val_accuracy: 0.2817
Epoch 28/100
36/36 [=====] - 3s 81ms/step - loss: 3.1161 - accuracy: 0.3652 - val_loss: 4.7544 - val_accuracy: 0.3627
Epoch 29/100
36/36 [=====] - 3s 81ms/step - loss: 3.3955 - accuracy: 0.3477 - val_loss: 8.6983 - val_accuracy: 0.6127
Epoch 30/100
36/36 [=====] - 3s 82ms/step - loss: 3.3444 - accuracy: 0.3889 - val_loss: 13.9567 - val_accuracy: 0.6690
Epoch 31/100
36/36 [=====] - 3s 84ms/step - loss: 3.3932 - accuracy: 0.3793 - val_loss: 2.2589 - val_accuracy: 0.2782
Epoch 32/100
36/36 [=====] - 3s 82ms/step - loss: 3.3859 - accuracy: 0.3494 - val_loss: 14.4888 - val_accuracy: 0.4437
Epoch 33/100
36/36 [=====] - 3s 84ms/step - loss: 2.8868 - accuracy: 0.3310 - val_loss: 3.5130 - val_accuracy: 0.3486
Epoch 34/100
36/36 [=====] - 3s 84ms/step - loss: 2.6114 - accuracy: 0.3117 - val_loss: 2.1012 - val_accuracy: 0.3380
Epoch 35/100
36/36 [=====] - 3s 85ms/step - loss: 2.3577 - accuracy: 0.3178 - val_loss: 1.3121 - val_accuracy: 0.4789
Epoch 36/100
36/36 [=====] - 3s 83ms/step - loss: 2.5067 - accuracy: 0.3257 - val_loss: 1.1290 - val_accuracy: 0.4085
Epoch 37/100
36/36 [=====] - 3s 84ms/step - loss: 2.1462 - accuracy: 0.3257 - val_loss: 1.9475 - val_accuracy: 0.3063
Epoch 38/100
36/36 [=====] - 3s 82ms/step - loss: 1.8983 - accuracy: 0.3319 - val_loss: 1.1354 - val_accuracy: 0.3873
Epoch 39/100
35/36 [=====]>. - ETA: 0s - loss: 1.9534 - accuracy: 0.3607Restoring model weights from the end of the best epoch: 9.
36/36 [=====] - 3s 81ms/step - loss: 1.9687 - accuracy: 0.3600 - val_loss: 2.3400 - val_accuracy: 0.3275
Epoch 39: early stopping
9/9 [=====] - 0s 34ms/step - loss: 24.8596 - accuracy: 0.7324
```

Metryki i Wizualizacja

Accuracy, F1, Loss

```
In [180]: data_dir_test = r'.\Data\Test\Images'

test_ds = tf.keras.utils.image_dataset_from_directory(
    data_dir_test, shuffle=False,
    seed=123,
    image_size=(img_height, img_width),
    batch_size=batch_size)
```

Found 51 files belonging to 2 classes.

```
In [21]: from sklearn.metrics import confusion_matrix, roc_curve
from sklearn import metrics
import seaborn as sns
from matplotlib import cm

from matplotlib.colors import ListedColormap, LinearSegmentedColormap
rainbow = cm.get_cmap('Spectral', 512).reversed()
newcmp = ListedColormap(rainbow(np.linspace(0.0, 0.9, 512)))
fig,axes = plt.subplots(2,2)
fig.set_figwidth(15)
fig.set_figheight(15)

fpr, tpr, threshold = roc_curve(true,preds)
roc_auc = metrics.auc(fpr, tpr)

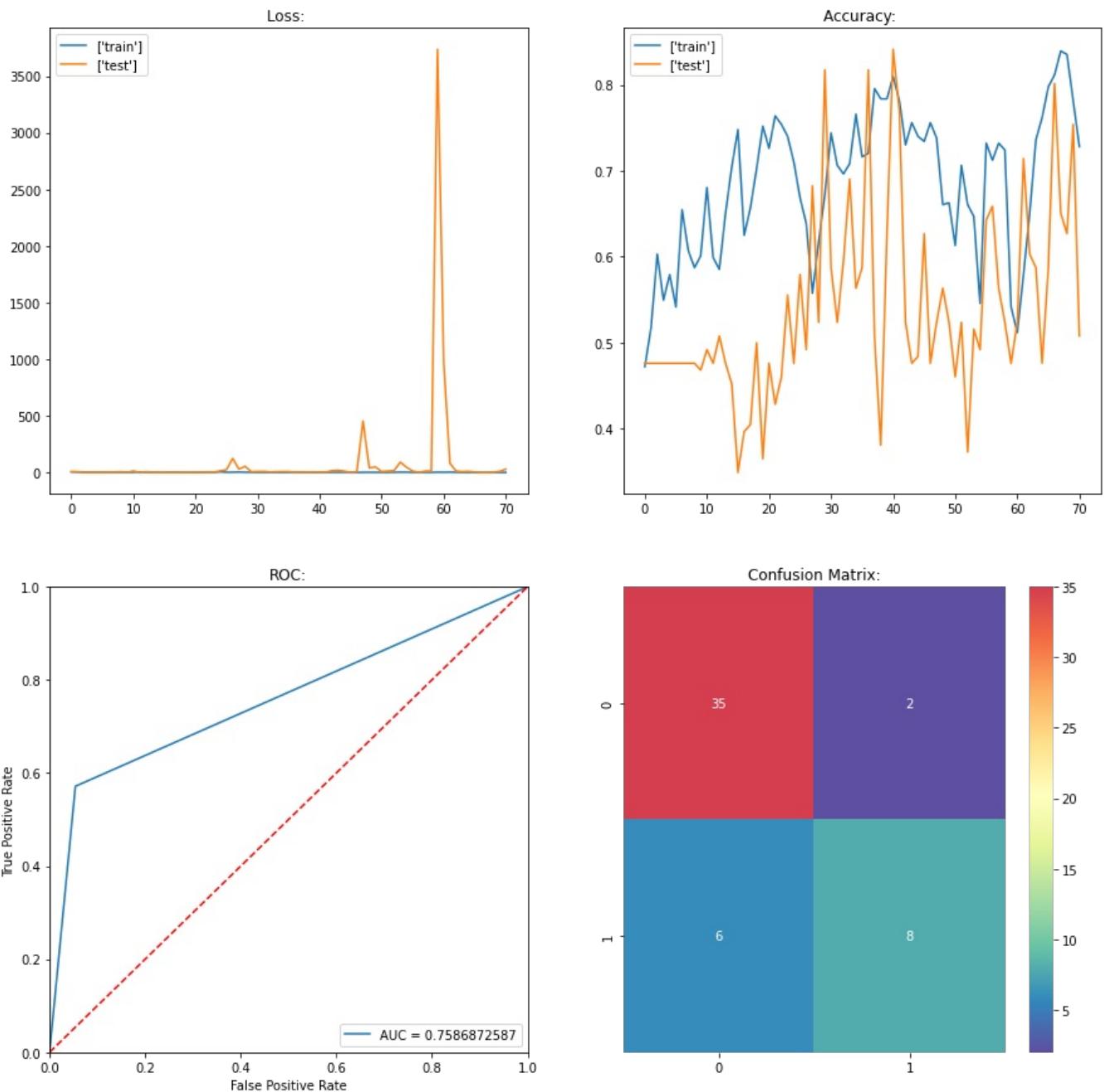
axes[1][0].set_title('ROC:')
axes[1][0].plot(fpr, tpr, label = 'AUC = %0.10f' % (roc_auc))
axes[1][0].legend(loc = 'lower right')
axes[1][0].plot([-0, 1], [0, 1], 'r--')
axes[1][0].set_xlim([-0, 1])
axes[1][0].set_ylim([-0, 1])
axes[1][0].set_ylabel('True Positive Rate')
axes[1][0].set_xlabel('False Positive Rate')

axes[1][1].set_title('Confusion Matrix:')
sns.heatmap(confusion_matrix(true,preds),ax=axes[1][1],annot=True,cmap=newcmp)

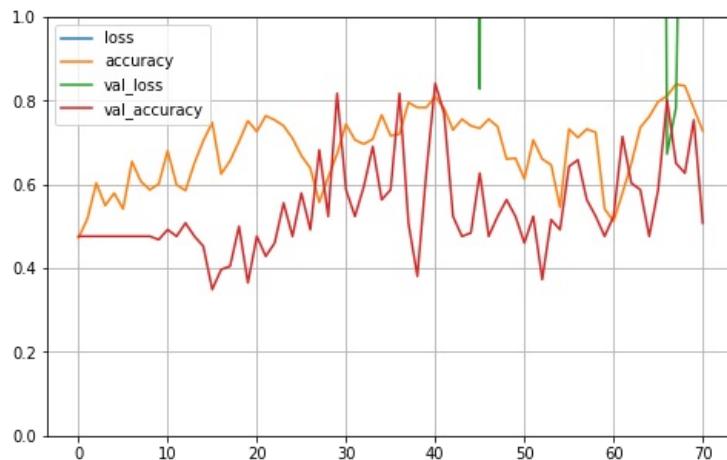
axes[0][1].set_title('Accuracy: ')
axes[0][1].plot(bessst_history.history["accuracy"],label=['train'])
axes[0][1].plot(bessst_history.history["val_accuracy"],label=['test'])
axes[0][1].legend()

axes[0][0].set_title('Loss: ')
axes[0][0].plot(bessst_history.history["loss"],label=['train'])
axes[0][0].plot(bessst_history.history["val_loss"],label=['test'])
axes[0][0].legend()

plt.show()
```



```
In [22]: pd.DataFrame(best_history.history).plot(figsize=(8, 5))
plt.grid(True)
plt.gca().set_ylim(0, 1)
plt.show()
```



Próbnna klasyfikacja

Klasyfikator Nie poradził sobie jakoś nadmiernie dobrze: Accuracy niby 84% ale Recall jedynie 50%. Sprawdźmy jednak dane, czy faktycznie będzie to taki problem, i czy pomyłki klasyfikatora mogą być uzasadnione dużą spornością danych

```
In [213]: import matplotlib.pyplot as plt
```

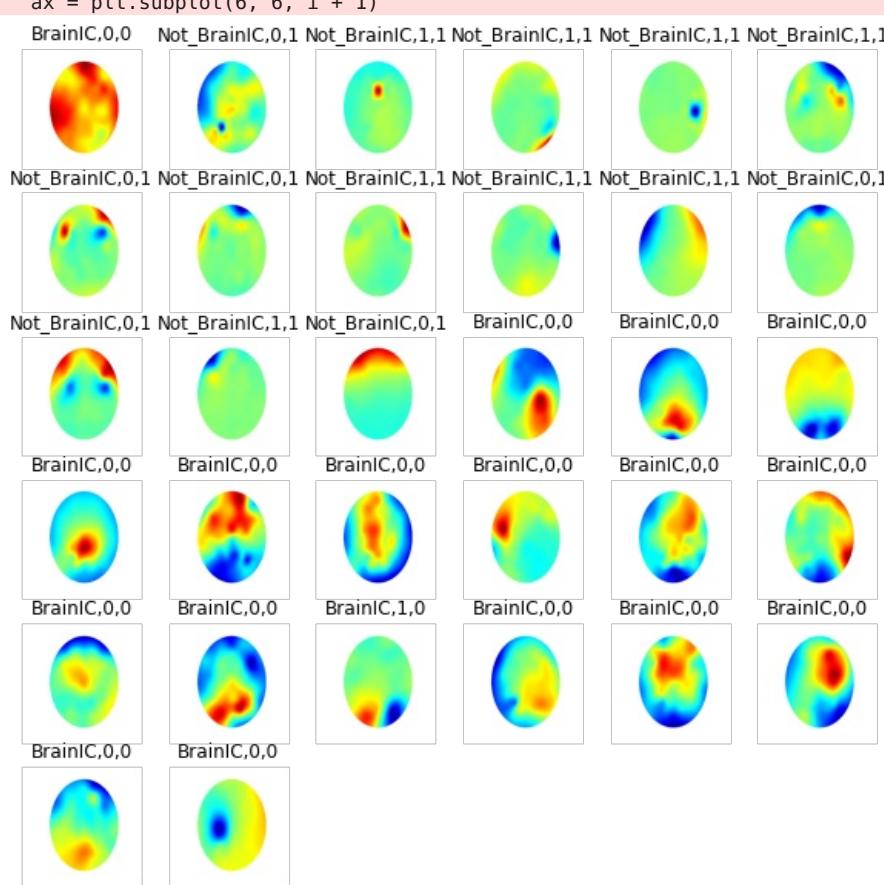
```

plt.figure(figsize=(10, 10))
for data_pack in test_ds:
    images = data_pack[0]
    labels = data_pack[1]
    preds = np.argmax(img_model.predict(images), axis=1)
    print(len(images))
    for i in range(len(images)):
        ax = plt.subplot(6, 6, i + 1)
        ax.set_width = 20
        ax.set_height = 20
        plt.imshow(np.array(images[-i]).astype("uint8"))
        plt.title('{}, {}, {}'.format(class_names[labels[-i]], preds[-i], labels[-i]))
        plt.axis("off")

```

32
19

C:\Users\barak\AppData\Local\Temp\ipykernel_22372\1352893733.py:10: MatplotlibDeprecationWarning: Adding an axes using the same arguments as a previous axes currently reuses the earlier instance. In a future version, a new instance will always be created and returned. Meanwhile, this warning can be suppressed, and the future behavior ensured, by passing a unique label to each axes instance.



In [201]: `len(test_ds)`

Out[201]: 2

Widac pomyłki modelu: wadliwe komponenty to 2,7, 8 ,12,13,15. Naromiast tylko drugi oraz 15 wyraźnie jest komponentem mózgowym. Reszta, mogła zostać zaklasyfikowana tak przez badacza z powodu ich pomieszanego z komponentami mózgowymi - co dla badania obecnego było wskazane, natomiast ogólnie jest problematyczne

Oznacza to, że błędy popełniane przez model nie są jakies rażące i popełnia on błędy tam, gdzie może to być faktycznie problematyczne.

Zachowanie modelu

Model do obrazków był tym trudniejszy do wyuczenia. Lepiej go zachowajmy dla przyszłych pokoleń.

In [29]: `model_img = model
model_img.save(r'..\Models\img_model_wightd')`

INFO:tensorflow:Assets written to: ..\Models\img_model_wightd\assets

Preidykcje łączone

Czy biorąc oba modele na zbiorze testowym, uda się osiągnąć nieco lepsze predykcje?

zeby jednak oba modele załadowac poprawnie trzeba trochę pokombinować z danymi. Ładowaliśmy nasze dane testowe bez przeprowadzania shuffle - w takim razie jest to po prostu konkatenacja klas 0 --> Brainlc wraz z klasą 1 --> Not_Brainlc.

Musimy analogicznie przekształcić dane kategoryczne - Pamiętając, żeby zachować kolejność - sprowadza się to na stworzeniu tabel - Brainlc oraz Not_Brainlc- uporządkowaniu ich, po czym dodaniu do siebie!

In [70]:

```
from tensorflow import keras
img_model = keras.models.load_model(r'.\Models\img_model_wightd')
img_model.evaluate(test_ds)

2/2 [=====] - 1s 109ms/step - loss: 2.8840 - accuracy: 0.8431
[2.8840086460113525, 0.843137264251709]
```

Out[70]:

In [72]: cat_model = keras.models.load_model(r'.\Models\cat')

In [103]: Testing_data = X_test
Testing_data['Y'] = y_test

In [94]: table_Not_brain = Testing_data[Testing_data['Y']==0]
table_Brain = Testing_data[Testing_data['Y']==1]
vertical_stack = pd.concat([table_Brain, table_Not_brain], axis=0)
X_test_mix = vertical_stack.drop('Y', axis=1)
X_test_mix

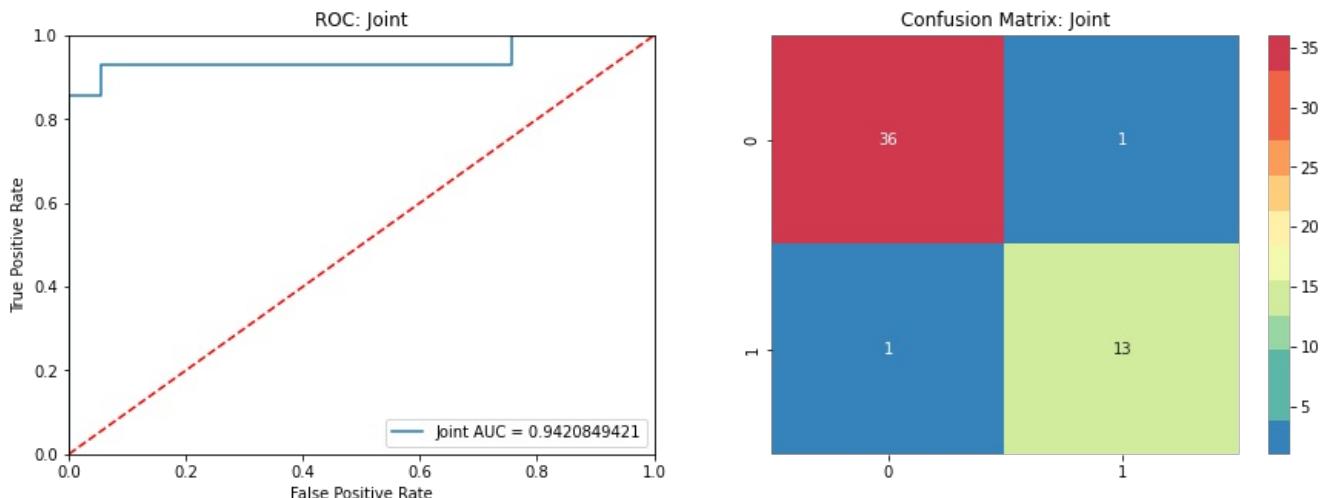
Out[94]:

	Elc_power_core	Elc_spectrum_corr	Kurtosis	Spect_flat	Spect_one_over_f	elc_signal_corr
2	1.436083	0.773469	-0.208194	-0.353666	0.349252	2.442805
3	-0.100024	-0.286024	-0.208178	0.774359	-2.265202	0.558686
4	-0.183061	0.368642	-0.191175	1.602942	0.402597	0.021864
5	-0.390052	-0.468381	-0.159276	2.434326	-3.401059	0.195632
6	-0.372215	0.407515	-0.206643	1.649494	-0.262706	-0.146167
7	-0.267822	0.378116	-0.212784	-0.805825	0.125648	0.462130
8	0.497756	-0.352031	-0.204984	1.147859	-2.789764	0.418053
9	-0.376351	0.603870	-0.212344	0.049548	0.102988	0.714924
10	0.566264	-2.038733	-0.188525	1.207898	-3.340011	-0.055839
11	-0.300986	0.299872	-0.211757	-0.649044	0.615762	-0.237778
14	-0.496852	0.255744	-0.187834	0.380588	-0.437678	-0.211687
15	-0.434347	0.483959	-0.212826	-0.339790	0.374727	-0.088460
16	0.149205	-0.047220	-0.209402	0.043003	-0.996575	0.229689
18	-0.066576	0.216127	-0.199826	0.673294	-0.795634	-0.504859
19	0.108627	0.374731	-0.211413	0.176570	0.263856	-0.046139
20	0.394568	0.699646	-0.209393	0.053273	0.418170	-0.045244
21	-0.185102	0.211910	-0.203147	-0.526294	0.055873	-0.249178
22	-0.095635	0.621034	-0.212347	0.341832	0.218692	-0.467208
23	-0.578465	0.016239	-0.110695	-0.936788	0.229137	-0.441095
24	-0.491815	0.699644	-0.213959	-0.063258	0.281025	-0.114598
26	-0.524819	0.674730	-0.212595	0.007576	0.431777	-0.317862
28	-0.186722	-1.257648	-0.209138	-1.175263	0.349717	-0.491402
29	-0.229894	0.237861	-0.206289	0.885570	-0.968862	-0.223787
31	-0.325574	0.580609	-0.212035	0.019535	0.660676	-0.230142
33	-0.063624	0.065170	-0.203987	-0.644642	0.194486	-0.424591
34	-0.375102	0.103168	-0.211767	-0.715646	0.520007	-0.164595
35	-0.353868	0.498257	-0.213142	-0.148746	0.645928	-0.463143
36	0.045628	0.594385	-0.213356	-0.382727	0.578589	-0.317104
37	-0.545755	0.586770	-0.213728	-0.281959	0.618425	-0.188660
39	-0.296847	0.231058	-0.212608	-0.917274	0.723772	-0.481939
40	-0.287671	0.640556	-0.206633	0.274189	0.809887	-0.355819
41	-0.484001	0.319101	-0.131696	-0.650055	-0.018065	-0.488324
42	-0.526581	0.485460	-0.213704	-0.429552	0.435933	-0.420611
44	-0.474455	0.270898	-0.214184	-0.690134	0.356884	-0.149445
46	-0.333513	0.619579	-0.213367	-0.391412	0.585206	-0.406313
47	-0.418345	0.620409	-0.201635	0.091845	0.452759	-0.427986
49	-0.208578	0.703822	0.131126	-0.453301	0.669481	-0.499067
0	4.910486	0.961457	-0.039870	3.330681	0.501824	4.838424
1	4.222781	0.868745	-0.187060	2.159324	0.841020	3.716037
12	-0.132190	-2.767742	-0.213841	-1.076312	0.301406	-0.399909
13	0.110429	-1.626206	-0.118667	-1.018585	-1.428962	-0.461497
17	-0.344096	-3.906490	-0.213295	-1.108203	0.471019	-0.397671
25	-0.442058	0.713960	-0.199273	0.090513	0.589017	-0.527222
27	-0.201281	-1.472598	-0.191675	-1.186244	0.553337	-0.096223
30	-0.112363	-0.923784	-0.212818	-1.037771	0.434386	-0.351033
32	0.172643	-1.327714	-0.210614	-1.099475	0.478582	-0.239139
38	0.308218	-1.555860	-0.198541	-1.005665	-0.031648	-0.489088
43	-0.474038	0.670556	0.252956	0.880865	0.360380	-0.500077
45	-0.408605	-0.248616	6.774897	-0.936709	-0.514534	-0.594867
48	-0.419462	0.779409	1.392795	0.944256	0.765907	-0.420588
50	-0.413946	0.642568	0.498444	-0.195003	0.482567	-0.461888

Po takim przekształceniu, musimy pamiętać **że dla danych korelacyjnych klasa 0 to klasa Not_brain a dla obrazkowych, 0 to Brain!** oznacza to, że możemy skorzystać z tego samego wektora, TYLKO musimy odwrócić nasze predykcje w jednym modelu:

```
In [188]: fpr, tpr, threshold = roc_curve(true, ((preds + categorical_preds)/2)[:,1])
roc_auc = metrics.auc(fpr, tpr)
fig,axes = plt.subplots(1,2)
fig.set_figwidth(15)
fig.set_figheight(5)
axes[0].set_title('ROC: {}'.format('Joint'))
axes[0].plot(fpr, tpr, label = '%s AUC = %0.10f' % ('Joint', roc_auc))
axes[0].legend(loc = 'lower right')
axes[0].plot([-0, 1], [0, 1], 'r--')
axes[0].set_xlim([-0, 1])
axes[0].set_ylim([-0, 1])
axes[0].set_ylabel('True Positive Rate')
axes[0].set_xlabel('False Positive Rate')

axes[1].set_title('Confusion Matrix: {}'.format('Joint'))
sns.heatmap(confusion_matrix(true,joint_predictions),ax=axes[1],annot=True,cmap=newcmp)
plt.show()
```



Można łatwo zauważyc, że model połączony - najlepszy klasyfikator: SVC rbf, wraz z siecią neuronową dają **najlepsze wyniki** ponieważ razem wspierają swoje predykcje przez uśrednianie.

Pokazuje to że możliwe jest stworzenie mieszanego, usrednionego klasyfikatora który by przewidywał takie rzeczy!

```
In [183]: import pandas as pd  
d = {'precision_score': lst_precision_score,  
     'recall_score': lst_recall_score,  
     'f1_score': lst_f1_score,  
     'accuracy_score' : lst_accuracy_score  
     }  
df = pd.DataFrame(data=d)  
df.insert(loc=0, column='Method', value=['SVM rbf','SVM linear','LogReg','GraBoost','AdaBoost','Bagging','RFore  
df
```

Out[183]:

	Method	precision_score	recall_score	f1_score	accuracy_score
0	SVM rbf	0.971429	0.918919	0.944444	0.921569
1	SVM linear	0.945946	0.945946	0.945946	0.921569
2	LogReg	0.918919	0.918919	0.918919	0.882353
3	GraBoost	1.000000	0.594595	0.745763	0.705882
4	AdaBoost	1.000000	0.648649	0.786885	0.745098
5	Bagging	1.000000	0.648649	0.786885	0.745098
6	RForest	1.000000	0.648649	0.786885	0.745098
7	Dense	0.853659	0.945946	0.897436	0.843137
8	Image	0.800000	0.571429	0.666667	0.843137
9	Joint	0.928571	0.928571	0.928571	0.960784

In []:

In []: