Bank Churn Prediction with Neural Net

Problem Statement:

Businesses like Banks have to worry about the problem of "Churn" or customers leaving to another service provider. It is important to understand which sevices influence a customer's decision.

Objective:

Given a bank customer, build a neural network-based classifier that can determine whether they will leave or not in the next 6 months.

Data Description:

- RowNumber
- CustomerId: Unique ID which is assigned to each customer.
- Surname: Last name of the customer.
- CreditScore: It defines the credit history of the customer.
- Geography: A customer’s location.
- Gender: It defines the Gender of the customer.
- Age: Age of the customer.
- Tenure: Number of years for which the customer has been with the bank.
- NumOfProducts: It refers to the number of products that a customer has purchased through the bank.
- Balance: Account balance
- HasCrCard: It is a categorical variable that decides whether the customer has a credit card or not.
- EstimatedSalary: Estimated salary
- isActiveMember: It is a categorical variable that decides whether the customer is an active member of the bank or not (Active member in the sense, using bank products regularly, making transactions, etc).
- Exited: It is a categorical variable that decides whether the customer left the bank within six months or not. It can take two values.

```
0=No ( Customer did not leave the bank )

1=Yes ( Customer left the bank )
```

Libraries:

In [1]:
```
import tensorflow as tf

print(tf.__version__)
```

```
2.7.0
```

In [2]:
```
%load_ext nb_black
# Library to suppress warnings or deprecation notes
import warnings

warnings.filterwarnings("ignore")

# Libraries to help with reading and manipulating data
import numpy as np
import pandas as pd

# Libraries to help with data visualization
import matplotlib.pyplot as plt

%matplotlib inline
import seaborn as sns

# to scale the data
from sklearn import preprocessing
from sklearn.preprocessing import StandardScaler
from sklearn.preprocessing import MinMaxScaler

# to split data
from sklearn.model_selection import train_test_split

# To oversample and undersample data
from imblearn.over_sampling import SMOTE
from imblearn.under_sampling import RandomUnderSampler

# model building and scores
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Dropout
from sklearn.metrics import (
    accuracy_score,
    confusion_matrix,
    precision_score,
    recall_score,
    f1_score,
    precision_recall_curve,
    auc,
)
from tensorflow.keras import optimizers
from tensorflow.keras.optimizers import Adam
from tensorflow.keras.optimizers import RMSprop
from tensorflow.keras.optimizers import Nadam
from sklearn.decomposition import PCA
from tensorflow.keras.callbacks import LearningRateScheduler
from tensorflow.keras import layers
```

Read Dataset

In [3]:
```
data = pd.read_csv("bank.csv")

df = data.copy()
```

Data Info/Details

In [4]:
```
df.head()
```

Out[4]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance
0	1	15634602	Hargrave	619	France	Female	42	2	0.00
1	2	15647311	Hill	608	Spain	Female	41	1	83807.86
2	3	15619304	Onio	502	France	Female	42	8	159660.80
3	4	15701354	Boni	699	France	Female	39	1	0.00
4	5	15737888	Mitchell	850	Spain	Female	43	2	125510.82

In [5]:
```
df.tail()
```

Out[5]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Bala
9995	9996	15606229	Obijiaku	771	France	Male	39	5	0
9996	9997	15569892	Johnstone	516	France	Male	35	10	57369
9997	9998	15584532	Liu	709	France	Female	36	7	0
9998	9999	15682355	Sabbatini	772	Germany	Male	42	3	75075
9999	10000	15628319	Walker	792	France	Female	28	4	130142

In [6]:
```
np.random.seed(2)
df.sample(10)
```

Out[6]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	
7878	7879	15760456	Eberechukwu	731	France	Female	38	10	1
3224	3225	15713463	Tate	645	Germany	Female	41	2	13
1919	1920	15739858	Otitodilichukwu	618	France	Male	56	7	
4432	4433	15751193	Nnaemeka	621	Spain	Male	33	4	
4835	4836	15590623	Kovalyov	561	Spain	Male	34	4	
4895	4896	15589435	Davide	784	France	Male	31	7	
7269	7270	15675926	Ardis	655	Germany	Male	34	7	11
1451	1452	15684198	McDonald	551	France	Female	38	10	
1742	1743	15578603	Alexeieva	584	Germany	Female	54	1	7
4628	4629	15788151	Moore	650	Spain	Male	32	1	1

In [7]:
```
print(f"There are {df.shape[0]} rows and {df.shape[1]} columns.")
```

```
There are 10000 rows and 14 columns.
```

In [8]:
```
df[data.duplicated()].count()
```

Out[8]:
```
RowNumber          0
CustomerId         0
Surname            0
CreditScore        0
Geography          0
Gender             0
Age                0
Tenure             0
Balance            0
NumOfProducts      0
HasCrCard          0
IsActiveMember     0
EstimatedSalary    0
Exited             0
dtype: int64
```

In [9]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 14 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   RowNumber        10000 non-null  int64  
 1   CustomerId       10000 non-null  int64  
 2   Surname          10000 non-null  object 
 3   CreditScore      10000 non-null  int64  
 4   Geography        10000 non-null  object 
 5   Gender           10000 non-null  object 
 6   Age              10000 non-null  int64  
 7   Tenure           10000 non-null  int64  
 8   Balance          10000 non-null  float64
 9   NumOfProducts    10000 non-null  int64  
 10  HasCrCard        10000 non-null  int64  
 11  IsActiveMember   10000 non-null  int64  
 12  EstimatedSalary  10000 non-null  float64
 13  Exited           10000 non-null  int64  
dtypes: float64(2), int64(9), object(3)
memory usage: 1.1+ MB
```

In [10]:
```
df.isnull().sum()
```

Out[10]:
```
RowNumber          0
CustomerId         0
Surname            0
CreditScore        0
Geography          0
Gender             0
Age                0
Tenure             0
Balance            0
NumOfProducts      0
HasCrCard          0
IsActiveMember     0
```

```
EstimatedSalary    0
Exited             0
dtype: int64
```

In [11]:
```
df.describe().T
```

Out[11]:

	count	mean	std	min	25%	50%
RowNumber	10000.0	5.000500e+03	2886.895680	1.00	2500.75	5.000500e+03
CustomerId	10000.0	1.569094e+07	71936.186123	15565701.00	15628528.25	1.569074e+07
CreditScore	10000.0	6.505288e+02	96.653299	350.00	584.00	6.520000e+02
Age	10000.0	3.892180e+01	10.487806	18.00	32.00	3.700000e+01
Tenure	10000.0	5.012800e+00	2.892174	0.00	3.00	5.000000e+00
Balance	10000.0	7.648589e+04	62397.405202	0.00	0.00	9.719854e+04
NumOfProducts	10000.0	1.530200e+00	0.581654	1.00	1.00	1.000000e+00
HasCrCard	10000.0	7.055000e-01	0.455840	0.00	0.00	1.000000e+00
IsActiveMember	10000.0	5.151000e-01	0.499797	0.00	0.00	1.000000e+00
EstimatedSalary	10000.0	1.000902e+05	57510.492818	11.58	51002.11	1.001939e+05
Exited	10000.0	2.037000e-01	0.402769	0.00	0.00	0.000000e+00

In [12]:
```
# dropping unneeded columns
df.drop(["RowNumber"], inplace=True, axis=1)  # contains no useful information
df.drop(["CustomerId"], inplace=True, axis=1)  # contains no useful information
df.drop(["Surname"], inplace=True, axis=1)  # contains no useful information
df.drop(
    ["Tenure"], inplace=True, axis=1
)  # since we are focused on a time frame of 6 months, the number of years a cus
```

EDA

Univariate

In [13]:
```
# checking the percentage of each class in the dataset
(data.Exited.value_counts()) / (data.Exited.count())
```

Out[13]:
```
0    0.7963
1    0.2037
Name: Exited, dtype: float64
```

- 80% of the customers did not leave the bank within 6 months.
- 20% of the customers left the bank within 6 months.

In [14]:
```
# Making a list of all categorical variables
cat_col = [
    "Geography",
    "Gender",
```

```
]

# Printing number of count of each unique value in each column
for column in cat_col:
    print(data[column].value_counts())
    print("-" * 40)
```

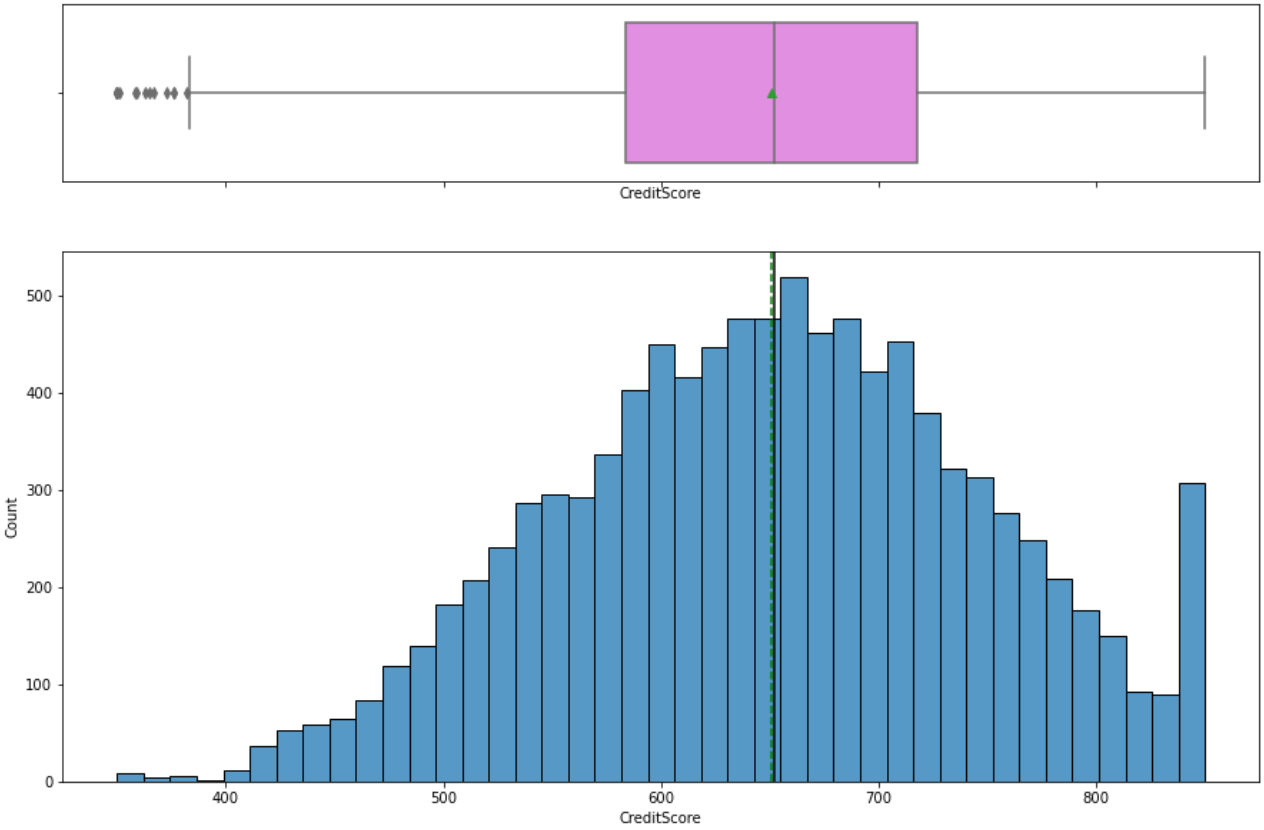
```
France     5014
Germany    2509
Spain      2477
Name: Geography, dtype: int64
----------------------------------------
Male      5457
Female    4543
Name: Gender, dtype: int64
----------------------------------------
```

- More than half of the customers are in France.
- There are a bit more Males.

In [15]:
```
def histogram_boxplot(data, feature, figsize=(15, 10), kde=False, bins=None):
    """
    Boxplot and histogram combined

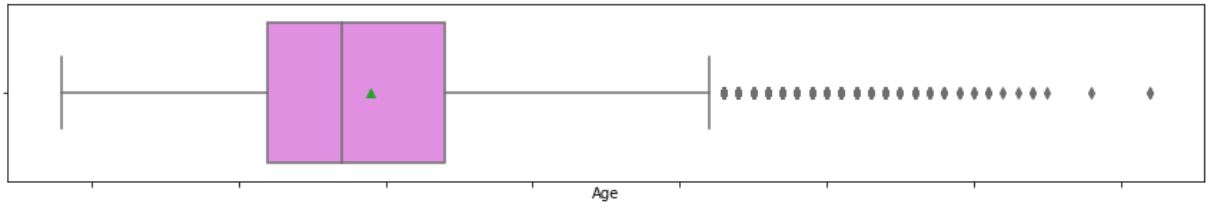
    data: dataframe
    feature: dataframe column
    figsize: size of figure (default (15,10))
    kde: whether to show the density curve (default False)
    bins: number of bins for histogram (default None)
    """
    f2, (ax_box2, ax_hist2) = plt.subplots(
        nrows=2,
        sharex=True,
        gridspec_kw={"height_ratios": (0.25, 0.75)},
        figsize=figsize,
    )
    sns.boxplot(data=data, x=feature, ax=ax_box2, showmeans=True, color="violet"
    sns.histplot(
        data=data, x=feature, kde=kde, ax=ax_hist2, bins=bins, palette="winter"
    ) if bins else sns.histplot(data=data, x=feature, kde=kde, ax=ax_hist2)
    ax_hist2.axvline(data[feature].mean(), color="green", linestyle="--")
    ax_hist2.axvline(data[feature].median(), color="black", linestyle="-")
```

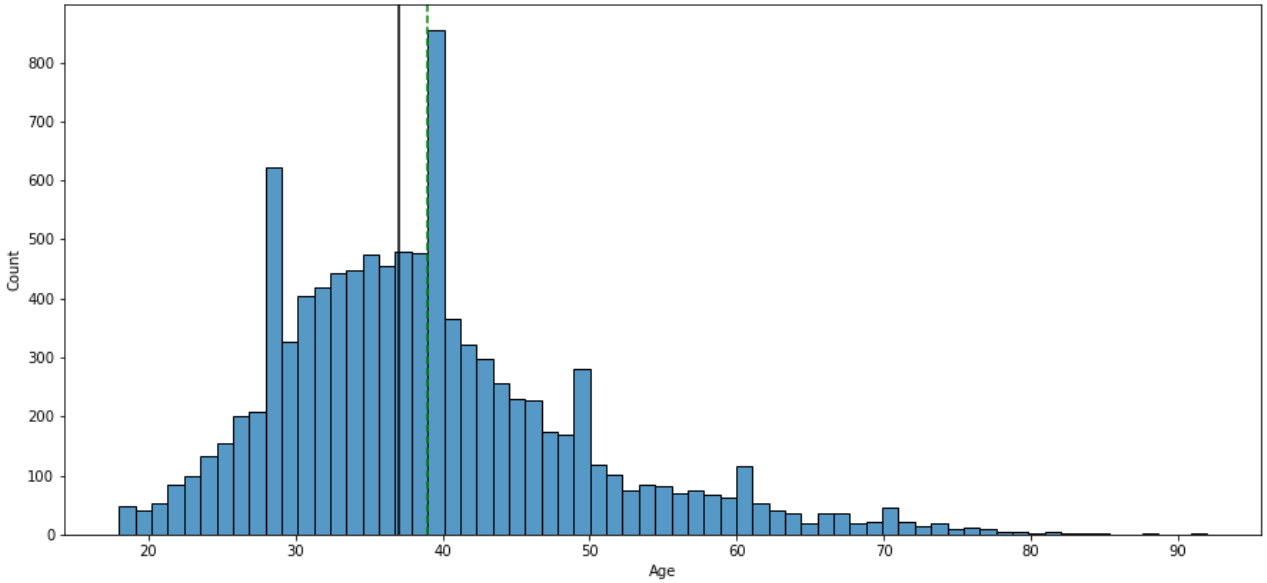
In [16]:
```
# Observation on CreditScore
histogram_boxplot(df, "CreditScore")
```



- CreditScore is almost normally distributed, but is a bit left-skewed.

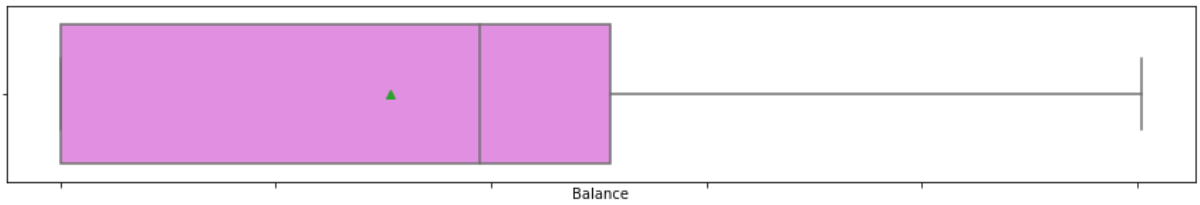
In [17]:
```
# Observation on Age
histogram_boxplot(df, "Age")
```

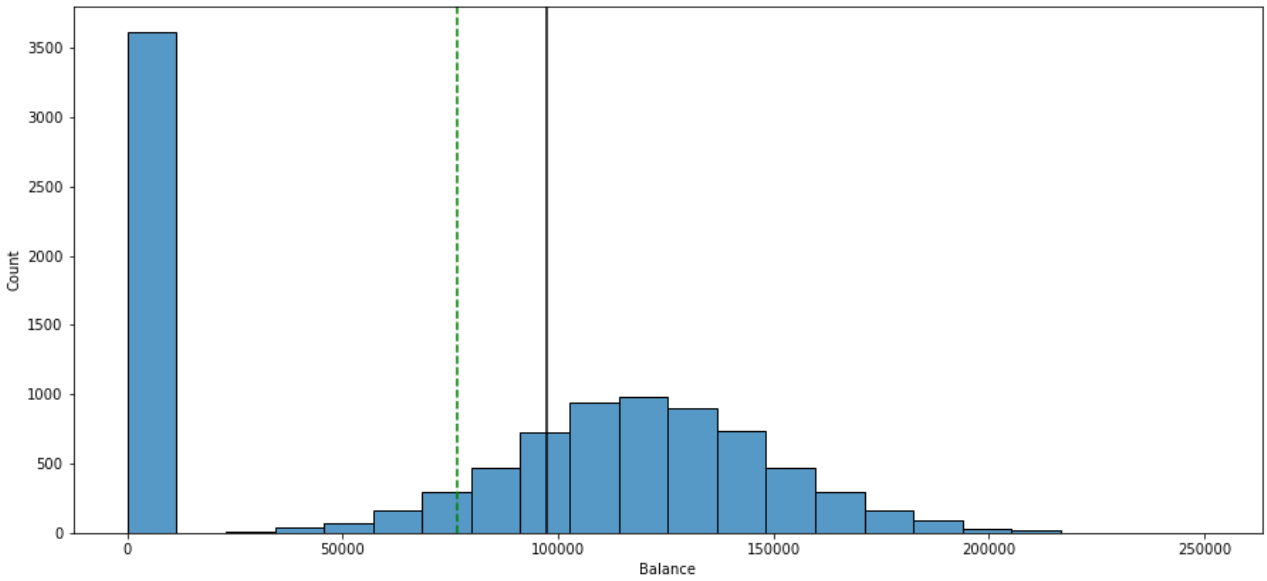




- Age is right-skewed.

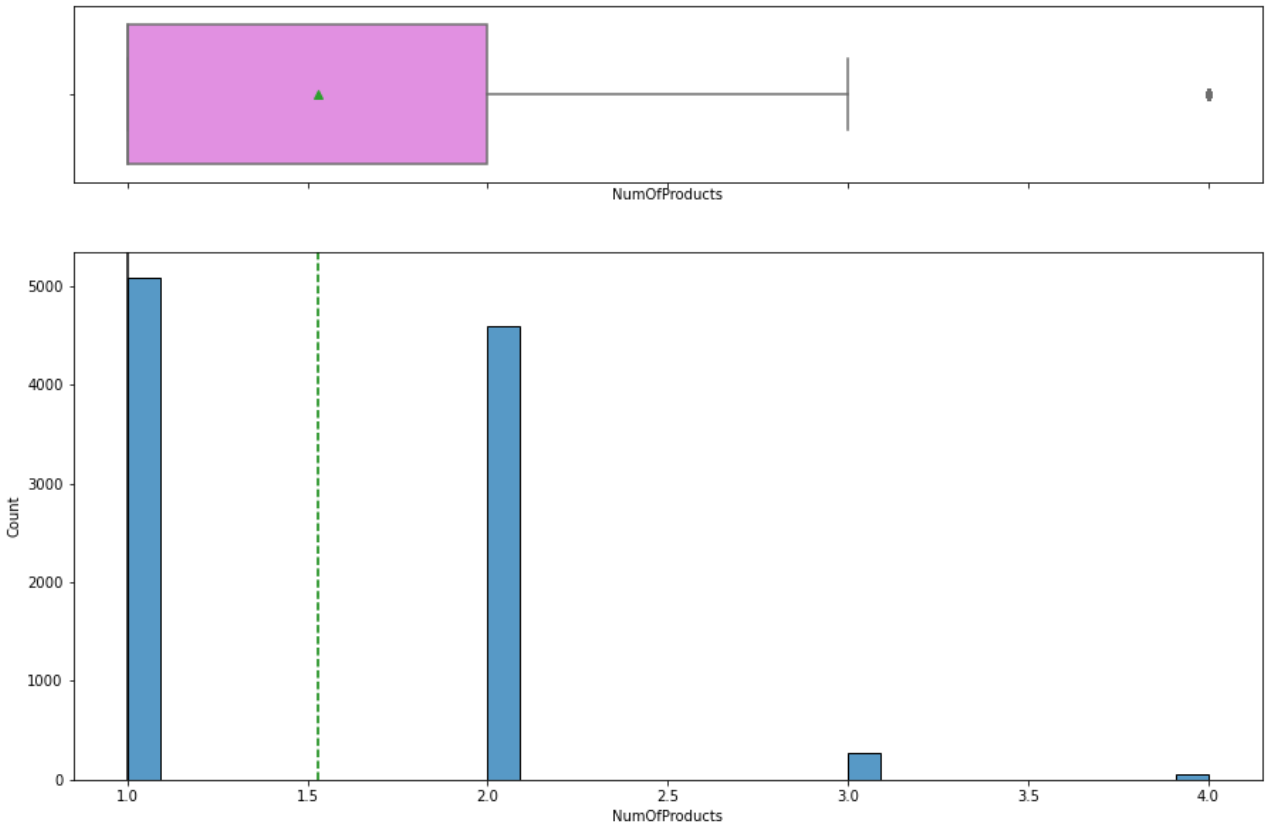
In [18]:
```
# Observation on Balance
histogram_boxplot(df, "Balance")
```





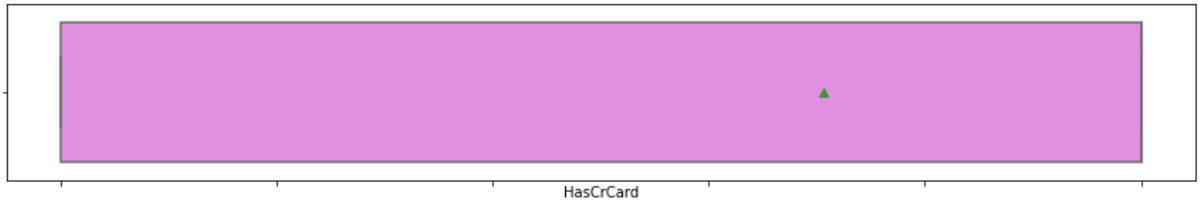
- There are a lot of customers with a balance of 0, so the data is right-skewed.

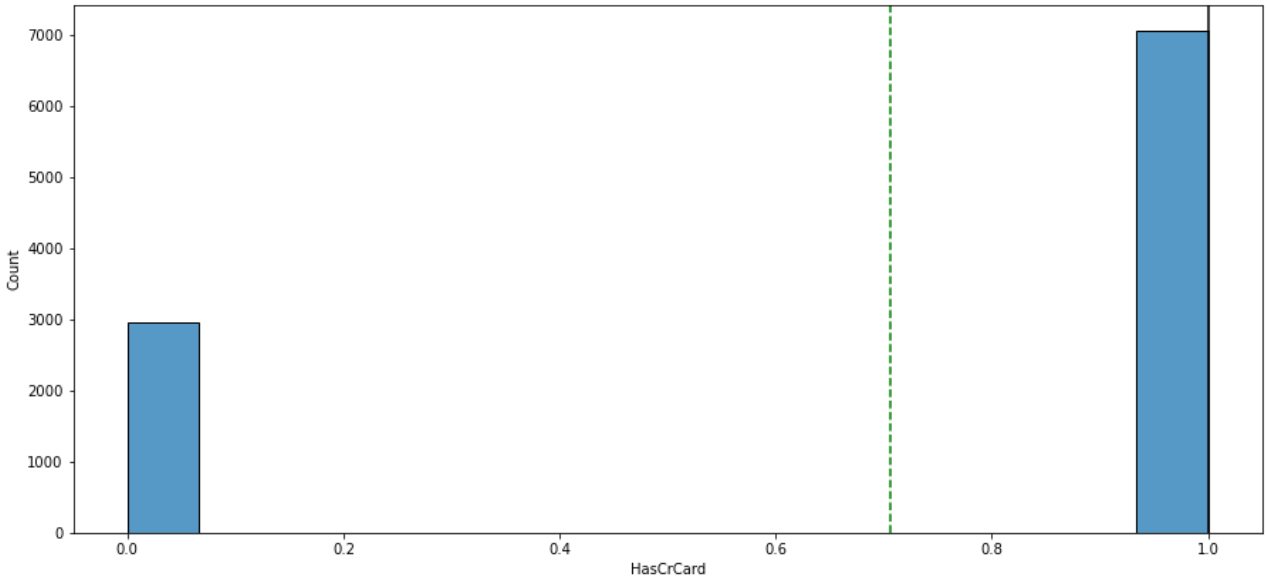
In [19]:
```
# Observation on NumOfProducts
histogram_boxplot(df, "NumOfProducts")
```



- Most people only buy 1 or 2 products.

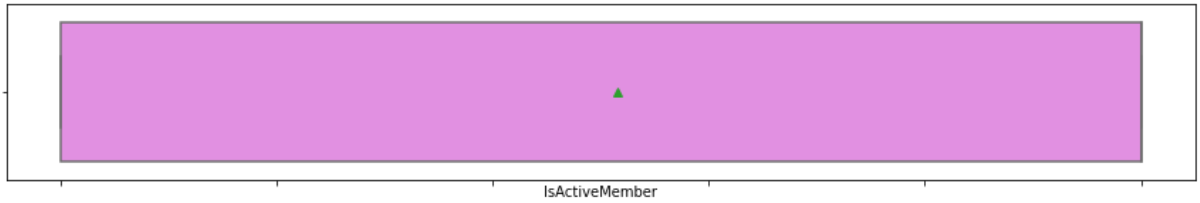
In [20]:
```
# Observation on HasCrCard
histogram_boxplot(df, "HasCrCard")
```

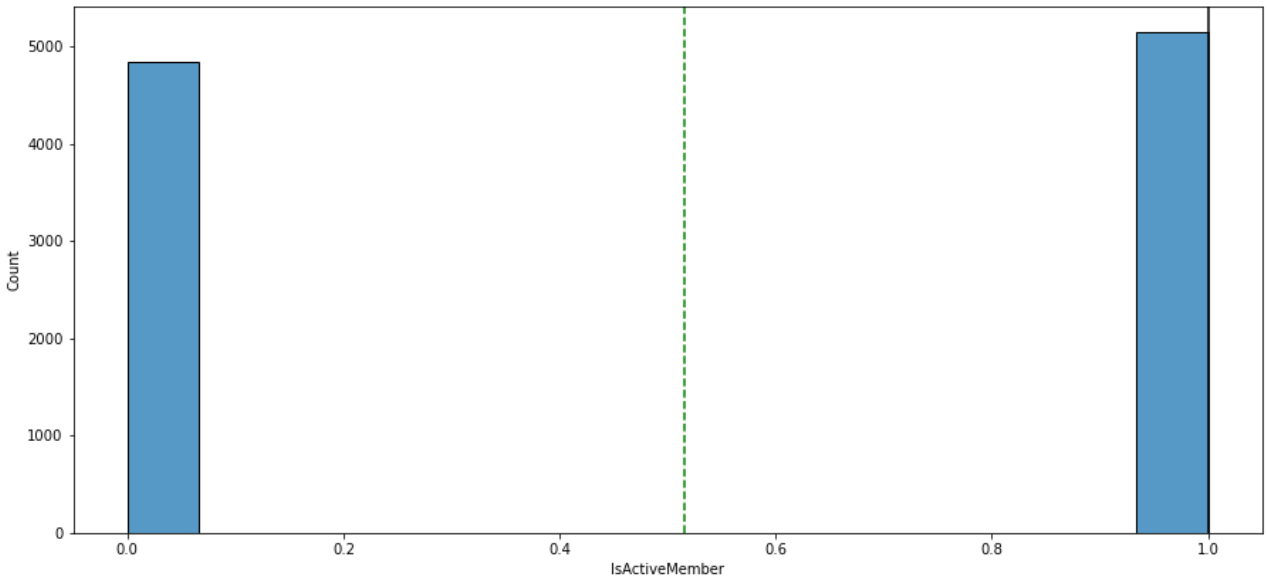




- More than half of the customers have a credit card.

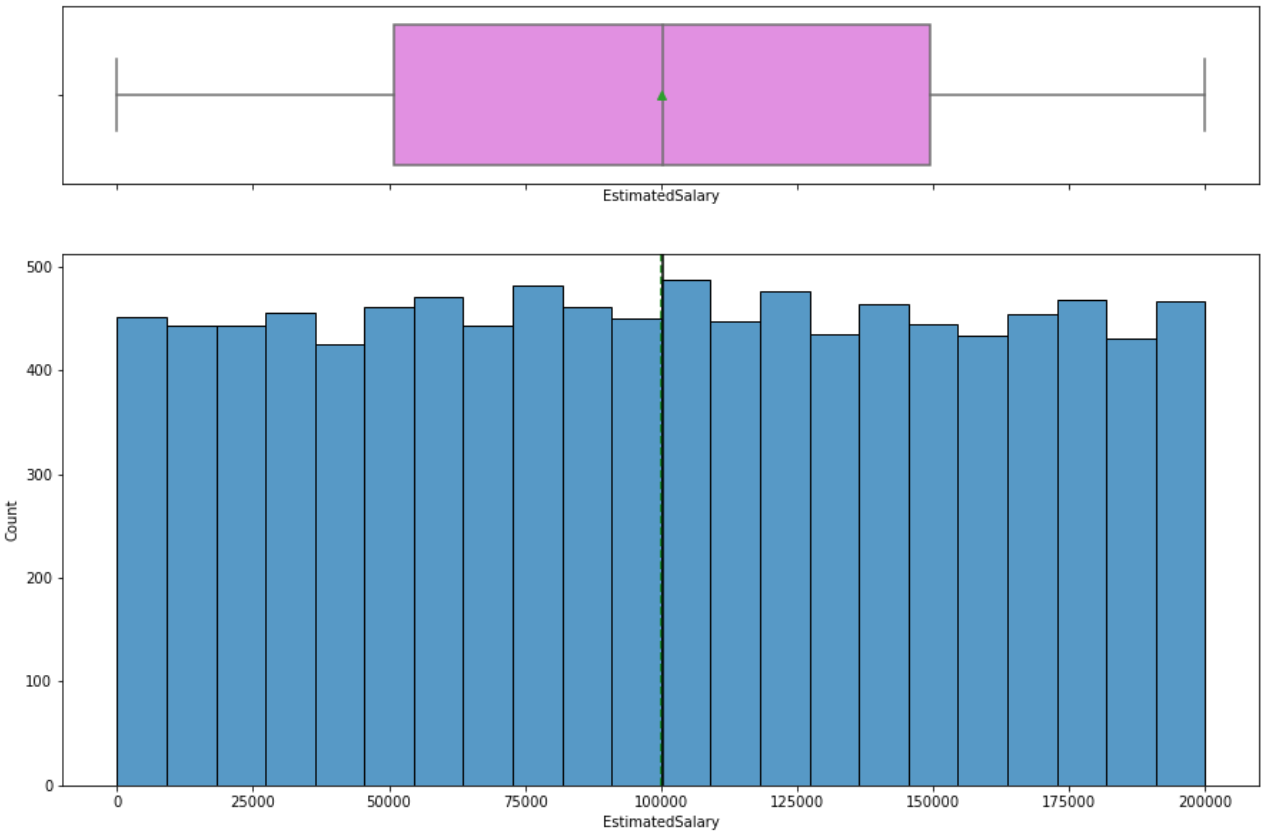
In [21]:
```
# Observation on IsActiveMember
histogram_boxplot(df, "IsActiveMember")
```





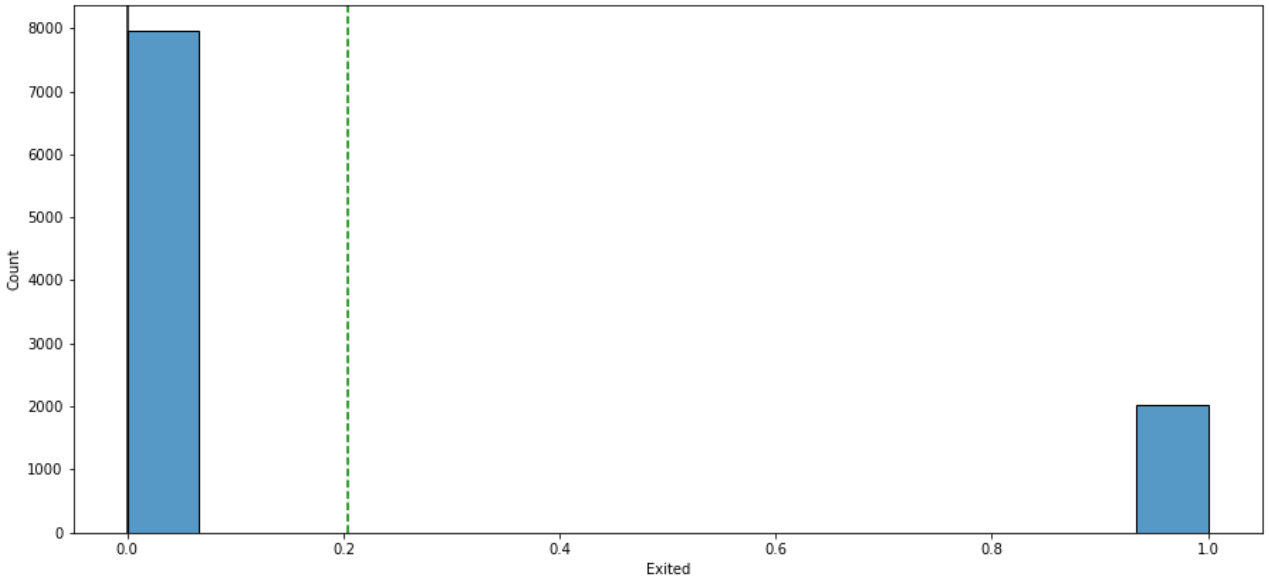
- There are almost the same amount of active members as inactive members.

In [22]:
```
# Observation on EstimatedSalary
histogram_boxplot(df, "EstimatedSalary")
```



- EstimatedSalary is uniformly distributed.

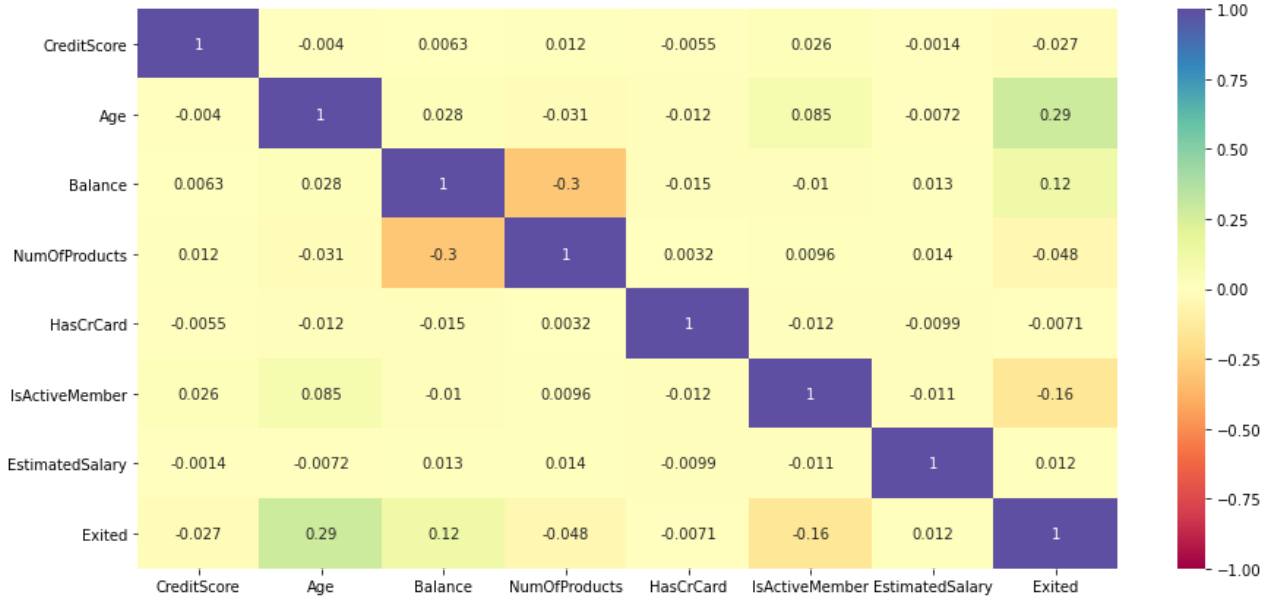
In [23]:
```
# Observation on Exited
histogram_boxplot(df, "Exited")
```



- Most customers don't leave the bank within 6 months.

Bivariate

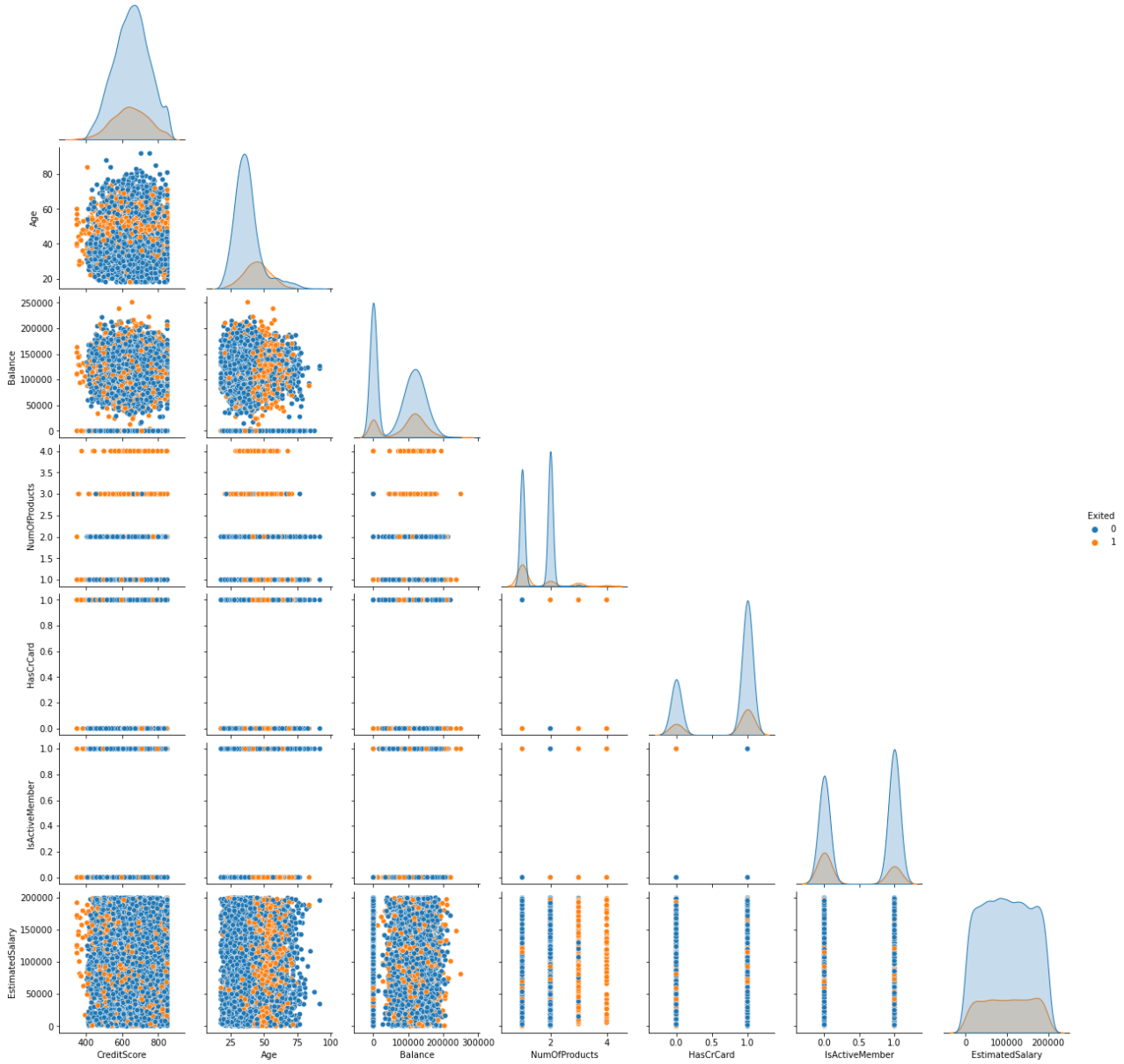
In [24]:
```
plt.figure(figsize=(15, 7))
sns.heatmap(df.corr(), annot=True, vmin=-1, vmax=1, cmap="Spectral")
plt.show()
```



- No variables are highly correlated.

In [25]:
```
sns.pairplot(df, corner=True, hue="Exited")
```

Out[25]:
```
<seaborn.axisgrid.PairGrid at 0x18590b9d6d0>
```



- Most customers who bought more than 2 products left the bank within 6 months.
- Looks like most people who left are in their 50/60s.
- Pretty much everyone with a credit score under 400 left the bank.

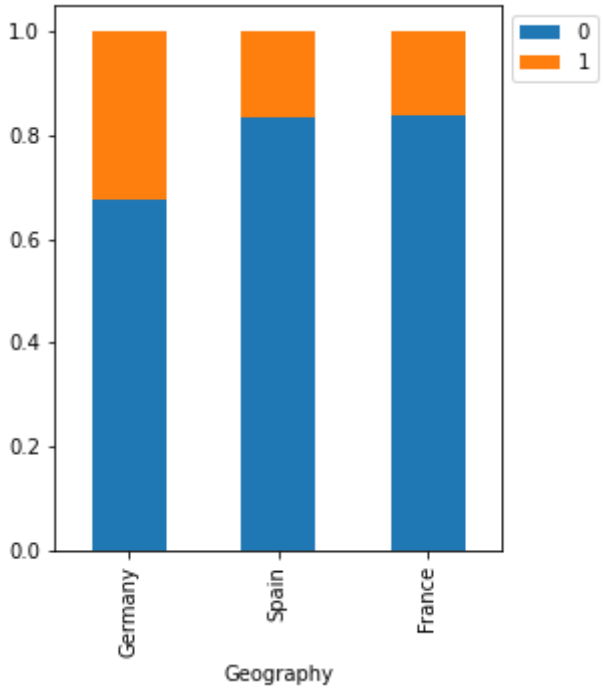
In [26]:
```
def stacked_barplot(data, predictor, target):  # function for stacked barplot
    """
    Print the category counts and plot a stacked bar chart

    data: dataframe
    predictor: independent variable
    target: target variable
    """
    count = data[predictor].nunique()
    sorter = data[target].value_counts().index[-1]
    tab1 = pd.crosstab(data[predictor], data[target], margins=True).sort_values(
```

```
        by=sorter, ascending=False
    )
    print(tab1)
    print("-" * 120)
    tab = pd.crosstab(data[predictor], data[target], normalize="index").sort_val
        by=sorter, ascending=False
    )
    tab.plot(kind="bar", stacked=True, figsize=(count + 1, 5))
    plt.legend(
        loc="lower left",
        frameon=False,
    )
    plt.legend(loc="upper left", bbox_to_anchor=(1, 1))
    plt.show()
```

In [27]:
```
stacked_barplot(data, "Geography", "Exited")
```

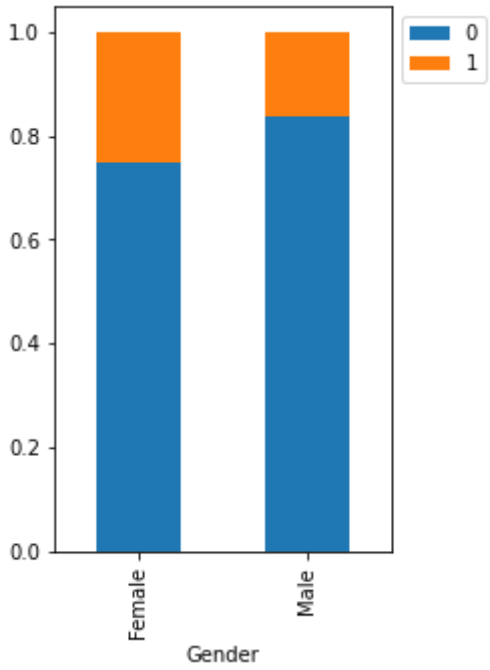
```
Exited         0     1    All
Geography
All         7963  2037  10000
Germany     1695   814   2509
France      4204   810   5014
Spain       2064   413   2477
------------------------------------------------------------------------------------
----------------------------------------
```



- Germany had the most people leave.

In [28]:
```
stacked_barplot(data, "Gender", "Exited")
```

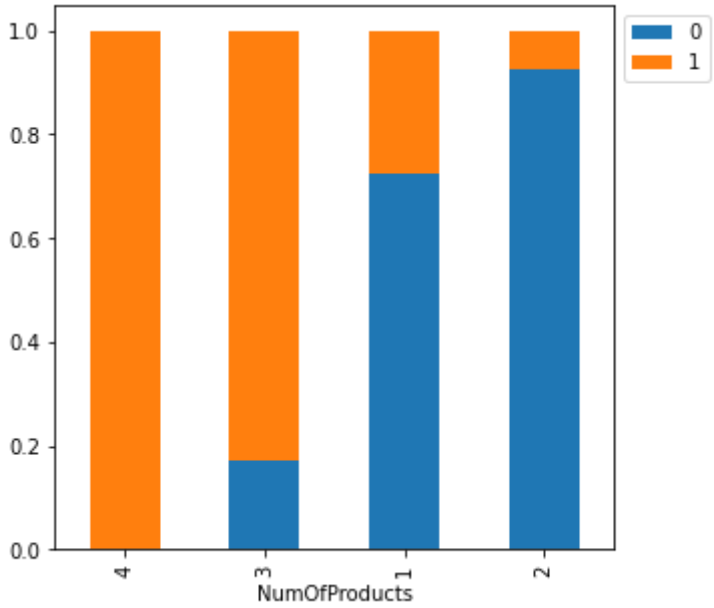
```
Exited     0     1    All
Gender
All     7963  2037  10000
Female  3404  1139   4543
Male    4559   898   5457
------------------------------------------------------------------------------------
----------------------------------------
```



- A bit more females left.

In [29]:
```
stacked_barplot(data, "NumOfProducts", "Exited")
```

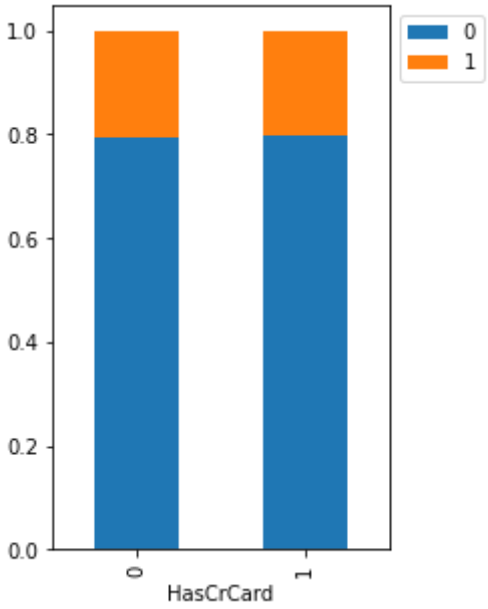
```
Exited             0     1    All
NumOfProducts
All             7963  2037  10000
1               3675  1409   5084
2               4242   348   4590
3                 46   220    266
4                  0    60     60
------------------------------------------------------------------------------------
----------------------------------------
```



- All customers who bought 4 products left within 6 months.

In [30]:
```
stacked_barplot(data, "HasCrCard", "Exited")
```

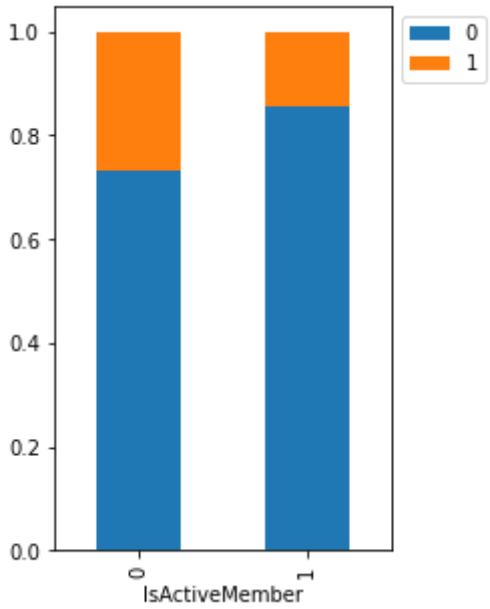
```
Exited          0     1    All
HasCrCard
All          7963  2037  10000
1            5631  1424   7055
0            2332   613   2945
------------------------------------------------------------------------------
--------------------------------------
```



- Having a credit card appears to not make a difference.

In [31]:
```
stacked_barplot(data, "IsActiveMember", "Exited")
```

```
Exited              0     1    All
IsActiveMember
All              7963  2037  10000
0                3547  1302   4849
1                4416   735   5151
------------------------------------------------------------------------------
--------------------------------------
```



- If someone is inactive, there is a higher chance they will leave within 6 months.

In [32]:
```
def distribution_plot_wrt_target(data, predictor, target):

    fig, axs = plt.subplots(2, 2, figsize=(12, 10))

    target_uniq = data[target].unique()

    axs[0, 0].set_title("Distribution of target for target=" + str(target_uniq[0
    sns.histplot(
        data=data[data[target] == target_uniq[0]],
        x=predictor,
        kde=True,
        ax=axs[0, 0],
        color="teal",
    )

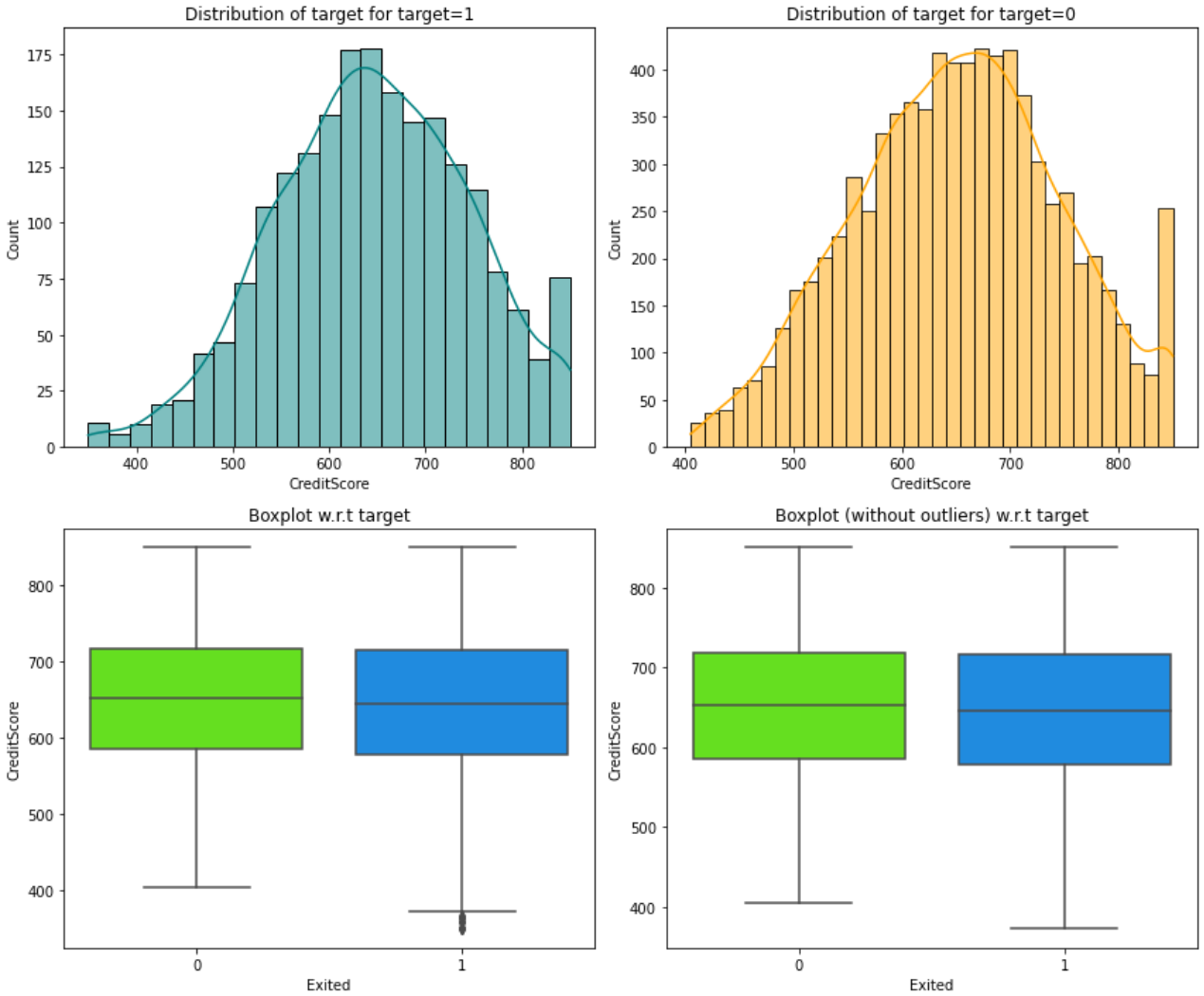
    axs[0, 1].set_title("Distribution of target for target=" + str(target_uniq[1
    sns.histplot(
        data=data[data[target] == target_uniq[1]],
        x=predictor,
        kde=True,
        ax=axs[0, 1],
        color="orange",
    )

    axs[1, 0].set_title("Boxplot w.r.t target")
    sns.boxplot(data=data, x=target, y=predictor, ax=axs[1, 0], palette="gist_ra

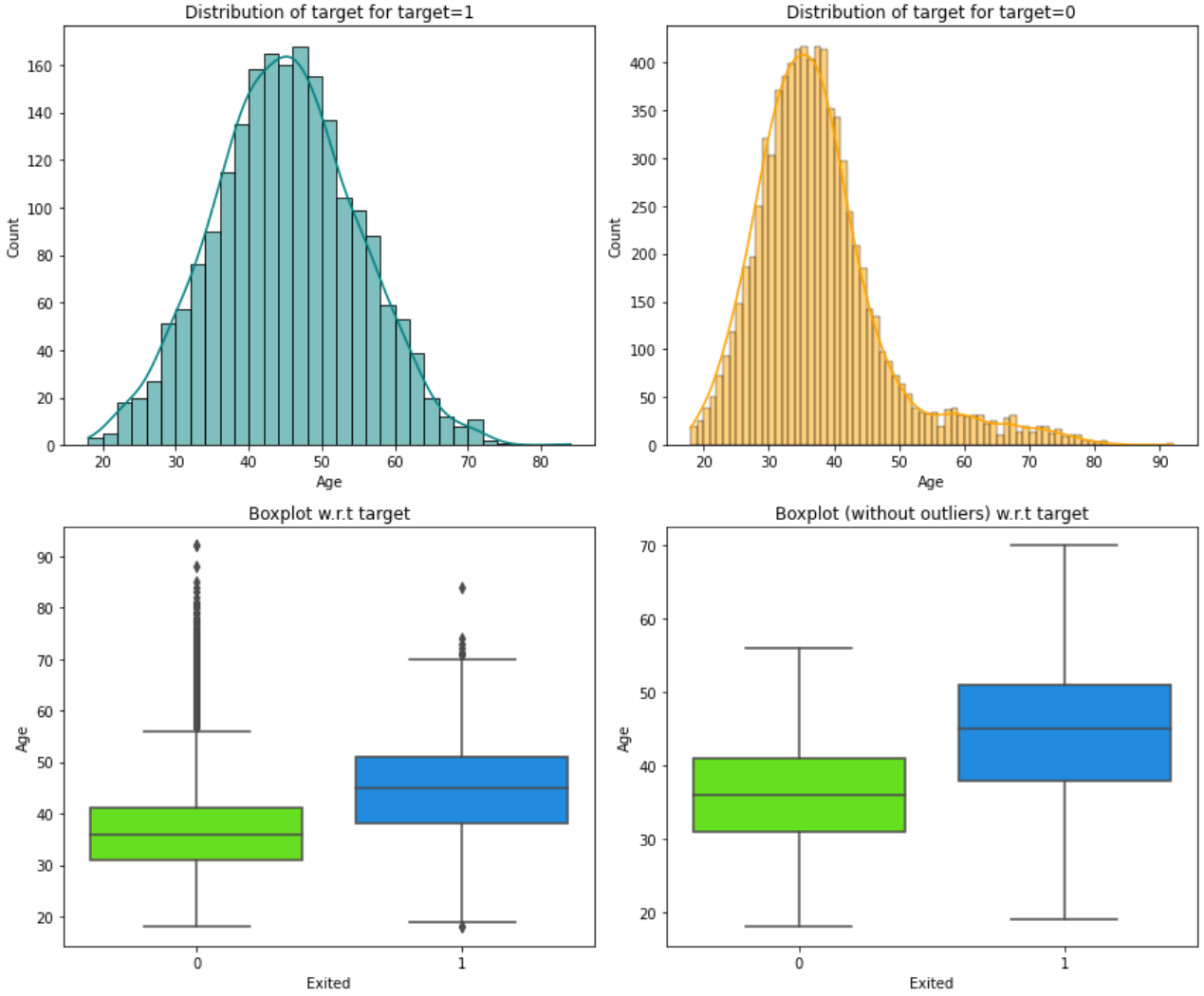
    axs[1, 1].set_title("Boxplot (without outliers) w.r.t target")
    sns.boxplot(
        data=data,
        x=target,
        y=predictor,
        ax=axs[1, 1],
        showfliers=False,
        palette="gist_rainbow",
    )
```

```
    plt.tight_layout()
    plt.show()
```

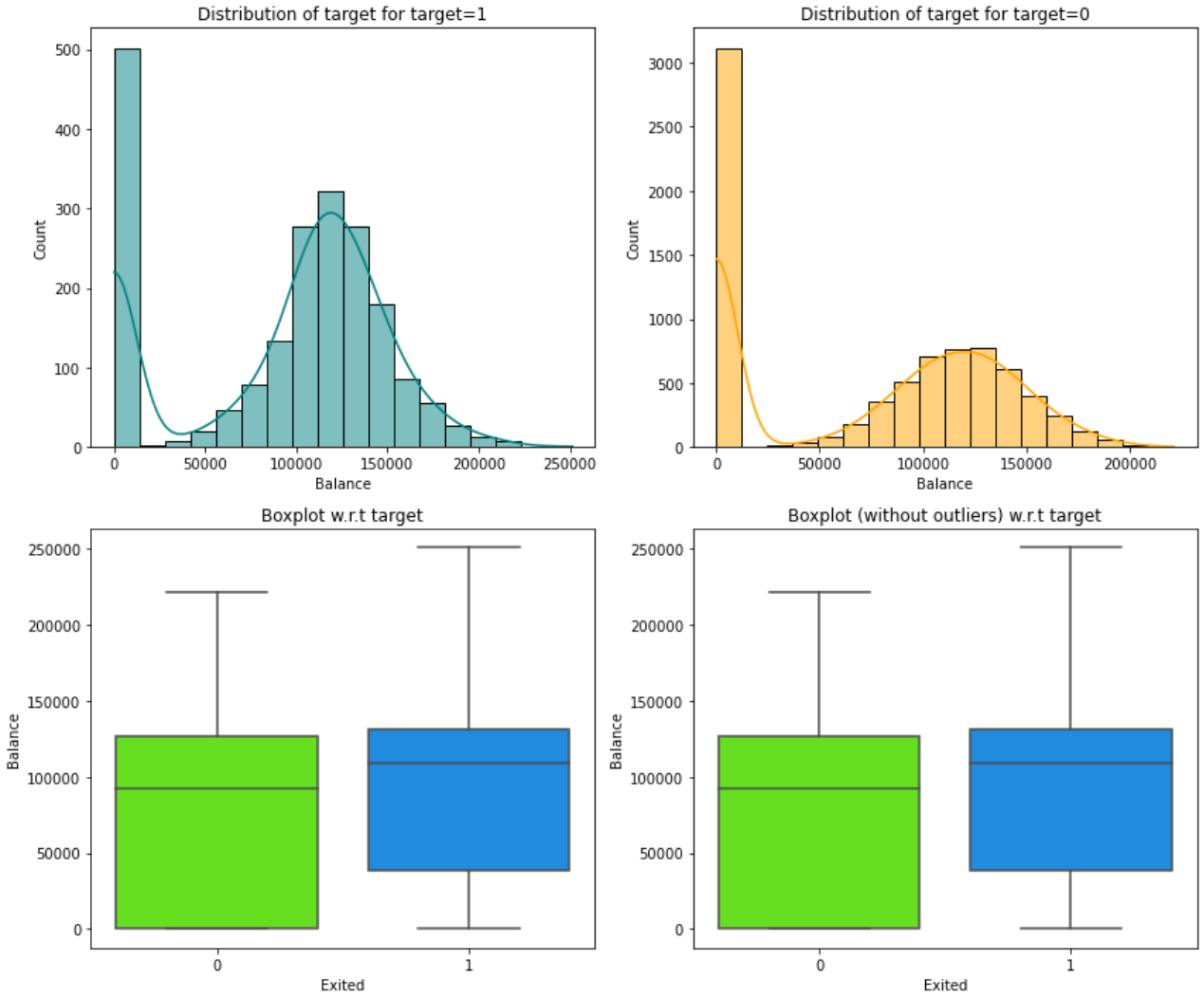
In [33]:
```
distribution_plot_wrt_target(data, "CreditScore", "Exited")
```



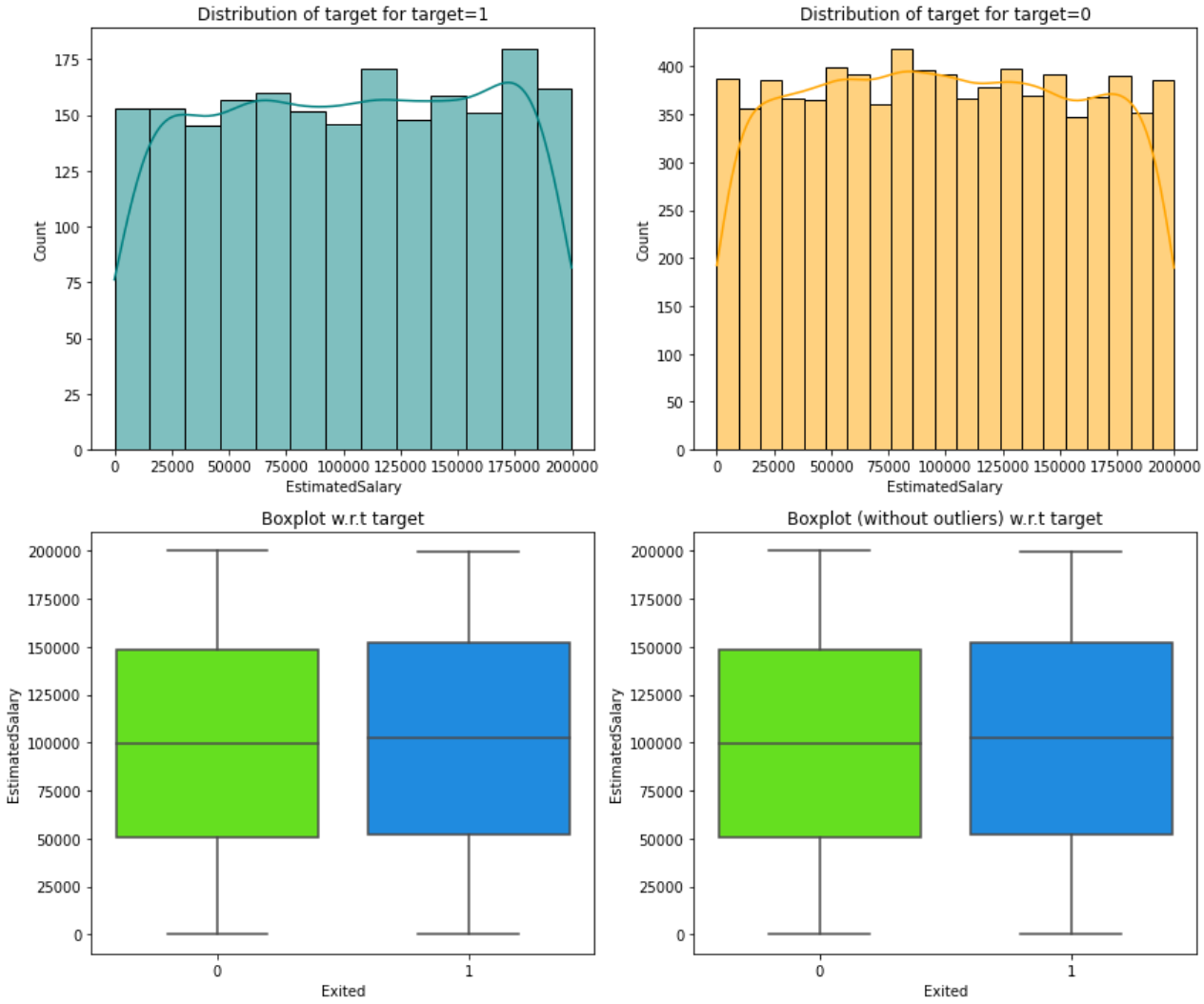
In [34]:
```
distribution_plot_wrt_target(data, "Age", "Exited")
```



In [35]:
```
distribution_plot_wrt_target(data, "Balance", "Exited")
```



In [36]:
```
distribution_plot_wrt_target(data, "EstimatedSalary", "Exited")
```



Insights based on EDA

- The target class is inbalanced.
- No variables are highly correlated
- Most customers who bought more than 2 products left the bank within 6 months.
- Looks like most people who left are in their 50/60s.
- Pretty much everyone with a credit score under 400 left the bank.
- If someone is inactive, there is a higher chance they will leave within 6 months.

Data Pre-processing

Creating Dummy Variables

In [37]:
```
df = pd.get_dummies(
    df,
    columns=[
        "Geography",
        "Gender",
    ],
```

```
    drop_first=False,
)
```

In [38]:
```
df.head()
```

Out[38]:

	CreditScore	Age	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	E
0	619	42	0.00	1	1	1	101348.88	
1	608	41	83807.86	1	0	1	112542.58	
2	502	42	159660.80	3	1	0	113931.57	
3	699	39	0.00	2	0	0	93826.63	
4	850	43	125510.82	1	1	1	79084.10	

Splitting Data

In [39]:
```
X = df.drop("Exited", axis=1)
y = df["Exited"]
```

In [40]:
```
# Splitting data into training and test set:
X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.2, random_state=1, stratify=y
)
print(X_train.shape, X_test.shape)
```

```
(8000, 12) (2000, 12)
```

- Will create validation when running the models.

Over/Undersampling

Since the pridiction class is inbalanced, I will try sampling techniques.

Over with SMOTE

In [41]:
```
print("Before UpSampling, counts of label 'Yes': {}".format(sum(y_train == 1)))
print("Before UpSampling, counts of label 'No': {} \n".format(sum(y_train == 0)))

sm = SMOTE(
    sampling_strategy=1, k_neighbors=5, random_state=1
)  # Synthetic Minority Over Sampling Technique
X_train_over, y_train_over = sm.fit_resample(X_train, y_train)


print("After UpSampling, counts of label 'Yes': {}".format(sum(y_train_over == 1
print("After UpSampling, counts of label 'No': {} \n".format(sum(y_train_over ==


print("After UpSampling, the shape of train_X: {}".format(X_train_over.shape))
print("After UpSampling, the shape of train_y: {} \n".format(y_train_over.shape)
```

```
Before UpSampling, counts of label 'Yes': 1630
Before UpSampling, counts of label 'No': 6370

After UpSampling, counts of label 'Yes': 6370
After UpSampling, counts of label 'No': 6370

After UpSampling, the shape of train_X: (12740, 12)
After UpSampling, the shape of train_y: (12740,)
```

Under with Random Under Sampler

In [42]:
```
rus = RandomUnderSampler(random_state=1)
X_train_un, y_train_un = rus.fit_resample(X_train, y_train)
```

In [43]:
```
print("Before Under Sampling, counts of label 'Yes': {}".format(sum(y_train == 1
print("Before Under Sampling, counts of label 'No': {} \n".format(sum(y_train ==

print("After Under Sampling, counts of label 'Yes': {}".format(sum(y_train_un ==
print("After Under Sampling, counts of label 'No': {} \n".format(sum(y_train_un

print("After Under Sampling, the shape of train_X: {}".format(X_train_un.shape))
print("After Under Sampling, the shape of train_y: {} \n".format(y_train_un.shap
```

```
Before Under Sampling, counts of label 'Yes': 1630
Before Under Sampling, counts of label 'No': 6370

After Under Sampling, counts of label 'Yes': 1630
After Under Sampling, counts of label 'No': 1630

After Under Sampling, the shape of train_X: (3260, 12)
After Under Sampling, the shape of train_y: (3260,)
```

Normalize

In [44]:
```
scaler = MinMaxScaler(feature_range=(0, 1))
# Scale both the training inputs and outputs
scaled_train_X = scaler.fit_transform(X_train)
scaled_test_X = scaler.transform(X_test)

scaled_train_over_X = scaler.fit_transform(X_train_over)
scaled_train_un_X = scaler.fit_transform(X_train_un)


scaled_train_y = scaler.fit_transform(y_train.values.reshape(-1, 1))
scaled_test_y = scaler.transform(y_test.values.reshape(-1, 1))

scaled_train_over_y = scaler.fit_transform(y_train_over.values.reshape(-1, 1))
scaled_train_un_y = scaler.fit_transform(y_train_un.values.reshape(-1, 1))
```

Model evaluation criterion:

Model Prediction Errors

1. Predicting someone who left the bank within 6 months, but didn't (FP).
2. Predicting someone who didn't leave the bank within 6 months, but did (FN).

Which is more important?

We want to create a model that accurately predicts those who leave the bank within 6 months, so we want to lower false-negatives. The bank wants to know what features or services are influencing the customers to leave.

Which metric to optimize?

Since we want to lower false-negatives, we will want to emphasize the recall score.

Functions for scoring and matrix

In [45]:
```
def make_confusion_matrix(
    cf,
    group_names=None,
    categories="auto",
    count=True,
    percent=True,
    cbar=True,
    xyticks=True,
    xyplotlabels=True,
    sum_stats=True,
    figsize=None,
    cmap="Blues",
    title=None,
):
    """
    This function will make a plot of an sklearn Confusion Matrix cm using a Sea
    Arguments
    """

    # CODE TO GENERATE TEXT INSIDE EACH SQUARE
    blanks = ["" for i in range(cf.size)]

    if group_names and len(group_names) == cf.size:
        group_labels = ["{}\n".format(value) for value in group_names]
    else:
        group_labels = blanks

    if count:
        group_counts = ["{0:0.0f}\n".format(value) for value in cf.flatten()]
    else:
        group_counts = blanks

    if percent:
        group_percentages = [
            "{0:.2%}".format(value) for value in cf.flatten() / np.sum(cf)
        ]
    else:
        group_percentages = blanks

    box_labels = [
```

```
        f"{v1}{v2}{v3}".strip()
        for v1, v2, v3 in zip(group_labels, group_counts, group_percentages)
    ]
    box_labels = np.asarray(box_labels).reshape(cf.shape[0], cf.shape[1])

    # CODE TO GENERATE SUMMARY STATISTICS & TEXT FOR SUMMARY STATS
    if sum_stats:
        # Accuracy is sum of diagonal divided by total observations
        accuracy = np.trace(cf) / float(np.sum(cf))

        # if it is a binary confusion matrix, show some more stats
        if len(cf) == 2:
            # Metrics for Binary Confusion Matrices
            precision = cf[1, 1] / sum(cf[:, 1])
            recall = cf[1, 1] / sum(cf[1, :])
            f1_score = 2 * precision * recall / (precision + recall)
            stats_text = "\n\nAccuracy={:0.3f}\nPrecision={:0.3f}\nRecall={:0.3f
                accuracy, precision, recall, f1_score
            )
        else:
            stats_text = "\n\nAccuracy={:0.3f}".format(accuracy)
    else:
        stats_text = ""

    # SET FIGURE PARAMETERS ACCORDING TO OTHER ARGUMENTS
    if figsize == None:
        # Get default figure size if not set
        figsize = plt.rcParams.get("figure.figsize")

    if xyticks == False:
        # Do not show categories if xyticks is False
        categories = False

    # MAKE THE HEATMAP VISUALIZATION
    plt.figure(figsize=figsize)
    sns.heatmap(
        cf,
        annot=box_labels,
        fmt="",
        cmap=cmap,
        cbar=cbar,
        xticklabels=categories,
        yticklabels=categories,
    )

    if xyplotlabels:
        plt.ylabel("True label")
        plt.xlabel("Predicted label" + stats_text)
    else:
        plt.xlabel(stats_text)

    if title:
        plt.title(title)
```

Building Models

In [46]:
```
# initialize the model
model1 = Sequential()
```

In [47]:
```
# This adds the input layer (by specifying input dimension) AND the first hidden
model1.add(
    Dense(
        units=24, input_dim=12, kernel_initializer="HeNormal", activation="leaky
    )
)  # input of 12 columns
# hidden layer
model1.add(Dense(units=24, kernel_initializer="HeNormal", activation="leaky_relu
# Adding Dropout to prevent overfitting
model1.add(Dropout(0.1))
# model1.add(Dense(48, kernel_initializer="HeNormal", activation="leaky_relu"))
# model1.add(Dense(48, kernel_initializer="HeNormal", activation="leaky_relu"))
# Adding the output layer
# we have an output of 1 node, which is the the desired dimensions of our output
model1.add(
    Dense(1, kernel_initializer="HeNormal", activation="sigmoid")
)  # Using sigmoid on output, as this is binary classification
```

Compile/Optimize/Loss Function

In [48]:
```
# Create optimizer with default learning rate
# Compile the model
model1.compile(Adam(lr=0.001), loss="binary_crossentropy", metrics=["accuracy"])
```

In [49]:
```
model1.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 dense (Dense)               (None, 24)                312

 dense_1 (Dense)             (None, 24)                600

 dropout (Dropout)           (None, 24)                0

 dense_2 (Dense)             (None, 1)                 25

=================================================================
Total params: 937
Trainable params: 937
Non-trainable params: 0
_________________________________________________________________
```

Training Forward and Backpropagation

In [50]:
```
# fitting the model
hist_mod1 = model1.fit(
    scaled_train_X, scaled_train_y, batch_size=1000, epochs=1000, validation_spl
)
```

```
Epoch 1/1000
7/7 [==============================] - 1s 27ms/step - loss: 0.6185 - accuracy:
0.6898 - val_loss: 0.5623 - val_accuracy: 0.7812
Epoch 2/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.5485 - accuracy: 0.
7770 - val_loss: 0.5230 - val_accuracy: 0.7906
Epoch 3/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.5199 - accuracy: 0.
7950 - val_loss: 0.5103 - val_accuracy: 0.7906
Epoch 4/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.5077 - accuracy: 0.
7962 - val_loss: 0.5067 - val_accuracy: 0.7906
Epoch 5/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.5068 - accuracy: 0.
7967 - val_loss: 0.5025 - val_accuracy: 0.7906
Epoch 6/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4967 - accuracy: 0.
7969 - val_loss: 0.4965 - val_accuracy: 0.7906
Epoch 7/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4879 - accuracy: 0.
7975 - val_loss: 0.4913 - val_accuracy: 0.7906
Epoch 8/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4885 - accuracy: 0.
7952 - val_loss: 0.4877 - val_accuracy: 0.7900
Epoch 9/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4805 - accuracy: 0.
7981 - val_loss: 0.4849 - val_accuracy: 0.7919
Epoch 10/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4791 - accuracy: 0.
7969 - val_loss: 0.4826 - val_accuracy: 0.7950
Epoch 11/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4793 - accuracy: 0.
7978 - val_loss: 0.4809 - val_accuracy: 0.7962
Epoch 12/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4739 - accuracy: 0.
7992 - val_loss: 0.4798 - val_accuracy: 0.7969
Epoch 13/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4712 - accuracy: 0.
7991 - val_loss: 0.4787 - val_accuracy: 0.7994
Epoch 14/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4693 - accuracy: 0.
7970 - val_loss: 0.4776 - val_accuracy: 0.7987
Epoch 15/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4705 - accuracy: 0.
7981 - val_loss: 0.4763 - val_accuracy: 0.8000
Epoch 16/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4683 - accuracy: 0.
8011 - val_loss: 0.4750 - val_accuracy: 0.7987
Epoch 17/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4646 - accuracy: 0.
8002 - val_loss: 0.4737 - val_accuracy: 0.7994
Epoch 18/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4636 - accuracy: 0.
8027 - val_loss: 0.4728 - val_accuracy: 0.8000
Epoch 19/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4633 - accuracy: 0.
8017 - val_loss: 0.4720 - val_accuracy: 0.7994
Epoch 20/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4602 - accuracy: 0.
8012 - val_loss: 0.4710 - val_accuracy: 0.8006
Epoch 21/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4605 - accuracy: 0.
8012 - val_loss: 0.4699 - val_accuracy: 0.8006
Epoch 22/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4588 - accuracy: 0.
```

```
8017 - val_loss: 0.4687 - val_accuracy: 0.8019
Epoch 23/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4592 - accuracy: 0.
8002 - val_loss: 0.4675 - val_accuracy: 0.8025
Epoch 24/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4611 - accuracy: 0.
8034 - val_loss: 0.4662 - val_accuracy: 0.8031
Epoch 25/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4561 - accuracy: 0.
8061 - val_loss: 0.4650 - val_accuracy: 0.8031
Epoch 26/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4554 - accuracy: 0.
8028 - val_loss: 0.4638 - val_accuracy: 0.8037
Epoch 27/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4543 - accuracy: 0.
8067 - val_loss: 0.4627 - val_accuracy: 0.8044
Epoch 28/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4532 - accuracy: 0.
8009 - val_loss: 0.4615 - val_accuracy: 0.8056
Epoch 29/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4503 - accuracy: 0.
8098 - val_loss: 0.4609 - val_accuracy: 0.8025
Epoch 30/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4495 - accuracy: 0.
8092 - val_loss: 0.4595 - val_accuracy: 0.8056
Epoch 31/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4492 - accuracy: 0.
8064 - val_loss: 0.4582 - val_accuracy: 0.8081
Epoch 32/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4494 - accuracy: 0.
8059 - val_loss: 0.4570 - val_accuracy: 0.8094
Epoch 33/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4471 - accuracy: 0.
8081 - val_loss: 0.4559 - val_accuracy: 0.8106
Epoch 34/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4439 - accuracy: 0.
8100 - val_loss: 0.4553 - val_accuracy: 0.8087
Epoch 35/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4414 - accuracy: 0.
8086 - val_loss: 0.4540 - val_accuracy: 0.8094
Epoch 36/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4422 - accuracy: 0.
8119 - val_loss: 0.4529 - val_accuracy: 0.8119
Epoch 37/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4416 - accuracy: 0.
8109 - val_loss: 0.4521 - val_accuracy: 0.8125
Epoch 38/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4400 - accuracy: 0.
8123 - val_loss: 0.4511 - val_accuracy: 0.8131
Epoch 39/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4391 - accuracy: 0.
8142 - val_loss: 0.4502 - val_accuracy: 0.8119
Epoch 40/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4379 - accuracy: 0.
8116 - val_loss: 0.4485 - val_accuracy: 0.8131
Epoch 41/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4378 - accuracy: 0.
8125 - val_loss: 0.4479 - val_accuracy: 0.8125
Epoch 42/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4367 - accuracy: 0.
8128 - val_loss: 0.4468 - val_accuracy: 0.8131
Epoch 43/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4378 - accuracy: 0.
8153 - val_loss: 0.4455 - val_accuracy: 0.8138
Epoch 44/1000
```

```
7/7 [==============================] - 0s 5ms/step - loss: 0.4366 - accuracy: 0.
8175 - val_loss: 0.4450 - val_accuracy: 0.8131
Epoch 45/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4337 - accuracy: 0.
8158 - val_loss: 0.4443 - val_accuracy: 0.8150
Epoch 46/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4340 - accuracy: 0.
8141 - val_loss: 0.4428 - val_accuracy: 0.8144
Epoch 47/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4316 - accuracy: 0.
8144 - val_loss: 0.4421 - val_accuracy: 0.8156
Epoch 48/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4331 - accuracy: 0.
8158 - val_loss: 0.4415 - val_accuracy: 0.8156
Epoch 49/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4330 - accuracy: 0.
8155 - val_loss: 0.4402 - val_accuracy: 0.8169
Epoch 50/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4315 - accuracy: 0.
8169 - val_loss: 0.4397 - val_accuracy: 0.8156
Epoch 51/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4303 - accuracy: 0.
8153 - val_loss: 0.4386 - val_accuracy: 0.8163
Epoch 52/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4284 - accuracy: 0.
8167 - val_loss: 0.4380 - val_accuracy: 0.8175
Epoch 53/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4276 - accuracy: 0.
8191 - val_loss: 0.4376 - val_accuracy: 0.8163
Epoch 54/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4262 - accuracy: 0.
8166 - val_loss: 0.4365 - val_accuracy: 0.8188
Epoch 55/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4264 - accuracy: 0.
8175 - val_loss: 0.4354 - val_accuracy: 0.8206
Epoch 56/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4253 - accuracy: 0.
8188 - val_loss: 0.4346 - val_accuracy: 0.8181
Epoch 57/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4217 - accuracy: 0.
8191 - val_loss: 0.4337 - val_accuracy: 0.8194
Epoch 58/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4263 - accuracy: 0.
8195 - val_loss: 0.4336 - val_accuracy: 0.8181
Epoch 59/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4244 - accuracy: 0.
8153 - val_loss: 0.4322 - val_accuracy: 0.8188
Epoch 60/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4228 - accuracy: 0.
8186 - val_loss: 0.4311 - val_accuracy: 0.8200
Epoch 61/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4244 - accuracy: 0.
8214 - val_loss: 0.4309 - val_accuracy: 0.8194
Epoch 62/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4210 - accuracy: 0.
8202 - val_loss: 0.4303 - val_accuracy: 0.8181
Epoch 63/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4212 - accuracy: 0.
8219 - val_loss: 0.4299 - val_accuracy: 0.8194
Epoch 64/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4219 - accuracy: 0.
8205 - val_loss: 0.4293 - val_accuracy: 0.8181
Epoch 65/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4208 - accuracy: 0.
8228 - val_loss: 0.4279 - val_accuracy: 0.8181
```

```
Epoch 66/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4202 - accuracy: 0.
8220 - val_loss: 0.4276 - val_accuracy: 0.8200
Epoch 67/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4189 - accuracy: 0.
8202 - val_loss: 0.4271 - val_accuracy: 0.8200
Epoch 68/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4194 - accuracy: 0.
8192 - val_loss: 0.4260 - val_accuracy: 0.8194
Epoch 69/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4161 - accuracy: 0.
8234 - val_loss: 0.4257 - val_accuracy: 0.8194
Epoch 70/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4155 - accuracy: 0.
8214 - val_loss: 0.4250 - val_accuracy: 0.8194
Epoch 71/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4175 - accuracy: 0.
8264 - val_loss: 0.4240 - val_accuracy: 0.8200
Epoch 72/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4156 - accuracy: 0.
8236 - val_loss: 0.4233 - val_accuracy: 0.8188
Epoch 73/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4165 - accuracy: 0.
8242 - val_loss: 0.4235 - val_accuracy: 0.8194
Epoch 74/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4162 - accuracy: 0.
8238 - val_loss: 0.4231 - val_accuracy: 0.8188
Epoch 75/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4154 - accuracy: 0.
8225 - val_loss: 0.4209 - val_accuracy: 0.8263
Epoch 76/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4152 - accuracy: 0.
8250 - val_loss: 0.4214 - val_accuracy: 0.8206
Epoch 77/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4130 - accuracy: 0.
8225 - val_loss: 0.4201 - val_accuracy: 0.8213
Epoch 78/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4129 - accuracy: 0.
8256 - val_loss: 0.4195 - val_accuracy: 0.8213
Epoch 79/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4122 - accuracy: 0.
8263 - val_loss: 0.4186 - val_accuracy: 0.8250
Epoch 80/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4111 - accuracy: 0.
8248 - val_loss: 0.4195 - val_accuracy: 0.8238
Epoch 81/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4127 - accuracy: 0.
8270 - val_loss: 0.4177 - val_accuracy: 0.8238
Epoch 82/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4116 - accuracy: 0.
8245 - val_loss: 0.4165 - val_accuracy: 0.8256
Epoch 83/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4128 - accuracy: 0.
8244 - val_loss: 0.4167 - val_accuracy: 0.8244
Epoch 84/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4111 - accuracy: 0.
8258 - val_loss: 0.4155 - val_accuracy: 0.8250
Epoch 85/1000
7/7 [==============================] - 0s 6ms/step - loss: 0.4106 - accuracy: 0.
8261 - val_loss: 0.4146 - val_accuracy: 0.8256
Epoch 86/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4091 - accuracy: 0.
8269 - val_loss: 0.4159 - val_accuracy: 0.8269
Epoch 87/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4084 - accuracy: 0.
```

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8264 - val_loss: 0.4134 - val_accuracy: 0.8275
Epoch 88/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4079 - accuracy: 0.
8244 - val_loss: 0.4136 - val_accuracy: 0.8281
Epoch 89/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4078 - accuracy: 0.
8275 - val_loss: 0.4130 - val_accuracy: 0.8281
Epoch 90/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4078 - accuracy: 0.
8284 - val_loss: 0.4120 - val_accuracy: 0.8294
Epoch 91/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4069 - accuracy: 0.
8286 - val_loss: 0.4116 - val_accuracy: 0.8294
Epoch 92/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4068 - accuracy: 0.
8264 - val_loss: 0.4113 - val_accuracy: 0.8275
Epoch 93/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4061 - accuracy: 0.
8302 - val_loss: 0.4104 - val_accuracy: 0.8269
Epoch 94/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4050 - accuracy: 0.
8280 - val_loss: 0.4107 - val_accuracy: 0.8281
Epoch 95/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4040 - accuracy: 0.
8316 - val_loss: 0.4092 - val_accuracy: 0.8281
Epoch 96/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4048 - accuracy: 0.
8280 - val_loss: 0.4085 - val_accuracy: 0.8281
Epoch 97/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4048 - accuracy: 0.
8294 - val_loss: 0.4074 - val_accuracy: 0.8325
Epoch 98/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4036 - accuracy: 0.
8283 - val_loss: 0.4079 - val_accuracy: 0.8300
Epoch 99/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4039 - accuracy: 0.
8317 - val_loss: 0.4071 - val_accuracy: 0.8288
Epoch 100/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4021 - accuracy: 0.
8308 - val_loss: 0.4064 - val_accuracy: 0.8300
Epoch 101/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4010 - accuracy: 0.
8334 - val_loss: 0.4053 - val_accuracy: 0.8325
Epoch 102/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4018 - accuracy: 0.
8345 - val_loss: 0.4045 - val_accuracy: 0.8331
Epoch 103/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4009 - accuracy: 0.
8334 - val_loss: 0.4041 - val_accuracy: 0.8331
Epoch 104/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3997 - accuracy: 0.
8323 - val_loss: 0.4035 - val_accuracy: 0.8350
Epoch 105/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.4013 - accuracy: 0.
8320 - val_loss: 0.4035 - val_accuracy: 0.8344
Epoch 106/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3995 - accuracy: 0.
8331 - val_loss: 0.4026 - val_accuracy: 0.8344
Epoch 107/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3987 - accuracy: 0.
8336 - val_loss: 0.4015 - val_accuracy: 0.8344
Epoch 108/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3966 - accuracy: 0.
8361 - val_loss: 0.4007 - val_accuracy: 0.8375
Epoch 109/1000
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7/7 [==============================] - 0s 5ms/step - loss: 0.3963 - accuracy: 0.
8342 - val_loss: 0.4009 - val_accuracy: 0.8356
Epoch 110/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3980 - accuracy: 0.
8314 - val_loss: 0.4004 - val_accuracy: 0.8363
Epoch 111/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3974 - accuracy: 0.
8339 - val_loss: 0.3997 - val_accuracy: 0.8356
Epoch 112/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3971 - accuracy: 0.
8328 - val_loss: 0.3992 - val_accuracy: 0.8356
Epoch 113/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3960 - accuracy: 0.
8347 - val_loss: 0.3978 - val_accuracy: 0.8394
Epoch 114/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3944 - accuracy: 0.
8341 - val_loss: 0.3973 - val_accuracy: 0.8400
Epoch 115/1000
7/7 [==============================] - 0s 6ms/step - loss: 0.3943 - accuracy: 0.
8333 - val_loss: 0.3968 - val_accuracy: 0.8400
Epoch 116/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3928 - accuracy: 0.
8364 - val_loss: 0.3962 - val_accuracy: 0.8394
Epoch 117/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3913 - accuracy: 0.
8355 - val_loss: 0.3960 - val_accuracy: 0.8375
Epoch 118/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3940 - accuracy: 0.
8370 - val_loss: 0.3942 - val_accuracy: 0.8375
Epoch 119/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3901 - accuracy: 0.
8341 - val_loss: 0.3943 - val_accuracy: 0.8388
Epoch 120/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3912 - accuracy: 0.
8377 - val_loss: 0.3926 - val_accuracy: 0.8400
Epoch 121/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3881 - accuracy: 0.
8367 - val_loss: 0.3921 - val_accuracy: 0.8394
Epoch 122/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3896 - accuracy: 0.
8377 - val_loss: 0.3906 - val_accuracy: 0.8388
Epoch 123/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3863 - accuracy: 0.
8403 - val_loss: 0.3898 - val_accuracy: 0.8381
Epoch 124/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3878 - accuracy: 0.
8363 - val_loss: 0.3886 - val_accuracy: 0.8400
Epoch 125/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3859 - accuracy: 0.
8378 - val_loss: 0.3884 - val_accuracy: 0.8406
Epoch 126/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3865 - accuracy: 0.
8380 - val_loss: 0.3874 - val_accuracy: 0.8400
Epoch 127/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3848 - accuracy: 0.
8422 - val_loss: 0.3861 - val_accuracy: 0.8400
Epoch 128/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3836 - accuracy: 0.
8419 - val_loss: 0.3851 - val_accuracy: 0.8400
Epoch 129/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3833 - accuracy: 0.
8409 - val_loss: 0.3847 - val_accuracy: 0.8388
Epoch 130/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3822 - accuracy: 0.
8405 - val_loss: 0.3831 - val_accuracy: 0.8413
```

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Epoch 131/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3792 - accuracy: 0.
8417 - val_loss: 0.3823 - val_accuracy: 0.8425
Epoch 132/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3785 - accuracy: 0.
8414 - val_loss: 0.3808 - val_accuracy: 0.8425
Epoch 133/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3780 - accuracy: 0.
8425 - val_loss: 0.3807 - val_accuracy: 0.8438
Epoch 134/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3764 - accuracy: 0.
8427 - val_loss: 0.3793 - val_accuracy: 0.8425
Epoch 135/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3750 - accuracy: 0.
8459 - val_loss: 0.3778 - val_accuracy: 0.8444
Epoch 136/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3755 - accuracy: 0.
8439 - val_loss: 0.3781 - val_accuracy: 0.8425
Epoch 137/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3759 - accuracy: 0.
8456 - val_loss: 0.3756 - val_accuracy: 0.8444
Epoch 138/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3731 - accuracy: 0.
8452 - val_loss: 0.3756 - val_accuracy: 0.8438
Epoch 139/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3731 - accuracy: 0.
8453 - val_loss: 0.3739 - val_accuracy: 0.8438
Epoch 140/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3708 - accuracy: 0.
8436 - val_loss: 0.3720 - val_accuracy: 0.8456
Epoch 141/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3700 - accuracy: 0.
8445 - val_loss: 0.3722 - val_accuracy: 0.8431
Epoch 142/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3694 - accuracy: 0.
8438 - val_loss: 0.3707 - val_accuracy: 0.8462
Epoch 143/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3693 - accuracy: 0.
8461 - val_loss: 0.3693 - val_accuracy: 0.8469
Epoch 144/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3666 - accuracy: 0.
8480 - val_loss: 0.3693 - val_accuracy: 0.8462
Epoch 145/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3675 - accuracy: 0.
8456 - val_loss: 0.3671 - val_accuracy: 0.8494
Epoch 146/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3652 - accuracy: 0.
8461 - val_loss: 0.3682 - val_accuracy: 0.8456
Epoch 147/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3660 - accuracy: 0.
8477 - val_loss: 0.3662 - val_accuracy: 0.8487
Epoch 148/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3661 - accuracy: 0.
8494 - val_loss: 0.3646 - val_accuracy: 0.8506
Epoch 149/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3639 - accuracy: 0.
8491 - val_loss: 0.3650 - val_accuracy: 0.8487
Epoch 150/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3623 - accuracy: 0.
8492 - val_loss: 0.3625 - val_accuracy: 0.8487
Epoch 151/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3600 - accuracy: 0.
8502 - val_loss: 0.3624 - val_accuracy: 0.8500
Epoch 152/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3622 - accuracy: 0.
```

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8498 - val_loss: 0.3624 - val_accuracy: 0.8494
Epoch 153/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3589 - accuracy: 0.
8523 - val_loss: 0.3602 - val_accuracy: 0.8537
Epoch 154/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3607 - accuracy: 0.
8477 - val_loss: 0.3615 - val_accuracy: 0.8506
Epoch 155/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3580 - accuracy: 0.
8494 - val_loss: 0.3591 - val_accuracy: 0.8525
Epoch 156/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3574 - accuracy: 0.
8523 - val_loss: 0.3581 - val_accuracy: 0.8550
Epoch 157/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3573 - accuracy: 0.
8542 - val_loss: 0.3591 - val_accuracy: 0.8525
Epoch 158/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3574 - accuracy: 0.
8481 - val_loss: 0.3583 - val_accuracy: 0.8506
Epoch 159/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3583 - accuracy: 0.
8483 - val_loss: 0.3574 - val_accuracy: 0.8537
Epoch 160/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3577 - accuracy: 0.
8516 - val_loss: 0.3575 - val_accuracy: 0.8525
Epoch 161/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3558 - accuracy: 0.
8531 - val_loss: 0.3560 - val_accuracy: 0.8556
Epoch 162/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3536 - accuracy: 0.
8545 - val_loss: 0.3557 - val_accuracy: 0.8544
Epoch 163/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3526 - accuracy: 0.
8562 - val_loss: 0.3546 - val_accuracy: 0.8556
Epoch 164/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3532 - accuracy: 0.
8539 - val_loss: 0.3545 - val_accuracy: 0.8569
Epoch 165/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3547 - accuracy: 0.
8553 - val_loss: 0.3543 - val_accuracy: 0.8562
Epoch 166/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3551 - accuracy: 0.
8531 - val_loss: 0.3535 - val_accuracy: 0.8562
Epoch 167/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3547 - accuracy: 0.
8527 - val_loss: 0.3546 - val_accuracy: 0.8525
Epoch 168/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3543 - accuracy: 0.
8544 - val_loss: 0.3524 - val_accuracy: 0.8581
Epoch 169/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3541 - accuracy: 0.
8520 - val_loss: 0.3529 - val_accuracy: 0.8569
Epoch 170/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3498 - accuracy: 0.
8562 - val_loss: 0.3518 - val_accuracy: 0.8562
Epoch 171/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3530 - accuracy: 0.
8517 - val_loss: 0.3521 - val_accuracy: 0.8562
Epoch 172/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3532 - accuracy: 0.
8514 - val_loss: 0.3525 - val_accuracy: 0.8519
Epoch 173/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3521 - accuracy: 0.
8542 - val_loss: 0.3506 - val_accuracy: 0.8562
Epoch 174/1000
```

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7/7 [==============================] - 0s 5ms/step - loss: 0.3513 - accuracy: 0.
8545 - val_loss: 0.3513 - val_accuracy: 0.8544
Epoch 175/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3509 - accuracy: 0.
8556 - val_loss: 0.3514 - val_accuracy: 0.8550
Epoch 176/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3493 - accuracy: 0.
8547 - val_loss: 0.3498 - val_accuracy: 0.8575
Epoch 177/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3514 - accuracy: 0.
8536 - val_loss: 0.3500 - val_accuracy: 0.8569
Epoch 178/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3470 - accuracy: 0.
8569 - val_loss: 0.3489 - val_accuracy: 0.8569
Epoch 179/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3487 - accuracy: 0.
8566 - val_loss: 0.3483 - val_accuracy: 0.8581
Epoch 180/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3500 - accuracy: 0.
8578 - val_loss: 0.3492 - val_accuracy: 0.8556
Epoch 181/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3461 - accuracy: 0.
8575 - val_loss: 0.3487 - val_accuracy: 0.8544
Epoch 182/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3485 - accuracy: 0.
8553 - val_loss: 0.3495 - val_accuracy: 0.8537
Epoch 183/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3477 - accuracy: 0.
8561 - val_loss: 0.3481 - val_accuracy: 0.8550
Epoch 184/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3489 - accuracy: 0.
8561 - val_loss: 0.3480 - val_accuracy: 0.8556
Epoch 185/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3502 - accuracy: 0.
8537 - val_loss: 0.3475 - val_accuracy: 0.8587
Epoch 186/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3464 - accuracy: 0.
8580 - val_loss: 0.3488 - val_accuracy: 0.8556
Epoch 187/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3463 - accuracy: 0.
8578 - val_loss: 0.3472 - val_accuracy: 0.8569
Epoch 188/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3461 - accuracy: 0.
8597 - val_loss: 0.3478 - val_accuracy: 0.8550
Epoch 189/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3446 - accuracy: 0.
8578 - val_loss: 0.3469 - val_accuracy: 0.8562
Epoch 190/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3462 - accuracy: 0.
8581 - val_loss: 0.3471 - val_accuracy: 0.8562
Epoch 191/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3458 - accuracy: 0.
8581 - val_loss: 0.3464 - val_accuracy: 0.8562
Epoch 192/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3444 - accuracy: 0.
8586 - val_loss: 0.3462 - val_accuracy: 0.8587
Epoch 193/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3448 - accuracy: 0.
8598 - val_loss: 0.3459 - val_accuracy: 0.8581
Epoch 194/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3456 - accuracy: 0.
8555 - val_loss: 0.3469 - val_accuracy: 0.8562
Epoch 195/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3459 - accuracy: 0.
8581 - val_loss: 0.3454 - val_accuracy: 0.8581
```

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Epoch 196/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3473 - accuracy: 0.
8577 - val_loss: 0.3459 - val_accuracy: 0.8600
Epoch 197/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3476 - accuracy: 0.
8598 - val_loss: 0.3459 - val_accuracy: 0.8606
Epoch 198/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3473 - accuracy: 0.
8556 - val_loss: 0.3453 - val_accuracy: 0.8600
Epoch 199/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3434 - accuracy: 0.
8578 - val_loss: 0.3458 - val_accuracy: 0.8594
Epoch 200/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3438 - accuracy: 0.
8605 - val_loss: 0.3449 - val_accuracy: 0.8594
Epoch 201/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3459 - accuracy: 0.
8555 - val_loss: 0.3464 - val_accuracy: 0.8550
Epoch 202/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3484 - accuracy: 0.
8547 - val_loss: 0.3455 - val_accuracy: 0.8569
Epoch 203/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3446 - accuracy: 0.
8566 - val_loss: 0.3469 - val_accuracy: 0.8581
Epoch 204/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3467 - accuracy: 0.
8547 - val_loss: 0.3450 - val_accuracy: 0.8581
Epoch 205/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3467 - accuracy: 0.
8567 - val_loss: 0.3447 - val_accuracy: 0.8575
Epoch 206/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3449 - accuracy: 0.
8572 - val_loss: 0.3455 - val_accuracy: 0.8587
Epoch 207/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3436 - accuracy: 0.
8573 - val_loss: 0.3448 - val_accuracy: 0.8581
Epoch 208/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3458 - accuracy: 0.
8555 - val_loss: 0.3446 - val_accuracy: 0.8594
Epoch 209/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3441 - accuracy: 0.
8612 - val_loss: 0.3451 - val_accuracy: 0.8587
Epoch 210/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3455 - accuracy: 0.
8608 - val_loss: 0.3444 - val_accuracy: 0.8581
Epoch 211/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3431 - accuracy: 0.
8595 - val_loss: 0.3443 - val_accuracy: 0.8575
Epoch 212/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3438 - accuracy: 0.
8581 - val_loss: 0.3440 - val_accuracy: 0.8594
Epoch 213/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3447 - accuracy: 0.
8591 - val_loss: 0.3440 - val_accuracy: 0.8587
Epoch 214/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3470 - accuracy: 0.
8580 - val_loss: 0.3435 - val_accuracy: 0.8606
Epoch 215/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3414 - accuracy: 0.
8583 - val_loss: 0.3441 - val_accuracy: 0.8606
Epoch 216/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3408 - accuracy: 0.
8594 - val_loss: 0.3438 - val_accuracy: 0.8600
Epoch 217/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3430 - accuracy: 0.
```

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8589 - val_loss: 0.3439 - val_accuracy: 0.8594
Epoch 218/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3440 - accuracy: 0.
8558 - val_loss: 0.3443 - val_accuracy: 0.8581
Epoch 219/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3425 - accuracy: 0.
8600 - val_loss: 0.3437 - val_accuracy: 0.8612
Epoch 220/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3415 - accuracy: 0.
8595 - val_loss: 0.3441 - val_accuracy: 0.8575
Epoch 221/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3418 - accuracy: 0.
8611 - val_loss: 0.3434 - val_accuracy: 0.8594
Epoch 222/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3431 - accuracy: 0.
8589 - val_loss: 0.3433 - val_accuracy: 0.8600
Epoch 223/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3430 - accuracy: 0.
8625 - val_loss: 0.3433 - val_accuracy: 0.8587
Epoch 224/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3416 - accuracy: 0.
8597 - val_loss: 0.3433 - val_accuracy: 0.8569
Epoch 225/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3444 - accuracy: 0.
8569 - val_loss: 0.3435 - val_accuracy: 0.8587
Epoch 226/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3429 - accuracy: 0.
8597 - val_loss: 0.3434 - val_accuracy: 0.8569
Epoch 227/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3438 - accuracy: 0.
8591 - val_loss: 0.3426 - val_accuracy: 0.8594
Epoch 228/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3443 - accuracy: 0.
8575 - val_loss: 0.3433 - val_accuracy: 0.8600
Epoch 229/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3415 - accuracy: 0.
8600 - val_loss: 0.3423 - val_accuracy: 0.8612
Epoch 230/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3435 - accuracy: 0.
8619 - val_loss: 0.3433 - val_accuracy: 0.8600
Epoch 231/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3420 - accuracy: 0.
8577 - val_loss: 0.3429 - val_accuracy: 0.8581
Epoch 232/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3418 - accuracy: 0.
8577 - val_loss: 0.3437 - val_accuracy: 0.8575
Epoch 233/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3421 - accuracy: 0.
8575 - val_loss: 0.3426 - val_accuracy: 0.8600
Epoch 234/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3407 - accuracy: 0.
8569 - val_loss: 0.3438 - val_accuracy: 0.8575
Epoch 235/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3417 - accuracy: 0.
8606 - val_loss: 0.3425 - val_accuracy: 0.8594
Epoch 236/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3417 - accuracy: 0.
8594 - val_loss: 0.3423 - val_accuracy: 0.8594
Epoch 237/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3416 - accuracy: 0.
8625 - val_loss: 0.3436 - val_accuracy: 0.8581
Epoch 238/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3400 - accuracy: 0.
8608 - val_loss: 0.3421 - val_accuracy: 0.8612
Epoch 239/1000
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7/7 [==============================] - 0s 5ms/step - loss: 0.3416 - accuracy: 0.
8603 - val_loss: 0.3438 - val_accuracy: 0.8556
Epoch 240/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3412 - accuracy: 0.
8606 - val_loss: 0.3429 - val_accuracy: 0.8612
Epoch 241/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3436 - accuracy: 0.
8591 - val_loss: 0.3424 - val_accuracy: 0.8625
Epoch 242/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3420 - accuracy: 0.
8597 - val_loss: 0.3439 - val_accuracy: 0.8569
Epoch 243/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3387 - accuracy: 0.
8641 - val_loss: 0.3417 - val_accuracy: 0.8612
Epoch 244/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3400 - accuracy: 0.
8606 - val_loss: 0.3420 - val_accuracy: 0.8606
Epoch 245/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3416 - accuracy: 0.
8605 - val_loss: 0.3418 - val_accuracy: 0.8612
Epoch 246/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3409 - accuracy: 0.
8598 - val_loss: 0.3413 - val_accuracy: 0.8637
Epoch 247/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3404 - accuracy: 0.
8608 - val_loss: 0.3431 - val_accuracy: 0.8544
Epoch 248/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3428 - accuracy: 0.
8612 - val_loss: 0.3427 - val_accuracy: 0.8587
Epoch 249/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3401 - accuracy: 0.
8598 - val_loss: 0.3416 - val_accuracy: 0.8637
Epoch 250/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3410 - accuracy: 0.
8608 - val_loss: 0.3427 - val_accuracy: 0.8594
Epoch 251/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3419 - accuracy: 0.
8598 - val_loss: 0.3417 - val_accuracy: 0.8606
Epoch 252/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3427 - accuracy: 0.
8589 - val_loss: 0.3414 - val_accuracy: 0.8612
Epoch 253/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3411 - accuracy: 0.
8608 - val_loss: 0.3420 - val_accuracy: 0.8600
Epoch 254/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3417 - accuracy: 0.
8616 - val_loss: 0.3410 - val_accuracy: 0.8631
Epoch 255/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3413 - accuracy: 0.
8609 - val_loss: 0.3431 - val_accuracy: 0.8575
Epoch 256/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3383 - accuracy: 0.
8625 - val_loss: 0.3410 - val_accuracy: 0.8644
Epoch 257/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3421 - accuracy: 0.
8598 - val_loss: 0.3417 - val_accuracy: 0.8606
Epoch 258/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3403 - accuracy: 0.
8614 - val_loss: 0.3413 - val_accuracy: 0.8600
Epoch 259/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3391 - accuracy: 0.
8603 - val_loss: 0.3411 - val_accuracy: 0.8644
Epoch 260/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3389 - accuracy: 0.
8564 - val_loss: 0.3421 - val_accuracy: 0.8600
```

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Epoch 261/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3422 - accuracy: 0.
8569 - val_loss: 0.3419 - val_accuracy: 0.8625
Epoch 262/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3393 - accuracy: 0.
8605 - val_loss: 0.3423 - val_accuracy: 0.8606
Epoch 263/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3412 - accuracy: 0.
8602 - val_loss: 0.3416 - val_accuracy: 0.8606
Epoch 264/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3391 - accuracy: 0.
8614 - val_loss: 0.3411 - val_accuracy: 0.8606
Epoch 265/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3407 - accuracy: 0.
8603 - val_loss: 0.3411 - val_accuracy: 0.8637
Epoch 266/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3416 - accuracy: 0.
8606 - val_loss: 0.3409 - val_accuracy: 0.8631
Epoch 267/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3399 - accuracy: 0.
8612 - val_loss: 0.3408 - val_accuracy: 0.8619
Epoch 268/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3402 - accuracy: 0.
8575 - val_loss: 0.3415 - val_accuracy: 0.8587
Epoch 269/1000
7/7 [==============================] - 0s 6ms/step - loss: 0.3400 - accuracy: 0.
8602 - val_loss: 0.3405 - val_accuracy: 0.8612
Epoch 270/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3394 - accuracy: 0.
8614 - val_loss: 0.3410 - val_accuracy: 0.8606
Epoch 271/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3404 - accuracy: 0.
8597 - val_loss: 0.3406 - val_accuracy: 0.8606
Epoch 272/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3423 - accuracy: 0.
8600 - val_loss: 0.3406 - val_accuracy: 0.8612
Epoch 273/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3383 - accuracy: 0.
8611 - val_loss: 0.3413 - val_accuracy: 0.8581
Epoch 274/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3402 - accuracy: 0.
8630 - val_loss: 0.3403 - val_accuracy: 0.8619
Epoch 275/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3380 - accuracy: 0.
8620 - val_loss: 0.3407 - val_accuracy: 0.8606
Epoch 276/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3383 - accuracy: 0.
8628 - val_loss: 0.3406 - val_accuracy: 0.8606
Epoch 277/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3388 - accuracy: 0.
8591 - val_loss: 0.3401 - val_accuracy: 0.8631
Epoch 278/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3379 - accuracy: 0.
8614 - val_loss: 0.3406 - val_accuracy: 0.8594
Epoch 279/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3395 - accuracy: 0.
8608 - val_loss: 0.3397 - val_accuracy: 0.8619
Epoch 280/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3384 - accuracy: 0.
8625 - val_loss: 0.3400 - val_accuracy: 0.8619
Epoch 281/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3395 - accuracy: 0.
8602 - val_loss: 0.3407 - val_accuracy: 0.8619
Epoch 282/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3388 - accuracy: 0.
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8602 - val_loss: 0.3403 - val_accuracy: 0.8612
Epoch 283/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3402 - accuracy: 0.
8580 - val_loss: 0.3402 - val_accuracy: 0.8606
Epoch 284/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3375 - accuracy: 0.
8617 - val_loss: 0.3405 - val_accuracy: 0.8581
Epoch 285/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3395 - accuracy: 0.
8602 - val_loss: 0.3398 - val_accuracy: 0.8625
Epoch 286/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3396 - accuracy: 0.
8591 - val_loss: 0.3405 - val_accuracy: 0.8612
Epoch 287/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3391 - accuracy: 0.
8583 - val_loss: 0.3403 - val_accuracy: 0.8606
Epoch 288/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3397 - accuracy: 0.
8611 - val_loss: 0.3404 - val_accuracy: 0.8600
Epoch 289/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3384 - accuracy: 0.
8595 - val_loss: 0.3408 - val_accuracy: 0.8581
Epoch 290/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3362 - accuracy: 0.
8659 - val_loss: 0.3394 - val_accuracy: 0.8650
Epoch 291/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3384 - accuracy: 0.
8600 - val_loss: 0.3415 - val_accuracy: 0.8594
Epoch 292/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3377 - accuracy: 0.
8612 - val_loss: 0.3402 - val_accuracy: 0.8631
Epoch 293/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3390 - accuracy: 0.
8614 - val_loss: 0.3398 - val_accuracy: 0.8631
Epoch 294/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3388 - accuracy: 0.
8597 - val_loss: 0.3411 - val_accuracy: 0.8594
Epoch 295/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3378 - accuracy: 0.
8611 - val_loss: 0.3399 - val_accuracy: 0.8650
Epoch 296/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3384 - accuracy: 0.
8587 - val_loss: 0.3404 - val_accuracy: 0.8600
Epoch 297/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3369 - accuracy: 0.
8623 - val_loss: 0.3396 - val_accuracy: 0.8650
Epoch 298/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3394 - accuracy: 0.
8642 - val_loss: 0.3400 - val_accuracy: 0.8600
Epoch 299/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3380 - accuracy: 0.
8612 - val_loss: 0.3401 - val_accuracy: 0.8612
Epoch 300/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3381 - accuracy: 0.
8642 - val_loss: 0.3403 - val_accuracy: 0.8606
Epoch 301/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3376 - accuracy: 0.
8619 - val_loss: 0.3402 - val_accuracy: 0.8594
Epoch 302/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3384 - accuracy: 0.
8622 - val_loss: 0.3393 - val_accuracy: 0.8612
Epoch 303/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3380 - accuracy: 0.
8609 - val_loss: 0.3403 - val_accuracy: 0.8587
Epoch 304/1000
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7/7 [==============================] - 0s 5ms/step - loss: 0.3381 - accuracy: 0.
8611 - val_loss: 0.3394 - val_accuracy: 0.8656
Epoch 305/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3381 - accuracy: 0.
8606 - val_loss: 0.3401 - val_accuracy: 0.8606
Epoch 306/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3383 - accuracy: 0.
8581 - val_loss: 0.3418 - val_accuracy: 0.8556
Epoch 307/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3394 - accuracy: 0.
8600 - val_loss: 0.3405 - val_accuracy: 0.8637
Epoch 308/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3374 - accuracy: 0.
8597 - val_loss: 0.3395 - val_accuracy: 0.8669
Epoch 309/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3378 - accuracy: 0.
8592 - val_loss: 0.3399 - val_accuracy: 0.8594
Epoch 310/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3353 - accuracy: 0.
8617 - val_loss: 0.3398 - val_accuracy: 0.8656
Epoch 311/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3353 - accuracy: 0.
8623 - val_loss: 0.3405 - val_accuracy: 0.8594
Epoch 312/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3377 - accuracy: 0.
8633 - val_loss: 0.3395 - val_accuracy: 0.8637
Epoch 313/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3378 - accuracy: 0.
8608 - val_loss: 0.3398 - val_accuracy: 0.8606
Epoch 314/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3371 - accuracy: 0.
8628 - val_loss: 0.3398 - val_accuracy: 0.8612
Epoch 315/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3381 - accuracy: 0.
8581 - val_loss: 0.3397 - val_accuracy: 0.8662
Epoch 316/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3363 - accuracy: 0.
8627 - val_loss: 0.3395 - val_accuracy: 0.8600
Epoch 317/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3368 - accuracy: 0.
8630 - val_loss: 0.3388 - val_accuracy: 0.8650
Epoch 318/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3357 - accuracy: 0.
8616 - val_loss: 0.3399 - val_accuracy: 0.8594
Epoch 319/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3364 - accuracy: 0.
8622 - val_loss: 0.3388 - val_accuracy: 0.8650
Epoch 320/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3361 - accuracy: 0.
8611 - val_loss: 0.3396 - val_accuracy: 0.8600
Epoch 321/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3368 - accuracy: 0.
8628 - val_loss: 0.3401 - val_accuracy: 0.8606
Epoch 322/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3359 - accuracy: 0.
8597 - val_loss: 0.3393 - val_accuracy: 0.8637
Epoch 323/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3368 - accuracy: 0.
8616 - val_loss: 0.3399 - val_accuracy: 0.8606
Epoch 324/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3345 - accuracy: 0.
8605 - val_loss: 0.3392 - val_accuracy: 0.8631
Epoch 325/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3389 - accuracy: 0.
8625 - val_loss: 0.3397 - val_accuracy: 0.8644
```

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Epoch 326/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3365 - accuracy: 0.
8628 - val_loss: 0.3395 - val_accuracy: 0.8637
Epoch 327/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3358 - accuracy: 0.
8609 - val_loss: 0.3389 - val_accuracy: 0.8656
Epoch 328/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3368 - accuracy: 0.
8609 - val_loss: 0.3394 - val_accuracy: 0.8637
Epoch 329/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3358 - accuracy: 0.
8620 - val_loss: 0.3392 - val_accuracy: 0.8606
Epoch 330/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3353 - accuracy: 0.
8619 - val_loss: 0.3389 - val_accuracy: 0.8644
Epoch 331/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3351 - accuracy: 0.
8609 - val_loss: 0.3390 - val_accuracy: 0.8606
Epoch 332/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3376 - accuracy: 0.
8597 - val_loss: 0.3392 - val_accuracy: 0.8606
Epoch 333/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3359 - accuracy: 0.
8617 - val_loss: 0.3383 - val_accuracy: 0.8600
Epoch 334/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3362 - accuracy: 0.
8619 - val_loss: 0.3387 - val_accuracy: 0.8612
Epoch 335/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3366 - accuracy: 0.
8639 - val_loss: 0.3397 - val_accuracy: 0.8594
Epoch 336/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3364 - accuracy: 0.
8614 - val_loss: 0.3386 - val_accuracy: 0.8656
Epoch 337/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3381 - accuracy: 0.
8630 - val_loss: 0.3390 - val_accuracy: 0.8637
Epoch 338/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3364 - accuracy: 0.
8614 - val_loss: 0.3380 - val_accuracy: 0.8612
Epoch 339/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3349 - accuracy: 0.
8637 - val_loss: 0.3383 - val_accuracy: 0.8631
Epoch 340/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3381 - accuracy: 0.
8628 - val_loss: 0.3386 - val_accuracy: 0.8606
Epoch 341/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3370 - accuracy: 0.
8620 - val_loss: 0.3388 - val_accuracy: 0.8631
Epoch 342/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3371 - accuracy: 0.
8619 - val_loss: 0.3394 - val_accuracy: 0.8644
Epoch 343/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3365 - accuracy: 0.
8598 - val_loss: 0.3390 - val_accuracy: 0.8631
Epoch 344/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3354 - accuracy: 0.
8630 - val_loss: 0.3382 - val_accuracy: 0.8600
Epoch 345/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3366 - accuracy: 0.
8630 - val_loss: 0.3389 - val_accuracy: 0.8606
Epoch 346/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3367 - accuracy: 0.
8609 - val_loss: 0.3383 - val_accuracy: 0.8656
Epoch 347/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3384 - accuracy: 0.
```

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8608 - val_loss: 0.3388 - val_accuracy: 0.8631
Epoch 348/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3347 - accuracy: 0.
8616 - val_loss: 0.3390 - val_accuracy: 0.8606
Epoch 349/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3350 - accuracy: 0.
8617 - val_loss: 0.3382 - val_accuracy: 0.8631
Epoch 350/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3372 - accuracy: 0.
8623 - val_loss: 0.3383 - val_accuracy: 0.8637
Epoch 351/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3367 - accuracy: 0.
8616 - val_loss: 0.3383 - val_accuracy: 0.8625
Epoch 352/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3350 - accuracy: 0.
8625 - val_loss: 0.3382 - val_accuracy: 0.8631
Epoch 353/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3358 - accuracy: 0.
8614 - val_loss: 0.3397 - val_accuracy: 0.8594
Epoch 354/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3348 - accuracy: 0.
8633 - val_loss: 0.3386 - val_accuracy: 0.8650
Epoch 355/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3361 - accuracy: 0.
8603 - val_loss: 0.3388 - val_accuracy: 0.8619
Epoch 356/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3357 - accuracy: 0.
8617 - val_loss: 0.3386 - val_accuracy: 0.8612
Epoch 357/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3377 - accuracy: 0.
8608 - val_loss: 0.3385 - val_accuracy: 0.8625
Epoch 358/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3366 - accuracy: 0.
8612 - val_loss: 0.3386 - val_accuracy: 0.8637
Epoch 359/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3335 - accuracy: 0.
8644 - val_loss: 0.3386 - val_accuracy: 0.8619
Epoch 360/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3356 - accuracy: 0.
8592 - val_loss: 0.3385 - val_accuracy: 0.8631
Epoch 361/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3357 - accuracy: 0.
8627 - val_loss: 0.3384 - val_accuracy: 0.8612
Epoch 362/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3340 - accuracy: 0.
8619 - val_loss: 0.3382 - val_accuracy: 0.8612
Epoch 363/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3341 - accuracy: 0.
8627 - val_loss: 0.3379 - val_accuracy: 0.8656
Epoch 364/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3359 - accuracy: 0.
8616 - val_loss: 0.3384 - val_accuracy: 0.8619
Epoch 365/1000
7/7 [==============================] - 0s 6ms/step - loss: 0.3359 - accuracy: 0.
8625 - val_loss: 0.3386 - val_accuracy: 0.8637
Epoch 366/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3363 - accuracy: 0.
8611 - val_loss: 0.3382 - val_accuracy: 0.8669
Epoch 367/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3348 - accuracy: 0.
8603 - val_loss: 0.3394 - val_accuracy: 0.8619
Epoch 368/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3350 - accuracy: 0.
8628 - val_loss: 0.3382 - val_accuracy: 0.8625
Epoch 369/1000
```

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7/7 [==============================] - 0s 5ms/step - loss: 0.3389 - accuracy: 0.
8578 - val_loss: 0.3383 - val_accuracy: 0.8625
Epoch 370/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3340 - accuracy: 0.
8661 - val_loss: 0.3380 - val_accuracy: 0.8637
Epoch 371/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3353 - accuracy: 0.
8612 - val_loss: 0.3385 - val_accuracy: 0.8625
Epoch 372/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3340 - accuracy: 0.
8623 - val_loss: 0.3382 - val_accuracy: 0.8656
Epoch 373/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3356 - accuracy: 0.
8652 - val_loss: 0.3387 - val_accuracy: 0.8619
Epoch 374/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3362 - accuracy: 0.
8628 - val_loss: 0.3383 - val_accuracy: 0.8631
Epoch 375/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3351 - accuracy: 0.
8612 - val_loss: 0.3375 - val_accuracy: 0.8631
Epoch 376/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3349 - accuracy: 0.
8606 - val_loss: 0.3377 - val_accuracy: 0.8625
Epoch 377/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3355 - accuracy: 0.
8620 - val_loss: 0.3386 - val_accuracy: 0.8619
Epoch 378/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3363 - accuracy: 0.
8617 - val_loss: 0.3388 - val_accuracy: 0.8656
Epoch 379/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3358 - accuracy: 0.
8620 - val_loss: 0.3390 - val_accuracy: 0.8625
Epoch 380/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3371 - accuracy: 0.
8603 - val_loss: 0.3382 - val_accuracy: 0.8631
Epoch 381/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3347 - accuracy: 0.
8623 - val_loss: 0.3388 - val_accuracy: 0.8637
Epoch 382/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3337 - accuracy: 0.
8634 - val_loss: 0.3380 - val_accuracy: 0.8625
Epoch 383/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3347 - accuracy: 0.
8612 - val_loss: 0.3382 - val_accuracy: 0.8644
Epoch 384/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3348 - accuracy: 0.
8628 - val_loss: 0.3381 - val_accuracy: 0.8637
Epoch 385/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3350 - accuracy: 0.
8625 - val_loss: 0.3382 - val_accuracy: 0.8644
Epoch 386/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3351 - accuracy: 0.
8614 - val_loss: 0.3382 - val_accuracy: 0.8637
Epoch 387/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3327 - accuracy: 0.
8672 - val_loss: 0.3383 - val_accuracy: 0.8637
Epoch 388/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3343 - accuracy: 0.
8612 - val_loss: 0.3381 - val_accuracy: 0.8631
Epoch 389/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3348 - accuracy: 0.
8608 - val_loss: 0.3382 - val_accuracy: 0.8644
Epoch 390/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3342 - accuracy: 0.
8603 - val_loss: 0.3383 - val_accuracy: 0.8631
```

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Epoch 391/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3334 - accuracy: 0.
8627 - val_loss: 0.3382 - val_accuracy: 0.8631
Epoch 392/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3328 - accuracy: 0.
8641 - val_loss: 0.3383 - val_accuracy: 0.8625
Epoch 393/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3342 - accuracy: 0.
8602 - val_loss: 0.3385 - val_accuracy: 0.8637
Epoch 394/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3343 - accuracy: 0.
8628 - val_loss: 0.3381 - val_accuracy: 0.8637
Epoch 395/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3331 - accuracy: 0.
8628 - val_loss: 0.3388 - val_accuracy: 0.8625
Epoch 396/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3329 - accuracy: 0.
8656 - val_loss: 0.3377 - val_accuracy: 0.8637
Epoch 397/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3368 - accuracy: 0.
8608 - val_loss: 0.3377 - val_accuracy: 0.8637
Epoch 398/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3342 - accuracy: 0.
8673 - val_loss: 0.3384 - val_accuracy: 0.8625
Epoch 399/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3348 - accuracy: 0.
8623 - val_loss: 0.3381 - val_accuracy: 0.8619
Epoch 400/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3341 - accuracy: 0.
8628 - val_loss: 0.3382 - val_accuracy: 0.8637
Epoch 401/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3349 - accuracy: 0.
8625 - val_loss: 0.3383 - val_accuracy: 0.8619
Epoch 402/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3356 - accuracy: 0.
8631 - val_loss: 0.3385 - val_accuracy: 0.8631
Epoch 403/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3334 - accuracy: 0.
8614 - val_loss: 0.3384 - val_accuracy: 0.8619
Epoch 404/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3334 - accuracy: 0.
8667 - val_loss: 0.3382 - val_accuracy: 0.8644
Epoch 405/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3320 - accuracy: 0.
8628 - val_loss: 0.3378 - val_accuracy: 0.8631
Epoch 406/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3375 - accuracy: 0.
8644 - val_loss: 0.3374 - val_accuracy: 0.8656
Epoch 407/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3332 - accuracy: 0.
8636 - val_loss: 0.3392 - val_accuracy: 0.8631
Epoch 408/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3330 - accuracy: 0.
8645 - val_loss: 0.3384 - val_accuracy: 0.8650
Epoch 409/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3325 - accuracy: 0.
8622 - val_loss: 0.3384 - val_accuracy: 0.8619
Epoch 410/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3329 - accuracy: 0.
8642 - val_loss: 0.3371 - val_accuracy: 0.8631
Epoch 411/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3331 - accuracy: 0.
8645 - val_loss: 0.3376 - val_accuracy: 0.8637
Epoch 412/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3340 - accuracy: 0.
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8611 - val_loss: 0.3377 - val_accuracy: 0.8644
Epoch 413/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3349 - accuracy: 0.
8617 - val_loss: 0.3385 - val_accuracy: 0.8637
Epoch 414/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3343 - accuracy: 0.
8633 - val_loss: 0.3379 - val_accuracy: 0.8619
Epoch 415/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3352 - accuracy: 0.
8625 - val_loss: 0.3378 - val_accuracy: 0.8644
Epoch 416/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3339 - accuracy: 0.
8609 - val_loss: 0.3388 - val_accuracy: 0.8625
Epoch 417/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3320 - accuracy: 0.
8636 - val_loss: 0.3381 - val_accuracy: 0.8631
Epoch 418/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3363 - accuracy: 0.
8587 - val_loss: 0.3385 - val_accuracy: 0.8619
Epoch 419/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3313 - accuracy: 0.
8616 - val_loss: 0.3378 - val_accuracy: 0.8625
Epoch 420/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3324 - accuracy: 0.
8631 - val_loss: 0.3384 - val_accuracy: 0.8631
Epoch 421/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3352 - accuracy: 0.
8631 - val_loss: 0.3386 - val_accuracy: 0.8656
Epoch 422/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3329 - accuracy: 0.
8645 - val_loss: 0.3381 - val_accuracy: 0.8625
Epoch 423/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3313 - accuracy: 0.
8631 - val_loss: 0.3373 - val_accuracy: 0.8650
Epoch 424/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3350 - accuracy: 0.
8619 - val_loss: 0.3374 - val_accuracy: 0.8625
Epoch 425/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3330 - accuracy: 0.
8644 - val_loss: 0.3381 - val_accuracy: 0.8625
Epoch 426/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3340 - accuracy: 0.
8631 - val_loss: 0.3383 - val_accuracy: 0.8644
Epoch 427/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3331 - accuracy: 0.
8642 - val_loss: 0.3388 - val_accuracy: 0.8625
Epoch 428/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3339 - accuracy: 0.
8645 - val_loss: 0.3385 - val_accuracy: 0.8612
Epoch 429/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3331 - accuracy: 0.
8627 - val_loss: 0.3376 - val_accuracy: 0.8619
Epoch 430/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3341 - accuracy: 0.
8634 - val_loss: 0.3375 - val_accuracy: 0.8631
Epoch 431/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3342 - accuracy: 0.
8636 - val_loss: 0.3379 - val_accuracy: 0.8637
Epoch 432/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3326 - accuracy: 0.
8631 - val_loss: 0.3377 - val_accuracy: 0.8650
Epoch 433/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3340 - accuracy: 0.
8630 - val_loss: 0.3384 - val_accuracy: 0.8619
Epoch 434/1000
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7/7 [==============================] - 0s 5ms/step - loss: 0.3326 - accuracy: 0.
8644 - val_loss: 0.3377 - val_accuracy: 0.8631
Epoch 435/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3317 - accuracy: 0.
8628 - val_loss: 0.3379 - val_accuracy: 0.8631
Epoch 436/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3322 - accuracy: 0.
8628 - val_loss: 0.3379 - val_accuracy: 0.8619
Epoch 437/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3330 - accuracy: 0.
8647 - val_loss: 0.3380 - val_accuracy: 0.8631
Epoch 438/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3343 - accuracy: 0.
8636 - val_loss: 0.3387 - val_accuracy: 0.8625
Epoch 439/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3315 - accuracy: 0.
8653 - val_loss: 0.3376 - val_accuracy: 0.8619
Epoch 440/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3319 - accuracy: 0.
8637 - val_loss: 0.3376 - val_accuracy: 0.8625
Epoch 441/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3339 - accuracy: 0.
8641 - val_loss: 0.3374 - val_accuracy: 0.8631
Epoch 442/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3322 - accuracy: 0.
8630 - val_loss: 0.3378 - val_accuracy: 0.8637
Epoch 443/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3317 - accuracy: 0.
8656 - val_loss: 0.3380 - val_accuracy: 0.8619
Epoch 444/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3322 - accuracy: 0.
8617 - val_loss: 0.3375 - val_accuracy: 0.8631
Epoch 445/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3318 - accuracy: 0.
8659 - val_loss: 0.3377 - val_accuracy: 0.8625
Epoch 446/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3322 - accuracy: 0.
8647 - val_loss: 0.3374 - val_accuracy: 0.8625
Epoch 447/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3305 - accuracy: 0.
8647 - val_loss: 0.3374 - val_accuracy: 0.8650
Epoch 448/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3309 - accuracy: 0.
8656 - val_loss: 0.3379 - val_accuracy: 0.8612
Epoch 449/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3319 - accuracy: 0.
8606 - val_loss: 0.3370 - val_accuracy: 0.8644
Epoch 450/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3328 - accuracy: 0.
8659 - val_loss: 0.3377 - val_accuracy: 0.8619
Epoch 451/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3337 - accuracy: 0.
8602 - val_loss: 0.3379 - val_accuracy: 0.8625
Epoch 452/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3324 - accuracy: 0.
8677 - val_loss: 0.3377 - val_accuracy: 0.8625
Epoch 453/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3324 - accuracy: 0.
8631 - val_loss: 0.3376 - val_accuracy: 0.8631
Epoch 454/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3341 - accuracy: 0.
8614 - val_loss: 0.3379 - val_accuracy: 0.8650
Epoch 455/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3325 - accuracy: 0.
8644 - val_loss: 0.3380 - val_accuracy: 0.8637
```

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Epoch 456/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3332 - accuracy: 0.
8630 - val_loss: 0.3379 - val_accuracy: 0.8656
Epoch 457/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3338 - accuracy: 0.
8619 - val_loss: 0.3377 - val_accuracy: 0.8637
Epoch 458/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3310 - accuracy: 0.
8641 - val_loss: 0.3378 - val_accuracy: 0.8637
Epoch 459/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3328 - accuracy: 0.
8641 - val_loss: 0.3380 - val_accuracy: 0.8637
Epoch 460/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3326 - accuracy: 0.
8636 - val_loss: 0.3377 - val_accuracy: 0.8637
Epoch 461/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3322 - accuracy: 0.
8641 - val_loss: 0.3372 - val_accuracy: 0.8662
Epoch 462/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3353 - accuracy: 0.
8611 - val_loss: 0.3377 - val_accuracy: 0.8637
Epoch 463/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3320 - accuracy: 0.
8641 - val_loss: 0.3374 - val_accuracy: 0.8637
Epoch 464/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3331 - accuracy: 0.
8623 - val_loss: 0.3373 - val_accuracy: 0.8656
Epoch 465/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3342 - accuracy: 0.
8637 - val_loss: 0.3371 - val_accuracy: 0.8644
Epoch 466/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3319 - accuracy: 0.
8630 - val_loss: 0.3378 - val_accuracy: 0.8625
Epoch 467/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3342 - accuracy: 0.
8631 - val_loss: 0.3371 - val_accuracy: 0.8637
Epoch 468/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3319 - accuracy: 0.
8636 - val_loss: 0.3370 - val_accuracy: 0.8650
Epoch 469/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3300 - accuracy: 0.
8662 - val_loss: 0.3379 - val_accuracy: 0.8612
Epoch 470/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3310 - accuracy: 0.
8666 - val_loss: 0.3369 - val_accuracy: 0.8625
Epoch 471/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3317 - accuracy: 0.
8653 - val_loss: 0.3387 - val_accuracy: 0.8606
Epoch 472/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3318 - accuracy: 0.
8645 - val_loss: 0.3377 - val_accuracy: 0.8637
Epoch 473/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3309 - accuracy: 0.
8655 - val_loss: 0.3376 - val_accuracy: 0.8662
Epoch 474/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3341 - accuracy: 0.
8634 - val_loss: 0.3373 - val_accuracy: 0.8631
Epoch 475/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3350 - accuracy: 0.
8620 - val_loss: 0.3376 - val_accuracy: 0.8625
Epoch 476/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3328 - accuracy: 0.
8616 - val_loss: 0.3382 - val_accuracy: 0.8619
Epoch 477/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3302 - accuracy: 0.
```

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8647 - val_loss: 0.3377 - val_accuracy: 0.8619
Epoch 478/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3315 - accuracy: 0.
8641 - val_loss: 0.3379 - val_accuracy: 0.8637
Epoch 479/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3325 - accuracy: 0.
8648 - val_loss: 0.3368 - val_accuracy: 0.8637
Epoch 480/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3324 - accuracy: 0.
8652 - val_loss: 0.3371 - val_accuracy: 0.8619
Epoch 481/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3295 - accuracy: 0.
8637 - val_loss: 0.3380 - val_accuracy: 0.8644
Epoch 482/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3332 - accuracy: 0.
8628 - val_loss: 0.3376 - val_accuracy: 0.8637
Epoch 483/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3321 - accuracy: 0.
8672 - val_loss: 0.3375 - val_accuracy: 0.8650
Epoch 484/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3334 - accuracy: 0.
8642 - val_loss: 0.3377 - val_accuracy: 0.8594
Epoch 485/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3293 - accuracy: 0.
8672 - val_loss: 0.3371 - val_accuracy: 0.8637
Epoch 486/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3323 - accuracy: 0.
8631 - val_loss: 0.3374 - val_accuracy: 0.8625
Epoch 487/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3312 - accuracy: 0.
8669 - val_loss: 0.3376 - val_accuracy: 0.8637
Epoch 488/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3321 - accuracy: 0.
8667 - val_loss: 0.3372 - val_accuracy: 0.8631
Epoch 489/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3293 - accuracy: 0.
8630 - val_loss: 0.3371 - val_accuracy: 0.8650
Epoch 490/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3314 - accuracy: 0.
8644 - val_loss: 0.3373 - val_accuracy: 0.8637
Epoch 491/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3309 - accuracy: 0.
8658 - val_loss: 0.3371 - val_accuracy: 0.8656
Epoch 492/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3310 - accuracy: 0.
8659 - val_loss: 0.3373 - val_accuracy: 0.8644
Epoch 493/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3295 - accuracy: 0.
8645 - val_loss: 0.3367 - val_accuracy: 0.8650
Epoch 494/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3326 - accuracy: 0.
8653 - val_loss: 0.3371 - val_accuracy: 0.8656
Epoch 495/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3302 - accuracy: 0.
8675 - val_loss: 0.3372 - val_accuracy: 0.8644
Epoch 496/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3318 - accuracy: 0.
8647 - val_loss: 0.3375 - val_accuracy: 0.8644
Epoch 497/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3313 - accuracy: 0.
8617 - val_loss: 0.3379 - val_accuracy: 0.8631
Epoch 498/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3326 - accuracy: 0.
8614 - val_loss: 0.3381 - val_accuracy: 0.8637
Epoch 499/1000
```

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7/7 [==============================] - 0s 5ms/step - loss: 0.3315 - accuracy: 0.
8641 - val_loss: 0.3374 - val_accuracy: 0.8612
Epoch 500/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3312 - accuracy: 0.
8644 - val_loss: 0.3368 - val_accuracy: 0.8644
Epoch 501/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3301 - accuracy: 0.
8652 - val_loss: 0.3371 - val_accuracy: 0.8644
Epoch 502/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3324 - accuracy: 0.
8648 - val_loss: 0.3377 - val_accuracy: 0.8644
Epoch 503/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3305 - accuracy: 0.
8641 - val_loss: 0.3373 - val_accuracy: 0.8619
Epoch 504/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3322 - accuracy: 0.
8636 - val_loss: 0.3375 - val_accuracy: 0.8644
Epoch 505/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3339 - accuracy: 0.
8636 - val_loss: 0.3372 - val_accuracy: 0.8650
Epoch 506/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3313 - accuracy: 0.
8653 - val_loss: 0.3377 - val_accuracy: 0.8650
Epoch 507/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3313 - accuracy: 0.
8627 - val_loss: 0.3379 - val_accuracy: 0.8637
Epoch 508/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3299 - accuracy: 0.
8633 - val_loss: 0.3378 - val_accuracy: 0.8650
Epoch 509/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3329 - accuracy: 0.
8645 - val_loss: 0.3372 - val_accuracy: 0.8631
Epoch 510/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3296 - accuracy: 0.
8648 - val_loss: 0.3374 - val_accuracy: 0.8625
Epoch 511/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3310 - accuracy: 0.
8647 - val_loss: 0.3367 - val_accuracy: 0.8637
Epoch 512/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3302 - accuracy: 0.
8652 - val_loss: 0.3370 - val_accuracy: 0.8625
Epoch 513/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3313 - accuracy: 0.
8631 - val_loss: 0.3373 - val_accuracy: 0.8637
Epoch 514/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3309 - accuracy: 0.
8631 - val_loss: 0.3371 - val_accuracy: 0.8631
Epoch 515/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3312 - accuracy: 0.
8622 - val_loss: 0.3377 - val_accuracy: 0.8650
Epoch 516/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3310 - accuracy: 0.
8636 - val_loss: 0.3381 - val_accuracy: 0.8650
Epoch 517/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3295 - accuracy: 0.
8642 - val_loss: 0.3376 - val_accuracy: 0.8619
Epoch 518/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3305 - accuracy: 0.
8653 - val_loss: 0.3373 - val_accuracy: 0.8612
Epoch 519/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3353 - accuracy: 0.
8631 - val_loss: 0.3372 - val_accuracy: 0.8644
Epoch 520/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3297 - accuracy: 0.
8662 - val_loss: 0.3367 - val_accuracy: 0.8644
```

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Epoch 521/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3298 - accuracy: 0.
8661 - val_loss: 0.3373 - val_accuracy: 0.8644
Epoch 522/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3299 - accuracy: 0.
8664 - val_loss: 0.3373 - val_accuracy: 0.8669
Epoch 523/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3317 - accuracy: 0.
8677 - val_loss: 0.3375 - val_accuracy: 0.8637
Epoch 524/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3329 - accuracy: 0.
8630 - val_loss: 0.3377 - val_accuracy: 0.8656
Epoch 525/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3309 - accuracy: 0.
8631 - val_loss: 0.3373 - val_accuracy: 0.8644
Epoch 526/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3311 - accuracy: 0.
8647 - val_loss: 0.3384 - val_accuracy: 0.8631
Epoch 527/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3317 - accuracy: 0.
8661 - val_loss: 0.3379 - val_accuracy: 0.8612
Epoch 528/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3321 - accuracy: 0.
8656 - val_loss: 0.3375 - val_accuracy: 0.8612
Epoch 529/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3300 - accuracy: 0.
8636 - val_loss: 0.3376 - val_accuracy: 0.8637
Epoch 530/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3286 - accuracy: 0.
8673 - val_loss: 0.3376 - val_accuracy: 0.8631
Epoch 531/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3318 - accuracy: 0.
8642 - val_loss: 0.3376 - val_accuracy: 0.8631
Epoch 532/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3314 - accuracy: 0.
8637 - val_loss: 0.3374 - val_accuracy: 0.8631
Epoch 533/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3279 - accuracy: 0.
8661 - val_loss: 0.3373 - val_accuracy: 0.8619
Epoch 534/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3322 - accuracy: 0.
8652 - val_loss: 0.3371 - val_accuracy: 0.8612
Epoch 535/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3292 - accuracy: 0.
8636 - val_loss: 0.3380 - val_accuracy: 0.8625
Epoch 536/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3295 - accuracy: 0.
8661 - val_loss: 0.3372 - val_accuracy: 0.8625
Epoch 537/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3305 - accuracy: 0.
8645 - val_loss: 0.3372 - val_accuracy: 0.8619
Epoch 538/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3309 - accuracy: 0.
8656 - val_loss: 0.3379 - val_accuracy: 0.8637
Epoch 539/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3313 - accuracy: 0.
8631 - val_loss: 0.3375 - val_accuracy: 0.8625
Epoch 540/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3287 - accuracy: 0.
8656 - val_loss: 0.3377 - val_accuracy: 0.8600
Epoch 541/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3290 - accuracy: 0.
8661 - val_loss: 0.3371 - val_accuracy: 0.8606
Epoch 542/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3313 - accuracy: 0.
```

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8655 - val_loss: 0.3371 - val_accuracy: 0.8625
Epoch 543/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3300 - accuracy: 0.
8625 - val_loss: 0.3381 - val_accuracy: 0.8644
Epoch 544/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3323 - accuracy: 0.
8644 - val_loss: 0.3377 - val_accuracy: 0.8606
Epoch 545/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3310 - accuracy: 0.
8620 - val_loss: 0.3381 - val_accuracy: 0.8637
Epoch 546/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3307 - accuracy: 0.
8642 - val_loss: 0.3370 - val_accuracy: 0.8587
Epoch 547/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3297 - accuracy: 0.
8647 - val_loss: 0.3372 - val_accuracy: 0.8625
Epoch 548/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3304 - accuracy: 0.
8658 - val_loss: 0.3371 - val_accuracy: 0.8606
Epoch 549/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3301 - accuracy: 0.
8684 - val_loss: 0.3378 - val_accuracy: 0.8625
Epoch 550/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3280 - accuracy: 0.
8617 - val_loss: 0.3373 - val_accuracy: 0.8631
Epoch 551/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3297 - accuracy: 0.
8644 - val_loss: 0.3371 - val_accuracy: 0.8644
Epoch 552/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3296 - accuracy: 0.
8648 - val_loss: 0.3366 - val_accuracy: 0.8637
Epoch 553/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3304 - accuracy: 0.
8644 - val_loss: 0.3376 - val_accuracy: 0.8631
Epoch 554/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3293 - accuracy: 0.
8653 - val_loss: 0.3376 - val_accuracy: 0.8619
Epoch 555/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3292 - accuracy: 0.
8659 - val_loss: 0.3374 - val_accuracy: 0.8612
Epoch 556/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3294 - accuracy: 0.
8622 - val_loss: 0.3373 - val_accuracy: 0.8656
Epoch 557/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3304 - accuracy: 0.
8655 - val_loss: 0.3371 - val_accuracy: 0.8637
Epoch 558/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3313 - accuracy: 0.
8623 - val_loss: 0.3378 - val_accuracy: 0.8637
Epoch 559/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3292 - accuracy: 0.
8662 - val_loss: 0.3375 - val_accuracy: 0.8619
Epoch 560/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3305 - accuracy: 0.
8639 - val_loss: 0.3376 - val_accuracy: 0.8644
Epoch 561/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3302 - accuracy: 0.
8655 - val_loss: 0.3373 - val_accuracy: 0.8625
Epoch 562/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3304 - accuracy: 0.
8637 - val_loss: 0.3373 - val_accuracy: 0.8619
Epoch 563/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3290 - accuracy: 0.
8655 - val_loss: 0.3376 - val_accuracy: 0.8625
Epoch 564/1000
```

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7/7 [==============================] - 0s 5ms/step - loss: 0.3300 - accuracy: 0.
8655 - val_loss: 0.3375 - val_accuracy: 0.8625
Epoch 565/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3291 - accuracy: 0.
8633 - val_loss: 0.3374 - val_accuracy: 0.8619
Epoch 566/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3281 - accuracy: 0.
8659 - val_loss: 0.3379 - val_accuracy: 0.8631
Epoch 567/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3311 - accuracy: 0.
8634 - val_loss: 0.3374 - val_accuracy: 0.8625
Epoch 568/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3305 - accuracy: 0.
8667 - val_loss: 0.3367 - val_accuracy: 0.8631
Epoch 569/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3321 - accuracy: 0.
8634 - val_loss: 0.3370 - val_accuracy: 0.8637
Epoch 570/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3305 - accuracy: 0.
8645 - val_loss: 0.3371 - val_accuracy: 0.8631
Epoch 571/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3307 - accuracy: 0.
8641 - val_loss: 0.3395 - val_accuracy: 0.8606
Epoch 572/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3312 - accuracy: 0.
8653 - val_loss: 0.3382 - val_accuracy: 0.8600
Epoch 573/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3305 - accuracy: 0.
8634 - val_loss: 0.3380 - val_accuracy: 0.8656
Epoch 574/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3299 - accuracy: 0.
8652 - val_loss: 0.3367 - val_accuracy: 0.8637
Epoch 575/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3291 - accuracy: 0.
8642 - val_loss: 0.3374 - val_accuracy: 0.8644
Epoch 576/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3287 - accuracy: 0.
8652 - val_loss: 0.3371 - val_accuracy: 0.8631
Epoch 577/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3307 - accuracy: 0.
8642 - val_loss: 0.3372 - val_accuracy: 0.8644
Epoch 578/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3306 - accuracy: 0.
8641 - val_loss: 0.3374 - val_accuracy: 0.8619
Epoch 579/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3312 - accuracy: 0.
8652 - val_loss: 0.3366 - val_accuracy: 0.8631
Epoch 580/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3286 - accuracy: 0.
8648 - val_loss: 0.3367 - val_accuracy: 0.8625
Epoch 581/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3294 - accuracy: 0.
8669 - val_loss: 0.3379 - val_accuracy: 0.8656
Epoch 582/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3277 - accuracy: 0.
8639 - val_loss: 0.3371 - val_accuracy: 0.8619
Epoch 583/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3289 - accuracy: 0.
8672 - val_loss: 0.3375 - val_accuracy: 0.8619
Epoch 584/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3303 - accuracy: 0.
8655 - val_loss: 0.3371 - val_accuracy: 0.8619
Epoch 585/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3308 - accuracy: 0.
8633 - val_loss: 0.3372 - val_accuracy: 0.8625
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Epoch 586/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3305 - accuracy: 0.
8633 - val_loss: 0.3370 - val_accuracy: 0.8612
Epoch 587/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3289 - accuracy: 0.
8627 - val_loss: 0.3379 - val_accuracy: 0.8606
Epoch 588/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3294 - accuracy: 0.
8659 - val_loss: 0.3375 - val_accuracy: 0.8612
Epoch 589/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3285 - accuracy: 0.
8648 - val_loss: 0.3372 - val_accuracy: 0.8631
Epoch 590/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3299 - accuracy: 0.
8662 - val_loss: 0.3371 - val_accuracy: 0.8625
Epoch 591/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3282 - accuracy: 0.
8672 - val_loss: 0.3371 - val_accuracy: 0.8619
Epoch 592/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3310 - accuracy: 0.
8639 - val_loss: 0.3381 - val_accuracy: 0.8612
Epoch 593/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3300 - accuracy: 0.
8644 - val_loss: 0.3373 - val_accuracy: 0.8612
Epoch 594/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3293 - accuracy: 0.
8631 - val_loss: 0.3367 - val_accuracy: 0.8625
Epoch 595/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3285 - accuracy: 0.
8661 - val_loss: 0.3371 - val_accuracy: 0.8612
Epoch 596/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3295 - accuracy: 0.
8658 - val_loss: 0.3373 - val_accuracy: 0.8606
Epoch 597/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3299 - accuracy: 0.
8639 - val_loss: 0.3386 - val_accuracy: 0.8606
Epoch 598/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3303 - accuracy: 0.
8652 - val_loss: 0.3377 - val_accuracy: 0.8594
Epoch 599/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3303 - accuracy: 0.
8648 - val_loss: 0.3372 - val_accuracy: 0.8600
Epoch 600/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3274 - accuracy: 0.
8656 - val_loss: 0.3366 - val_accuracy: 0.8612
Epoch 601/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3307 - accuracy: 0.
8623 - val_loss: 0.3365 - val_accuracy: 0.8612
Epoch 602/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3306 - accuracy: 0.
8652 - val_loss: 0.3374 - val_accuracy: 0.8600
Epoch 603/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3301 - accuracy: 0.
8634 - val_loss: 0.3370 - val_accuracy: 0.8637
Epoch 604/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3322 - accuracy: 0.
8620 - val_loss: 0.3367 - val_accuracy: 0.8631
Epoch 605/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3298 - accuracy: 0.
8652 - val_loss: 0.3373 - val_accuracy: 0.8637
Epoch 606/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3309 - accuracy: 0.
8658 - val_loss: 0.3367 - val_accuracy: 0.8612
Epoch 607/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3297 - accuracy: 0.
```

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8655 - val_loss: 0.3376 - val_accuracy: 0.8631
Epoch 608/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3284 - accuracy: 0.
8655 - val_loss: 0.3362 - val_accuracy: 0.8637
Epoch 609/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3288 - accuracy: 0.
8655 - val_loss: 0.3367 - val_accuracy: 0.8625
Epoch 610/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3298 - accuracy: 0.
8637 - val_loss: 0.3371 - val_accuracy: 0.8644
Epoch 611/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3297 - accuracy: 0.
8637 - val_loss: 0.3367 - val_accuracy: 0.8606
Epoch 612/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3281 - accuracy: 0.
8684 - val_loss: 0.3372 - val_accuracy: 0.8594
Epoch 613/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3276 - accuracy: 0.
8664 - val_loss: 0.3384 - val_accuracy: 0.8631
Epoch 614/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3294 - accuracy: 0.
8661 - val_loss: 0.3366 - val_accuracy: 0.8619
Epoch 615/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3279 - accuracy: 0.
8672 - val_loss: 0.3371 - val_accuracy: 0.8631
Epoch 616/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3283 - accuracy: 0.
8644 - val_loss: 0.3366 - val_accuracy: 0.8612
Epoch 617/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3269 - accuracy: 0.
8645 - val_loss: 0.3373 - val_accuracy: 0.8619
Epoch 618/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3268 - accuracy: 0.
8687 - val_loss: 0.3378 - val_accuracy: 0.8612
Epoch 619/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3294 - accuracy: 0.
8662 - val_loss: 0.3373 - val_accuracy: 0.8625
Epoch 620/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3288 - accuracy: 0.
8662 - val_loss: 0.3366 - val_accuracy: 0.8612
Epoch 621/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3273 - accuracy: 0.
8678 - val_loss: 0.3370 - val_accuracy: 0.8600
Epoch 622/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3285 - accuracy: 0.
8641 - val_loss: 0.3378 - val_accuracy: 0.8612
Epoch 623/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3302 - accuracy: 0.
8642 - val_loss: 0.3377 - val_accuracy: 0.8625
Epoch 624/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3288 - accuracy: 0.
8636 - val_loss: 0.3369 - val_accuracy: 0.8619
Epoch 625/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3283 - accuracy: 0.
8667 - val_loss: 0.3375 - val_accuracy: 0.8606
Epoch 626/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3312 - accuracy: 0.
8631 - val_loss: 0.3370 - val_accuracy: 0.8612
Epoch 627/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3286 - accuracy: 0.
8650 - val_loss: 0.3371 - val_accuracy: 0.8625
Epoch 628/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3306 - accuracy: 0.
8614 - val_loss: 0.3372 - val_accuracy: 0.8606
Epoch 629/1000
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7/7 [==============================] - 0s 5ms/step - loss: 0.3286 - accuracy: 0.
8648 - val_loss: 0.3368 - val_accuracy: 0.8594
Epoch 630/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3261 - accuracy: 0.
8661 - val_loss: 0.3369 - val_accuracy: 0.8619
Epoch 631/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3272 - accuracy: 0.
8661 - val_loss: 0.3370 - val_accuracy: 0.8612
Epoch 632/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3278 - accuracy: 0.
8667 - val_loss: 0.3371 - val_accuracy: 0.8600
Epoch 633/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3277 - accuracy: 0.
8644 - val_loss: 0.3372 - val_accuracy: 0.8600
Epoch 634/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3299 - accuracy: 0.
8631 - val_loss: 0.3370 - val_accuracy: 0.8600
Epoch 635/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3281 - accuracy: 0.
8664 - val_loss: 0.3375 - val_accuracy: 0.8631
Epoch 636/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3275 - accuracy: 0.
8687 - val_loss: 0.3370 - val_accuracy: 0.8612
Epoch 637/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3303 - accuracy: 0.
8645 - val_loss: 0.3378 - val_accuracy: 0.8619
Epoch 638/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3287 - accuracy: 0.
8648 - val_loss: 0.3371 - val_accuracy: 0.8594
Epoch 639/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3281 - accuracy: 0.
8681 - val_loss: 0.3370 - val_accuracy: 0.8619
Epoch 640/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3287 - accuracy: 0.
8656 - val_loss: 0.3367 - val_accuracy: 0.8587
Epoch 641/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3303 - accuracy: 0.
8637 - val_loss: 0.3371 - val_accuracy: 0.8619
Epoch 642/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3289 - accuracy: 0.
8619 - val_loss: 0.3371 - val_accuracy: 0.8594
Epoch 643/1000
7/7 [==============================] - 0s 6ms/step - loss: 0.3278 - accuracy: 0.
8653 - val_loss: 0.3373 - val_accuracy: 0.8606
Epoch 644/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3275 - accuracy: 0.
8658 - val_loss: 0.3374 - val_accuracy: 0.8600
Epoch 645/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3288 - accuracy: 0.
8655 - val_loss: 0.3376 - val_accuracy: 0.8612
Epoch 646/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3301 - accuracy: 0.
8656 - val_loss: 0.3379 - val_accuracy: 0.8612
Epoch 647/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3282 - accuracy: 0.
8681 - val_loss: 0.3375 - val_accuracy: 0.8600
Epoch 648/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3280 - accuracy: 0.
8644 - val_loss: 0.3381 - val_accuracy: 0.8631
Epoch 649/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3271 - accuracy: 0.
8667 - val_loss: 0.3374 - val_accuracy: 0.8612
Epoch 650/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3285 - accuracy: 0.
8634 - val_loss: 0.3373 - val_accuracy: 0.8625
```

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Epoch 651/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3270 - accuracy: 0.
8645 - val_loss: 0.3367 - val_accuracy: 0.8587
Epoch 652/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3278 - accuracy: 0.
8689 - val_loss: 0.3374 - val_accuracy: 0.8600
Epoch 653/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3271 - accuracy: 0.
8648 - val_loss: 0.3365 - val_accuracy: 0.8612
Epoch 654/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3297 - accuracy: 0.
8650 - val_loss: 0.3369 - val_accuracy: 0.8612
Epoch 655/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3253 - accuracy: 0.
8653 - val_loss: 0.3373 - val_accuracy: 0.8581
Epoch 656/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3293 - accuracy: 0.
8616 - val_loss: 0.3376 - val_accuracy: 0.8600
Epoch 657/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3292 - accuracy: 0.
8661 - val_loss: 0.3368 - val_accuracy: 0.8581
Epoch 658/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3279 - accuracy: 0.
8634 - val_loss: 0.3369 - val_accuracy: 0.8619
Epoch 659/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3286 - accuracy: 0.
8639 - val_loss: 0.3362 - val_accuracy: 0.8612
Epoch 660/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3284 - accuracy: 0.
8647 - val_loss: 0.3366 - val_accuracy: 0.8606
Epoch 661/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3299 - accuracy: 0.
8648 - val_loss: 0.3368 - val_accuracy: 0.8606
Epoch 662/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3290 - accuracy: 0.
8639 - val_loss: 0.3369 - val_accuracy: 0.8612
Epoch 663/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3283 - accuracy: 0.
8644 - val_loss: 0.3368 - val_accuracy: 0.8612
Epoch 664/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3274 - accuracy: 0.
8661 - val_loss: 0.3364 - val_accuracy: 0.8625
Epoch 665/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3279 - accuracy: 0.
8647 - val_loss: 0.3369 - val_accuracy: 0.8612
Epoch 666/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3284 - accuracy: 0.
8667 - val_loss: 0.3374 - val_accuracy: 0.8594
Epoch 667/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3272 - accuracy: 0.
8650 - val_loss: 0.3372 - val_accuracy: 0.8612
Epoch 668/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3276 - accuracy: 0.
8650 - val_loss: 0.3370 - val_accuracy: 0.8600
Epoch 669/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3276 - accuracy: 0.
8678 - val_loss: 0.3369 - val_accuracy: 0.8612
Epoch 670/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3269 - accuracy: 0.
8670 - val_loss: 0.3372 - val_accuracy: 0.8600
Epoch 671/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3277 - accuracy: 0.
8652 - val_loss: 0.3375 - val_accuracy: 0.8644
Epoch 672/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3260 - accuracy: 0.
```

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8659 - val_loss: 0.3370 - val_accuracy: 0.8600
Epoch 673/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3275 - accuracy: 0.
8659 - val_loss: 0.3373 - val_accuracy: 0.8644
Epoch 674/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3261 - accuracy: 0.
8645 - val_loss: 0.3373 - val_accuracy: 0.8625
Epoch 675/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3252 - accuracy: 0.
8653 - val_loss: 0.3373 - val_accuracy: 0.8625
Epoch 676/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3277 - accuracy: 0.
8677 - val_loss: 0.3370 - val_accuracy: 0.8625
Epoch 677/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3275 - accuracy: 0.
8639 - val_loss: 0.3372 - val_accuracy: 0.8587
Epoch 678/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3278 - accuracy: 0.
8677 - val_loss: 0.3374 - val_accuracy: 0.8594
Epoch 679/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3287 - accuracy: 0.
8669 - val_loss: 0.3370 - val_accuracy: 0.8587
Epoch 680/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3292 - accuracy: 0.
8645 - val_loss: 0.3370 - val_accuracy: 0.8587
Epoch 681/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3252 - accuracy: 0.
8642 - val_loss: 0.3379 - val_accuracy: 0.8600
Epoch 682/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3279 - accuracy: 0.
8637 - val_loss: 0.3376 - val_accuracy: 0.8594
Epoch 683/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3257 - accuracy: 0.
8661 - val_loss: 0.3365 - val_accuracy: 0.8606
Epoch 684/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3257 - accuracy: 0.
8655 - val_loss: 0.3364 - val_accuracy: 0.8606
Epoch 685/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3271 - accuracy: 0.
8647 - val_loss: 0.3375 - val_accuracy: 0.8587
Epoch 686/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3275 - accuracy: 0.
8684 - val_loss: 0.3374 - val_accuracy: 0.8612
Epoch 687/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3277 - accuracy: 0.
8655 - val_loss: 0.3373 - val_accuracy: 0.8637
Epoch 688/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3268 - accuracy: 0.
8672 - val_loss: 0.3363 - val_accuracy: 0.8625
Epoch 689/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3275 - accuracy: 0.
8650 - val_loss: 0.3365 - val_accuracy: 0.8625
Epoch 690/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3273 - accuracy: 0.
8681 - val_loss: 0.3369 - val_accuracy: 0.8619
Epoch 691/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3295 - accuracy: 0.
8650 - val_loss: 0.3373 - val_accuracy: 0.8619
Epoch 692/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3259 - accuracy: 0.
8647 - val_loss: 0.3373 - val_accuracy: 0.8637
Epoch 693/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3295 - accuracy: 0.
8631 - val_loss: 0.3365 - val_accuracy: 0.8619
Epoch 694/1000
```

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7/7 [==============================] - 0s 5ms/step - loss: 0.3280 - accuracy: 0.
8653 - val_loss: 0.3369 - val_accuracy: 0.8637
Epoch 695/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3308 - accuracy: 0.
8644 - val_loss: 0.3366 - val_accuracy: 0.8612
Epoch 696/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3261 - accuracy: 0.
8670 - val_loss: 0.3369 - val_accuracy: 0.8625
Epoch 697/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3273 - accuracy: 0.
8667 - val_loss: 0.3370 - val_accuracy: 0.8587
Epoch 698/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3255 - accuracy: 0.
8661 - val_loss: 0.3371 - val_accuracy: 0.8631
Epoch 699/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3277 - accuracy: 0.
8653 - val_loss: 0.3365 - val_accuracy: 0.8587
Epoch 700/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3271 - accuracy: 0.
8675 - val_loss: 0.3371 - val_accuracy: 0.8619
Epoch 701/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3272 - accuracy: 0.
8642 - val_loss: 0.3374 - val_accuracy: 0.8612
Epoch 702/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3272 - accuracy: 0.
8678 - val_loss: 0.3370 - val_accuracy: 0.8606
Epoch 703/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3259 - accuracy: 0.
8666 - val_loss: 0.3367 - val_accuracy: 0.8600
Epoch 704/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3257 - accuracy: 0.
8670 - val_loss: 0.3372 - val_accuracy: 0.8619
Epoch 705/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3293 - accuracy: 0.
8658 - val_loss: 0.3373 - val_accuracy: 0.8606
Epoch 706/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3249 - accuracy: 0.
8659 - val_loss: 0.3369 - val_accuracy: 0.8600
Epoch 707/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3258 - accuracy: 0.
8662 - val_loss: 0.3375 - val_accuracy: 0.8625
Epoch 708/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3266 - accuracy: 0.
8645 - val_loss: 0.3367 - val_accuracy: 0.8587
Epoch 709/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3268 - accuracy: 0.
8652 - val_loss: 0.3371 - val_accuracy: 0.8625
Epoch 710/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3282 - accuracy: 0.
8652 - val_loss: 0.3366 - val_accuracy: 0.8612
Epoch 711/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3261 - accuracy: 0.
8681 - val_loss: 0.3367 - val_accuracy: 0.8594
Epoch 712/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3258 - accuracy: 0.
8683 - val_loss: 0.3370 - val_accuracy: 0.8612
Epoch 713/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3260 - accuracy: 0.
8678 - val_loss: 0.3374 - val_accuracy: 0.8594
Epoch 714/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3260 - accuracy: 0.
8652 - val_loss: 0.3369 - val_accuracy: 0.8594
Epoch 715/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3287 - accuracy: 0.
8637 - val_loss: 0.3368 - val_accuracy: 0.8594
```

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Epoch 716/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3279 - accuracy: 0.
8655 - val_loss: 0.3367 - val_accuracy: 0.8644
Epoch 717/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3266 - accuracy: 0.
8661 - val_loss: 0.3363 - val_accuracy: 0.8587
Epoch 718/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3266 - accuracy: 0.
8648 - val_loss: 0.3374 - val_accuracy: 0.8606
Epoch 719/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3267 - accuracy: 0.
8644 - val_loss: 0.3371 - val_accuracy: 0.8587
Epoch 720/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3271 - accuracy: 0.
8637 - val_loss: 0.3369 - val_accuracy: 0.8612
Epoch 721/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3261 - accuracy: 0.
8695 - val_loss: 0.3376 - val_accuracy: 0.8619
Epoch 722/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3269 - accuracy: 0.
8664 - val_loss: 0.3371 - val_accuracy: 0.8581
Epoch 723/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3261 - accuracy: 0.
8652 - val_loss: 0.3372 - val_accuracy: 0.8594
Epoch 724/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3273 - accuracy: 0.
8655 - val_loss: 0.3369 - val_accuracy: 0.8587
Epoch 725/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3279 - accuracy: 0.
8652 - val_loss: 0.3375 - val_accuracy: 0.8606
Epoch 726/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3261 - accuracy: 0.
8656 - val_loss: 0.3371 - val_accuracy: 0.8575
Epoch 727/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3263 - accuracy: 0.
8662 - val_loss: 0.3370 - val_accuracy: 0.8612
Epoch 728/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3264 - accuracy: 0.
8645 - val_loss: 0.3365 - val_accuracy: 0.8594
Epoch 729/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3266 - accuracy: 0.
8647 - val_loss: 0.3379 - val_accuracy: 0.8581
Epoch 730/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3266 - accuracy: 0.
8670 - val_loss: 0.3375 - val_accuracy: 0.8612
Epoch 731/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3261 - accuracy: 0.
8661 - val_loss: 0.3373 - val_accuracy: 0.8600
Epoch 732/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3269 - accuracy: 0.
8662 - val_loss: 0.3375 - val_accuracy: 0.8612
Epoch 733/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3256 - accuracy: 0.
8659 - val_loss: 0.3373 - val_accuracy: 0.8587
Epoch 734/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3260 - accuracy: 0.
8669 - val_loss: 0.3379 - val_accuracy: 0.8619
Epoch 735/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3261 - accuracy: 0.
8672 - val_loss: 0.3371 - val_accuracy: 0.8606
Epoch 736/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3292 - accuracy: 0.
8662 - val_loss: 0.3384 - val_accuracy: 0.8575
Epoch 737/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3277 - accuracy: 0.
```

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8653 - val_loss: 0.3376 - val_accuracy: 0.8600
Epoch 738/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3257 - accuracy: 0.
8639 - val_loss: 0.3370 - val_accuracy: 0.8612
Epoch 739/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3245 - accuracy: 0.
8666 - val_loss: 0.3365 - val_accuracy: 0.8587
Epoch 740/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3275 - accuracy: 0.
8630 - val_loss: 0.3368 - val_accuracy: 0.8594
Epoch 741/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3274 - accuracy: 0.
8669 - val_loss: 0.3383 - val_accuracy: 0.8612
Epoch 742/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3264 - accuracy: 0.
8647 - val_loss: 0.3373 - val_accuracy: 0.8581
Epoch 743/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3248 - accuracy: 0.
8672 - val_loss: 0.3374 - val_accuracy: 0.8587
Epoch 744/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3282 - accuracy: 0.
8677 - val_loss: 0.3371 - val_accuracy: 0.8612
Epoch 745/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3265 - accuracy: 0.
8644 - val_loss: 0.3372 - val_accuracy: 0.8575
Epoch 746/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3254 - accuracy: 0.
8686 - val_loss: 0.3373 - val_accuracy: 0.8612
Epoch 747/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3266 - accuracy: 0.
8680 - val_loss: 0.3366 - val_accuracy: 0.8600
Epoch 748/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3253 - accuracy: 0.
8670 - val_loss: 0.3366 - val_accuracy: 0.8594
Epoch 749/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3262 - accuracy: 0.
8666 - val_loss: 0.3368 - val_accuracy: 0.8600
Epoch 750/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3251 - accuracy: 0.
8661 - val_loss: 0.3364 - val_accuracy: 0.8619
Epoch 751/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3259 - accuracy: 0.
8652 - val_loss: 0.3361 - val_accuracy: 0.8594
Epoch 752/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3263 - accuracy: 0.
8655 - val_loss: 0.3366 - val_accuracy: 0.8625
Epoch 753/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3259 - accuracy: 0.
8673 - val_loss: 0.3364 - val_accuracy: 0.8594
Epoch 754/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3269 - accuracy: 0.
8659 - val_loss: 0.3368 - val_accuracy: 0.8606
Epoch 755/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3263 - accuracy: 0.
8639 - val_loss: 0.3360 - val_accuracy: 0.8594
Epoch 756/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3275 - accuracy: 0.
8644 - val_loss: 0.3367 - val_accuracy: 0.8606
Epoch 757/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3262 - accuracy: 0.
8645 - val_loss: 0.3370 - val_accuracy: 0.8594
Epoch 758/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3240 - accuracy: 0.
8691 - val_loss: 0.3377 - val_accuracy: 0.8600
Epoch 759/1000
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7/7 [==============================] - 0s 5ms/step - loss: 0.3264 - accuracy: 0.
8667 - val_loss: 0.3371 - val_accuracy: 0.8600
Epoch 760/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3277 - accuracy: 0.
8656 - val_loss: 0.3365 - val_accuracy: 0.8600
Epoch 761/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3248 - accuracy: 0.
8662 - val_loss: 0.3365 - val_accuracy: 0.8594
Epoch 762/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3249 - accuracy: 0.
8656 - val_loss: 0.3372 - val_accuracy: 0.8600
Epoch 763/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3226 - accuracy: 0.
8681 - val_loss: 0.3370 - val_accuracy: 0.8600
Epoch 764/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3255 - accuracy: 0.
8645 - val_loss: 0.3365 - val_accuracy: 0.8606
Epoch 765/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3255 - accuracy: 0.
8673 - val_loss: 0.3366 - val_accuracy: 0.8594
Epoch 766/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3263 - accuracy: 0.
8642 - val_loss: 0.3372 - val_accuracy: 0.8587
Epoch 767/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3246 - accuracy: 0.
8670 - val_loss: 0.3369 - val_accuracy: 0.8594
Epoch 768/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3257 - accuracy: 0.
8672 - val_loss: 0.3365 - val_accuracy: 0.8600
Epoch 769/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3252 - accuracy: 0.
8661 - val_loss: 0.3368 - val_accuracy: 0.8606
Epoch 770/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3242 - accuracy: 0.
8653 - val_loss: 0.3374 - val_accuracy: 0.8612
Epoch 771/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3251 - accuracy: 0.
8681 - val_loss: 0.3372 - val_accuracy: 0.8612
Epoch 772/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3258 - accuracy: 0.
8673 - val_loss: 0.3371 - val_accuracy: 0.8575
Epoch 773/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3266 - accuracy: 0.
8650 - val_loss: 0.3366 - val_accuracy: 0.8619
Epoch 774/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3252 - accuracy: 0.
8683 - val_loss: 0.3365 - val_accuracy: 0.8606
Epoch 775/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3246 - accuracy: 0.
8623 - val_loss: 0.3371 - val_accuracy: 0.8594
Epoch 776/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3238 - accuracy: 0.
8692 - val_loss: 0.3369 - val_accuracy: 0.8600
Epoch 777/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3239 - accuracy: 0.
8698 - val_loss: 0.3375 - val_accuracy: 0.8606
Epoch 778/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3264 - accuracy: 0.
8669 - val_loss: 0.3372 - val_accuracy: 0.8594
Epoch 779/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3242 - accuracy: 0.
8672 - val_loss: 0.3375 - val_accuracy: 0.8625
Epoch 780/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3239 - accuracy: 0.
8667 - val_loss: 0.3371 - val_accuracy: 0.8606
```

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Epoch 781/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3275 - accuracy: 0.
8670 - val_loss: 0.3369 - val_accuracy: 0.8612
Epoch 782/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3245 - accuracy: 0.
8661 - val_loss: 0.3370 - val_accuracy: 0.8600
Epoch 783/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3270 - accuracy: 0.
8667 - val_loss: 0.3371 - val_accuracy: 0.8600
Epoch 784/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3249 - accuracy: 0.
8666 - val_loss: 0.3373 - val_accuracy: 0.8594
Epoch 785/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3250 - accuracy: 0.
8684 - val_loss: 0.3372 - val_accuracy: 0.8594
Epoch 786/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3250 - accuracy: 0.
8670 - val_loss: 0.3374 - val_accuracy: 0.8606
Epoch 787/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3266 - accuracy: 0.
8658 - val_loss: 0.3371 - val_accuracy: 0.8619
Epoch 788/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3264 - accuracy: 0.
8681 - val_loss: 0.3368 - val_accuracy: 0.8619
Epoch 789/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3272 - accuracy: 0.
8661 - val_loss: 0.3368 - val_accuracy: 0.8612
Epoch 790/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3255 - accuracy: 0.
8658 - val_loss: 0.3382 - val_accuracy: 0.8606
Epoch 791/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3242 - accuracy: 0.
8659 - val_loss: 0.3372 - val_accuracy: 0.8606
Epoch 792/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3262 - accuracy: 0.
8647 - val_loss: 0.3366 - val_accuracy: 0.8600
Epoch 793/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3232 - accuracy: 0.
8652 - val_loss: 0.3374 - val_accuracy: 0.8644
Epoch 794/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3252 - accuracy: 0.
8681 - val_loss: 0.3376 - val_accuracy: 0.8606
Epoch 795/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3266 - accuracy: 0.
8661 - val_loss: 0.3378 - val_accuracy: 0.8612
Epoch 796/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3253 - accuracy: 0.
8684 - val_loss: 0.3379 - val_accuracy: 0.8612
Epoch 797/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3251 - accuracy: 0.
8669 - val_loss: 0.3370 - val_accuracy: 0.8606
Epoch 798/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3244 - accuracy: 0.
8697 - val_loss: 0.3379 - val_accuracy: 0.8600
Epoch 799/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3248 - accuracy: 0.
8675 - val_loss: 0.3373 - val_accuracy: 0.8594
Epoch 800/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3251 - accuracy: 0.
8691 - val_loss: 0.3373 - val_accuracy: 0.8594
Epoch 801/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3235 - accuracy: 0.
8677 - val_loss: 0.3369 - val_accuracy: 0.8594
Epoch 802/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3254 - accuracy: 0.
```

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8667 - val_loss: 0.3371 - val_accuracy: 0.8612
Epoch 803/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3249 - accuracy: 0.
8692 - val_loss: 0.3377 - val_accuracy: 0.8600
Epoch 804/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3233 - accuracy: 0.
8677 - val_loss: 0.3373 - val_accuracy: 0.8612
Epoch 805/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3229 - accuracy: 0.
8681 - val_loss: 0.3372 - val_accuracy: 0.8606
Epoch 806/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3279 - accuracy: 0.
8641 - val_loss: 0.3368 - val_accuracy: 0.8594
Epoch 807/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3254 - accuracy: 0.
8667 - val_loss: 0.3369 - val_accuracy: 0.8600
Epoch 808/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3249 - accuracy: 0.
8677 - val_loss: 0.3376 - val_accuracy: 0.8587
Epoch 809/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3237 - accuracy: 0.
8678 - val_loss: 0.3374 - val_accuracy: 0.8594
Epoch 810/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3238 - accuracy: 0.
8662 - val_loss: 0.3375 - val_accuracy: 0.8619
Epoch 811/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3258 - accuracy: 0.
8641 - val_loss: 0.3366 - val_accuracy: 0.8612
Epoch 812/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3265 - accuracy: 0.
8658 - val_loss: 0.3369 - val_accuracy: 0.8600
Epoch 813/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3240 - accuracy: 0.
8673 - val_loss: 0.3376 - val_accuracy: 0.8612
Epoch 814/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3255 - accuracy: 0.
8639 - val_loss: 0.3365 - val_accuracy: 0.8594
Epoch 815/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3257 - accuracy: 0.
8614 - val_loss: 0.3375 - val_accuracy: 0.8600
Epoch 816/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3249 - accuracy: 0.
8683 - val_loss: 0.3378 - val_accuracy: 0.8600
Epoch 817/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3242 - accuracy: 0.
8637 - val_loss: 0.3381 - val_accuracy: 0.8600
Epoch 818/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3264 - accuracy: 0.
8664 - val_loss: 0.3370 - val_accuracy: 0.8606
Epoch 819/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3256 - accuracy: 0.
8667 - val_loss: 0.3374 - val_accuracy: 0.8631
Epoch 820/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3279 - accuracy: 0.
8642 - val_loss: 0.3372 - val_accuracy: 0.8600
Epoch 821/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3258 - accuracy: 0.
8669 - val_loss: 0.3381 - val_accuracy: 0.8594
Epoch 822/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3242 - accuracy: 0.
8675 - val_loss: 0.3378 - val_accuracy: 0.8594
Epoch 823/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3237 - accuracy: 0.
8666 - val_loss: 0.3368 - val_accuracy: 0.8606
Epoch 824/1000
```

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7/7 [==============================] - 0s 5ms/step - loss: 0.3241 - accuracy: 0.
8675 - val_loss: 0.3369 - val_accuracy: 0.8594
Epoch 825/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3236 - accuracy: 0.
8667 - val_loss: 0.3368 - val_accuracy: 0.8600
Epoch 826/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3268 - accuracy: 0.
8662 - val_loss: 0.3377 - val_accuracy: 0.8594
Epoch 827/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3248 - accuracy: 0.
8659 - val_loss: 0.3383 - val_accuracy: 0.8594
Epoch 828/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3267 - accuracy: 0.
8667 - val_loss: 0.3373 - val_accuracy: 0.8600
Epoch 829/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3267 - accuracy: 0.
8669 - val_loss: 0.3369 - val_accuracy: 0.8625
Epoch 830/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3244 - accuracy: 0.
8678 - val_loss: 0.3370 - val_accuracy: 0.8600
Epoch 831/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3244 - accuracy: 0.
8658 - val_loss: 0.3376 - val_accuracy: 0.8594
Epoch 832/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3251 - accuracy: 0.
8644 - val_loss: 0.3368 - val_accuracy: 0.8619
Epoch 833/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3266 - accuracy: 0.
8652 - val_loss: 0.3373 - val_accuracy: 0.8606
Epoch 834/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3231 - accuracy: 0.
8670 - val_loss: 0.3374 - val_accuracy: 0.8594
Epoch 835/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3254 - accuracy: 0.
8686 - val_loss: 0.3375 - val_accuracy: 0.8575
Epoch 836/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3258 - accuracy: 0.
8639 - val_loss: 0.3373 - val_accuracy: 0.8587
Epoch 837/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3236 - accuracy: 0.
8677 - val_loss: 0.3369 - val_accuracy: 0.8594
Epoch 838/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3242 - accuracy: 0.
8664 - val_loss: 0.3374 - val_accuracy: 0.8619
Epoch 839/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3252 - accuracy: 0.
8681 - val_loss: 0.3372 - val_accuracy: 0.8594
Epoch 840/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3262 - accuracy: 0.
8655 - val_loss: 0.3372 - val_accuracy: 0.8606
Epoch 841/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3251 - accuracy: 0.
8656 - val_loss: 0.3376 - val_accuracy: 0.8587
Epoch 842/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3255 - accuracy: 0.
8661 - val_loss: 0.3374 - val_accuracy: 0.8581
Epoch 843/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3246 - accuracy: 0.
8687 - val_loss: 0.3375 - val_accuracy: 0.8587
Epoch 844/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3235 - accuracy: 0.
8691 - val_loss: 0.3376 - val_accuracy: 0.8594
Epoch 845/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3245 - accuracy: 0.
8680 - val_loss: 0.3375 - val_accuracy: 0.8581
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Epoch 846/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3237 - accuracy: 0.
8630 - val_loss: 0.3382 - val_accuracy: 0.8594
Epoch 847/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3250 - accuracy: 0.
8666 - val_loss: 0.3380 - val_accuracy: 0.8600
Epoch 848/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3256 - accuracy: 0.
8656 - val_loss: 0.3372 - val_accuracy: 0.8606
Epoch 849/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3258 - accuracy: 0.
8666 - val_loss: 0.3372 - val_accuracy: 0.8600
Epoch 850/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3255 - accuracy: 0.
8692 - val_loss: 0.3374 - val_accuracy: 0.8600
Epoch 851/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3239 - accuracy: 0.
8666 - val_loss: 0.3380 - val_accuracy: 0.8587
Epoch 852/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3233 - accuracy: 0.
8678 - val_loss: 0.3381 - val_accuracy: 0.8569
Epoch 853/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3225 - accuracy: 0.
8666 - val_loss: 0.3375 - val_accuracy: 0.8619
Epoch 854/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3220 - accuracy: 0.
8680 - val_loss: 0.3377 - val_accuracy: 0.8594
Epoch 855/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3272 - accuracy: 0.
8661 - val_loss: 0.3380 - val_accuracy: 0.8587
Epoch 856/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3257 - accuracy: 0.
8675 - val_loss: 0.3375 - val_accuracy: 0.8600
Epoch 857/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3250 - accuracy: 0.
8655 - val_loss: 0.3374 - val_accuracy: 0.8606
Epoch 858/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3231 - accuracy: 0.
8675 - val_loss: 0.3377 - val_accuracy: 0.8619
Epoch 859/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3221 - accuracy: 0.
8673 - val_loss: 0.3377 - val_accuracy: 0.8612
Epoch 860/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3218 - accuracy: 0.
8669 - val_loss: 0.3370 - val_accuracy: 0.8594
Epoch 861/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3234 - accuracy: 0.
8673 - val_loss: 0.3371 - val_accuracy: 0.8594
Epoch 862/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3213 - accuracy: 0.
8708 - val_loss: 0.3376 - val_accuracy: 0.8600
Epoch 863/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3231 - accuracy: 0.
8673 - val_loss: 0.3375 - val_accuracy: 0.8606
Epoch 864/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3269 - accuracy: 0.
8667 - val_loss: 0.3373 - val_accuracy: 0.8600
Epoch 865/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3235 - accuracy: 0.
8675 - val_loss: 0.3377 - val_accuracy: 0.8587
Epoch 866/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3237 - accuracy: 0.
8662 - val_loss: 0.3372 - val_accuracy: 0.8581
Epoch 867/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3234 - accuracy: 0.
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8694 - val_loss: 0.3374 - val_accuracy: 0.8594
Epoch 868/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3237 - accuracy: 0.
8678 - val_loss: 0.3375 - val_accuracy: 0.8600
Epoch 869/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3248 - accuracy: 0.
8650 - val_loss: 0.3384 - val_accuracy: 0.8606
Epoch 870/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3243 - accuracy: 0.
8656 - val_loss: 0.3382 - val_accuracy: 0.8575
Epoch 871/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3233 - accuracy: 0.
8678 - val_loss: 0.3373 - val_accuracy: 0.8581
Epoch 872/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3229 - accuracy: 0.
8669 - val_loss: 0.3375 - val_accuracy: 0.8594
Epoch 873/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3242 - accuracy: 0.
8670 - val_loss: 0.3376 - val_accuracy: 0.8575
Epoch 874/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3247 - accuracy: 0.
8664 - val_loss: 0.3381 - val_accuracy: 0.8587
Epoch 875/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3242 - accuracy: 0.
8625 - val_loss: 0.3377 - val_accuracy: 0.8594
Epoch 876/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3242 - accuracy: 0.
8656 - val_loss: 0.3371 - val_accuracy: 0.8587
Epoch 877/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3248 - accuracy: 0.
8683 - val_loss: 0.3373 - val_accuracy: 0.8619
Epoch 878/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3238 - accuracy: 0.
8664 - val_loss: 0.3371 - val_accuracy: 0.8612
Epoch 879/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3235 - accuracy: 0.
8680 - val_loss: 0.3375 - val_accuracy: 0.8606
Epoch 880/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3241 - accuracy: 0.
8658 - val_loss: 0.3373 - val_accuracy: 0.8600
Epoch 881/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3258 - accuracy: 0.
8661 - val_loss: 0.3374 - val_accuracy: 0.8594
Epoch 882/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3244 - accuracy: 0.
8673 - val_loss: 0.3369 - val_accuracy: 0.8600
Epoch 883/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3203 - accuracy: 0.
8691 - val_loss: 0.3374 - val_accuracy: 0.8631
Epoch 884/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3234 - accuracy: 0.
8680 - val_loss: 0.3377 - val_accuracy: 0.8594
Epoch 885/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3248 - accuracy: 0.
8683 - val_loss: 0.3388 - val_accuracy: 0.8612
Epoch 886/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3221 - accuracy: 0.
8664 - val_loss: 0.3382 - val_accuracy: 0.8594
Epoch 887/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3261 - accuracy: 0.
8664 - val_loss: 0.3374 - val_accuracy: 0.8581
Epoch 888/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3234 - accuracy: 0.
8686 - val_loss: 0.3375 - val_accuracy: 0.8569
Epoch 889/1000
```

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7/7 [==============================] - 0s 5ms/step - loss: 0.3240 - accuracy: 0.
8652 - val_loss: 0.3375 - val_accuracy: 0.8587
Epoch 890/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3247 - accuracy: 0.
8653 - val_loss: 0.3378 - val_accuracy: 0.8612
Epoch 891/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3228 - accuracy: 0.
8659 - val_loss: 0.3375 - val_accuracy: 0.8594
Epoch 892/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3257 - accuracy: 0.
8673 - val_loss: 0.3375 - val_accuracy: 0.8606
Epoch 893/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3243 - accuracy: 0.
8664 - val_loss: 0.3368 - val_accuracy: 0.8594
Epoch 894/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3223 - accuracy: 0.
8689 - val_loss: 0.3380 - val_accuracy: 0.8594
Epoch 895/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3231 - accuracy: 0.
8664 - val_loss: 0.3374 - val_accuracy: 0.8587
Epoch 896/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3232 - accuracy: 0.
8673 - val_loss: 0.3373 - val_accuracy: 0.8569
Epoch 897/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3250 - accuracy: 0.
8689 - val_loss: 0.3373 - val_accuracy: 0.8594
Epoch 898/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3248 - accuracy: 0.
8644 - val_loss: 0.3370 - val_accuracy: 0.8600
Epoch 899/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3259 - accuracy: 0.
8648 - val_loss: 0.3370 - val_accuracy: 0.8606
Epoch 900/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3236 - accuracy: 0.
8650 - val_loss: 0.3374 - val_accuracy: 0.8600
Epoch 901/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3257 - accuracy: 0.
8659 - val_loss: 0.3374 - val_accuracy: 0.8587
Epoch 902/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3227 - accuracy: 0.
8667 - val_loss: 0.3379 - val_accuracy: 0.8600
Epoch 903/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3227 - accuracy: 0.
8670 - val_loss: 0.3378 - val_accuracy: 0.8594
Epoch 904/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3226 - accuracy: 0.
8675 - val_loss: 0.3379 - val_accuracy: 0.8587
Epoch 905/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3212 - accuracy: 0.
8681 - val_loss: 0.3374 - val_accuracy: 0.8600
Epoch 906/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3246 - accuracy: 0.
8691 - val_loss: 0.3384 - val_accuracy: 0.8594
Epoch 907/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3225 - accuracy: 0.
8687 - val_loss: 0.3385 - val_accuracy: 0.8600
Epoch 908/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3250 - accuracy: 0.
8666 - val_loss: 0.3384 - val_accuracy: 0.8587
Epoch 909/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3231 - accuracy: 0.
8673 - val_loss: 0.3386 - val_accuracy: 0.8581
Epoch 910/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3224 - accuracy: 0.
8697 - val_loss: 0.3377 - val_accuracy: 0.8587
```

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Epoch 911/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3214 - accuracy: 0.
8684 - val_loss: 0.3377 - val_accuracy: 0.8562
Epoch 912/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3237 - accuracy: 0.
8650 - val_loss: 0.3386 - val_accuracy: 0.8562
Epoch 913/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3251 - accuracy: 0.
8666 - val_loss: 0.3387 - val_accuracy: 0.8575
Epoch 914/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3246 - accuracy: 0.
8672 - val_loss: 0.3379 - val_accuracy: 0.8587
Epoch 915/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3221 - accuracy: 0.
8684 - val_loss: 0.3382 - val_accuracy: 0.8581
Epoch 916/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3249 - accuracy: 0.
8648 - val_loss: 0.3384 - val_accuracy: 0.8606
Epoch 917/1000
7/7 [==============================] - 0s 6ms/step - loss: 0.3246 - accuracy: 0.
8677 - val_loss: 0.3384 - val_accuracy: 0.8581
Epoch 918/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3247 - accuracy: 0.
8630 - val_loss: 0.3377 - val_accuracy: 0.8594
Epoch 919/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3238 - accuracy: 0.
8656 - val_loss: 0.3380 - val_accuracy: 0.8594
Epoch 920/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3245 - accuracy: 0.
8659 - val_loss: 0.3377 - val_accuracy: 0.8587
Epoch 921/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3241 - accuracy: 0.
8636 - val_loss: 0.3377 - val_accuracy: 0.8575
Epoch 922/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3247 - accuracy: 0.
8669 - val_loss: 0.3373 - val_accuracy: 0.8587
Epoch 923/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3233 - accuracy: 0.
8691 - val_loss: 0.3373 - val_accuracy: 0.8600
Epoch 924/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3229 - accuracy: 0.
8650 - val_loss: 0.3371 - val_accuracy: 0.8594
Epoch 925/1000
7/7 [==============================] - 0s 6ms/step - loss: 0.3234 - accuracy: 0.
8678 - val_loss: 0.3375 - val_accuracy: 0.8606
Epoch 926/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3246 - accuracy: 0.
8667 - val_loss: 0.3382 - val_accuracy: 0.8612
Epoch 927/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3214 - accuracy: 0.
8697 - val_loss: 0.3386 - val_accuracy: 0.8600
Epoch 928/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3236 - accuracy: 0.
8680 - val_loss: 0.3382 - val_accuracy: 0.8600
Epoch 929/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3240 - accuracy: 0.
8648 - val_loss: 0.3387 - val_accuracy: 0.8600
Epoch 930/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3239 - accuracy: 0.
8661 - val_loss: 0.3372 - val_accuracy: 0.8600
Epoch 931/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3216 - accuracy: 0.
8672 - val_loss: 0.3372 - val_accuracy: 0.8606
Epoch 932/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3231 - accuracy: 0.
```

```
8656 - val_loss: 0.3385 - val_accuracy: 0.8594
Epoch 933/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3227 - accuracy: 0.
8694 - val_loss: 0.3379 - val_accuracy: 0.8594
Epoch 934/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3234 - accuracy: 0.
8667 - val_loss: 0.3379 - val_accuracy: 0.8581
Epoch 935/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3249 - accuracy: 0.
8675 - val_loss: 0.3372 - val_accuracy: 0.8600
Epoch 936/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3219 - accuracy: 0.
8673 - val_loss: 0.3378 - val_accuracy: 0.8594
Epoch 937/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3245 - accuracy: 0.
8652 - val_loss: 0.3386 - val_accuracy: 0.8581
Epoch 938/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3235 - accuracy: 0.
8678 - val_loss: 0.3384 - val_accuracy: 0.8600
Epoch 939/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3224 - accuracy: 0.
8670 - val_loss: 0.3376 - val_accuracy: 0.8600
Epoch 940/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3253 - accuracy: 0.
8672 - val_loss: 0.3379 - val_accuracy: 0.8587
Epoch 941/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3204 - accuracy: 0.
8681 - val_loss: 0.3379 - val_accuracy: 0.8600
Epoch 942/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3225 - accuracy: 0.
8702 - val_loss: 0.3378 - val_accuracy: 0.8600
Epoch 943/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3223 - accuracy: 0.
8664 - val_loss: 0.3378 - val_accuracy: 0.8581
Epoch 944/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3220 - accuracy: 0.
8673 - val_loss: 0.3378 - val_accuracy: 0.8594
Epoch 945/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3215 - accuracy: 0.
8683 - val_loss: 0.3374 - val_accuracy: 0.8600
Epoch 946/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3227 - accuracy: 0.
8666 - val_loss: 0.3376 - val_accuracy: 0.8575
Epoch 947/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3232 - accuracy: 0.
8684 - val_loss: 0.3385 - val_accuracy: 0.8594
Epoch 948/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3259 - accuracy: 0.
8670 - val_loss: 0.3391 - val_accuracy: 0.8587
Epoch 949/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3241 - accuracy: 0.
8650 - val_loss: 0.3382 - val_accuracy: 0.8594
Epoch 950/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3244 - accuracy: 0.
8655 - val_loss: 0.3374 - val_accuracy: 0.8600
Epoch 951/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3265 - accuracy: 0.
8655 - val_loss: 0.3381 - val_accuracy: 0.8612
Epoch 952/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3221 - accuracy: 0.
8658 - val_loss: 0.3378 - val_accuracy: 0.8587
Epoch 953/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3216 - accuracy: 0.
8691 - val_loss: 0.3386 - val_accuracy: 0.8594
Epoch 954/1000
```

```
7/7 [==============================] - 0s 5ms/step - loss: 0.3227 - accuracy: 0.
8687 - val_loss: 0.3384 - val_accuracy: 0.8594
Epoch 955/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3232 - accuracy: 0.
8692 - val_loss: 0.3382 - val_accuracy: 0.8594
Epoch 956/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3208 - accuracy: 0.
8678 - val_loss: 0.3390 - val_accuracy: 0.8594
Epoch 957/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3221 - accuracy: 0.
8637 - val_loss: 0.3383 - val_accuracy: 0.8600
Epoch 958/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3220 - accuracy: 0.
8680 - val_loss: 0.3383 - val_accuracy: 0.8575
Epoch 959/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3250 - accuracy: 0.
8653 - val_loss: 0.3383 - val_accuracy: 0.8587
Epoch 960/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3236 - accuracy: 0.
8697 - val_loss: 0.3390 - val_accuracy: 0.8594
Epoch 961/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3247 - accuracy: 0.
8652 - val_loss: 0.3375 - val_accuracy: 0.8606
Epoch 962/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3233 - accuracy: 0.
8697 - val_loss: 0.3377 - val_accuracy: 0.8606
Epoch 963/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3230 - accuracy: 0.
8639 - val_loss: 0.3384 - val_accuracy: 0.8569
Epoch 964/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3242 - accuracy: 0.
8653 - val_loss: 0.3387 - val_accuracy: 0.8581
Epoch 965/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3224 - accuracy: 0.
8669 - val_loss: 0.3395 - val_accuracy: 0.8581
Epoch 966/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3238 - accuracy: 0.
8672 - val_loss: 0.3384 - val_accuracy: 0.8581
Epoch 967/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3219 - accuracy: 0.
8673 - val_loss: 0.3383 - val_accuracy: 0.8606
Epoch 968/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3257 - accuracy: 0.
8664 - val_loss: 0.3382 - val_accuracy: 0.8600
Epoch 969/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3230 - accuracy: 0.
8689 - val_loss: 0.3380 - val_accuracy: 0.8600
Epoch 970/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3225 - accuracy: 0.
8675 - val_loss: 0.3377 - val_accuracy: 0.8581
Epoch 971/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3238 - accuracy: 0.
8686 - val_loss: 0.3374 - val_accuracy: 0.8606
Epoch 972/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3212 - accuracy: 0.
8680 - val_loss: 0.3374 - val_accuracy: 0.8581
Epoch 973/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3240 - accuracy: 0.
8672 - val_loss: 0.3389 - val_accuracy: 0.8600
Epoch 974/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3230 - accuracy: 0.
8703 - val_loss: 0.3384 - val_accuracy: 0.8594
Epoch 975/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3227 - accuracy: 0.
8677 - val_loss: 0.3391 - val_accuracy: 0.8594
```

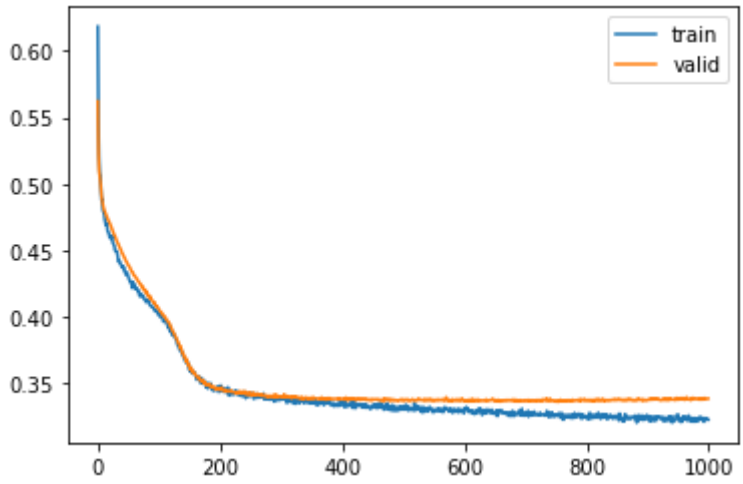
```
Epoch 976/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3212 - accuracy: 0.
8661 - val_loss: 0.3387 - val_accuracy: 0.8612
Epoch 977/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3211 - accuracy: 0.
8694 - val_loss: 0.3381 - val_accuracy: 0.8587
Epoch 978/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3239 - accuracy: 0.
8680 - val_loss: 0.3387 - val_accuracy: 0.8606
Epoch 979/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3225 - accuracy: 0.
8655 - val_loss: 0.3386 - val_accuracy: 0.8569
Epoch 980/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3215 - accuracy: 0.
8681 - val_loss: 0.3386 - val_accuracy: 0.8606
Epoch 981/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3233 - accuracy: 0.
8675 - val_loss: 0.3381 - val_accuracy: 0.8600
Epoch 982/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3223 - accuracy: 0.
8677 - val_loss: 0.3381 - val_accuracy: 0.8594
Epoch 983/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3213 - accuracy: 0.
8683 - val_loss: 0.3382 - val_accuracy: 0.8581
Epoch 984/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3231 - accuracy: 0.
8695 - val_loss: 0.3383 - val_accuracy: 0.8594
Epoch 985/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3229 - accuracy: 0.
8691 - val_loss: 0.3377 - val_accuracy: 0.8612
Epoch 986/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3247 - accuracy: 0.
8653 - val_loss: 0.3385 - val_accuracy: 0.8612
Epoch 987/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3232 - accuracy: 0.
8653 - val_loss: 0.3381 - val_accuracy: 0.8575
Epoch 988/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3235 - accuracy: 0.
8675 - val_loss: 0.3376 - val_accuracy: 0.8587
Epoch 989/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3243 - accuracy: 0.
8670 - val_loss: 0.3384 - val_accuracy: 0.8600
Epoch 990/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3228 - accuracy: 0.
8664 - val_loss: 0.3388 - val_accuracy: 0.8587
Epoch 991/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3229 - accuracy: 0.
8681 - val_loss: 0.3382 - val_accuracy: 0.8606
Epoch 992/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3220 - accuracy: 0.
8659 - val_loss: 0.3377 - val_accuracy: 0.8594
Epoch 993/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3210 - accuracy: 0.
8709 - val_loss: 0.3381 - val_accuracy: 0.8594
Epoch 994/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3230 - accuracy: 0.
8644 - val_loss: 0.3390 - val_accuracy: 0.8575
Epoch 995/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3237 - accuracy: 0.
8670 - val_loss: 0.3383 - val_accuracy: 0.8600
Epoch 996/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3239 - accuracy: 0.
8645 - val_loss: 0.3383 - val_accuracy: 0.8587
Epoch 997/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3232 - accuracy: 0.
```

```
8680 - val_loss: 0.3385 - val_accuracy: 0.8587
Epoch 998/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3229 - accuracy: 0.
8677 - val_loss: 0.3382 - val_accuracy: 0.8581
Epoch 999/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3233 - accuracy: 0.
8652 - val_loss: 0.3383 - val_accuracy: 0.8600
Epoch 1000/1000
7/7 [==============================] - 0s 5ms/step - loss: 0.3226 - accuracy: 0.
8658 - val_loss: 0.3384 - val_accuracy: 0.8594
```

In [51]:
```
# Capturing learning history per epoch
hist1 = pd.DataFrame(hist_mod1.history)
hist1["epoch"] = hist_mod1.epoch

# Plotting accuracy at different epochs
plt.plot(hist1["loss"])
plt.plot(hist1["val_loss"])
plt.legend(("train", "valid"), loc=0)
```

Out[51]:
```
<matplotlib.legend.Legend at 0x1859d17b9d0>
```



In [52]:
```
model1_score = model1.evaluate(scaled_test_X, scaled_test_y)
```

```
63/63 [==============================] - 0s 646us/step - loss: 0.3505 - accurac
y: 0.8595
```

In [53]:
```
# initialize the model
model2 = Sequential()
```

In [54]:
```
# This adds the input layer (by specifying input dimension) AND the first hidden
model2.add(
    Dense(
        units=48,
        input_dim=12,
        kernel_initializer="GlorotNormal",
        activation="leaky_relu",
    )
)  # input of 12 columns
# hidden layer
model2.add(Dense(units=24, kernel_initializer="GlorotNormal", activation="leaky_
```

```
# Adding Dropout to prevent overfitting
# model2.add(Dropout(0.5))
# model2.add(Dense(48, kernel_initializer="HeNormal", activation="relu"))
# model2.add(Dense(48, kernel_initializer="HeNormal", activation="relu"))
# Adding the output layer
# we have an output of 1 node, which is the the desired dimensions of our output
model2.add(
    Dense(1, kernel_initializer="GlorotNormal", activation="sigmoid")
)  # Using sigmoid on output, as this is binary classification
```

In [55]:
```
es1 = tf.keras.callbacks.EarlyStopping(
    monitor="loss",
    min_delta=0,
    patience=15,
    verbose=0,
    mode="min",
    baseline=None,
    restore_best_weights=True,
)
```

In [56]:
```
# Create optimizer with default learning rate
# Compile the model
model2.compile(Adam(lr=0.001), loss="binary_crossentropy", metrics=["accuracy"])
```

In [57]:
```
model2.summary()
```

```
Model: "sequential_1"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 dense_3 (Dense)             (None, 48)                624

 dense_4 (Dense)             (None, 24)                1176

 dense_5 (Dense)             (None, 1)                 25

=================================================================
Total params: 1,825
Trainable params: 1,825
Non-trainable params: 0
_________________________________________________________________
```

In [58]:
```
# fitting the model
hist_mod2 = model2.fit(
    scaled_train_over_X,
    scaled_train_over_y,
    batch_size=1000,
    epochs=1000,
    callbacks=[es1],
    validation_split=0.2,
)
```

```
Epoch 1/1000
11/11 [==============================] - 0s 13ms/step - loss: 0.6353 - accuracy:
0.6235 - val_loss: 0.9378 - val_accuracy: 0.0000e+00
Epoch 2/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.6011 - accuracy:
```

```
0.6261 - val_loss: 0.8840 - val_accuracy: 0.0557
Epoch 3/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.5762 - accuracy:
0.6682 - val_loss: 0.8102 - val_accuracy: 0.4015
Epoch 4/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.5559 - accuracy:
0.7261 - val_loss: 0.7541 - val_accuracy: 0.5400
Epoch 5/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.5381 - accuracy:
0.7452 - val_loss: 0.6974 - val_accuracy: 0.6350
Epoch 6/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.5220 - accuracy:
0.7674 - val_loss: 0.6278 - val_accuracy: 0.7155
Epoch 7/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.5077 - accuracy:
0.7768 - val_loss: 0.5962 - val_accuracy: 0.7496
Epoch 8/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.4936 - accuracy:
0.7888 - val_loss: 0.5356 - val_accuracy: 0.7920
Epoch 9/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.4790 - accuracy:
0.7952 - val_loss: 0.4856 - val_accuracy: 0.8199
Epoch 10/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.4643 - accuracy:
0.8027 - val_loss: 0.4413 - val_accuracy: 0.8359
Epoch 11/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.4496 - accuracy:
0.8084 - val_loss: 0.3930 - val_accuracy: 0.8544
Epoch 12/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.4357 - accuracy:
0.8128 - val_loss: 0.3755 - val_accuracy: 0.8477
Epoch 13/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.4246 - accuracy:
0.8160 - val_loss: 0.2918 - val_accuracy: 0.8905
Epoch 14/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.4156 - accuracy:
0.8189 - val_loss: 0.3161 - val_accuracy: 0.8638
Epoch 15/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.4102 - accuracy:
0.8200 - val_loss: 0.2778 - val_accuracy: 0.8803
Epoch 16/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.4062 - accuracy:
0.8198 - val_loss: 0.2804 - val_accuracy: 0.8732
Epoch 17/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.4030 - accuracy:
0.8200 - val_loss: 0.2650 - val_accuracy: 0.8803
Epoch 18/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.4004 - accuracy:
0.8216 - val_loss: 0.2787 - val_accuracy: 0.8685
Epoch 19/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3984 - accuracy:
0.8222 - val_loss: 0.2319 - val_accuracy: 0.8952
Epoch 20/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3977 - accuracy:
0.8218 - val_loss: 0.2425 - val_accuracy: 0.8881
Epoch 21/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3957 - accuracy:
0.8253 - val_loss: 0.2480 - val_accuracy: 0.8827
Epoch 22/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3931 - accuracy:
0.8236 - val_loss: 0.2299 - val_accuracy: 0.8909
Epoch 23/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3920 - accuracy:
0.8221 - val_loss: 0.2390 - val_accuracy: 0.8846
Epoch 24/1000
```

```
11/11 [==============================] - 0s 4ms/step - loss: 0.3892 - accuracy:
0.8265 - val_loss: 0.2408 - val_accuracy: 0.8834
Epoch 25/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3875 - accuracy:
0.8273 - val_loss: 0.2307 - val_accuracy: 0.8878
Epoch 26/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3861 - accuracy:
0.8271 - val_loss: 0.2398 - val_accuracy: 0.8830
Epoch 27/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3857 - accuracy:
0.8284 - val_loss: 0.2659 - val_accuracy: 0.8658
Epoch 28/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3851 - accuracy:
0.8272 - val_loss: 0.2225 - val_accuracy: 0.8909
Epoch 29/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3818 - accuracy:
0.8286 - val_loss: 0.2134 - val_accuracy: 0.8948
Epoch 30/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3793 - accuracy:
0.8300 - val_loss: 0.2263 - val_accuracy: 0.8866
Epoch 31/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3779 - accuracy:
0.8307 - val_loss: 0.2183 - val_accuracy: 0.8901
Epoch 32/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3764 - accuracy:
0.8318 - val_loss: 0.2283 - val_accuracy: 0.8846
Epoch 33/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3749 - accuracy:
0.8336 - val_loss: 0.2437 - val_accuracy: 0.8756
Epoch 34/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3744 - accuracy:
0.8321 - val_loss: 0.2083 - val_accuracy: 0.8980
Epoch 35/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3719 - accuracy:
0.8334 - val_loss: 0.2055 - val_accuracy: 0.8960
Epoch 36/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3703 - accuracy:
0.8352 - val_loss: 0.1857 - val_accuracy: 0.9129
Epoch 37/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3691 - accuracy:
0.8382 - val_loss: 0.2253 - val_accuracy: 0.8823
Epoch 38/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3676 - accuracy:
0.8369 - val_loss: 0.2168 - val_accuracy: 0.8858
Epoch 39/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3652 - accuracy:
0.8382 - val_loss: 0.2098 - val_accuracy: 0.8913
Epoch 40/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3633 - accuracy:
0.8398 - val_loss: 0.2100 - val_accuracy: 0.8921
Epoch 41/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3617 - accuracy:
0.8407 - val_loss: 0.1962 - val_accuracy: 0.9031
Epoch 42/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3601 - accuracy:
0.8408 - val_loss: 0.2174 - val_accuracy: 0.8878
Epoch 43/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3584 - accuracy:
0.8417 - val_loss: 0.2041 - val_accuracy: 0.8952
Epoch 44/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3562 - accuracy:
0.8445 - val_loss: 0.1996 - val_accuracy: 0.8987
Epoch 45/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3543 - accuracy:
0.8438 - val_loss: 0.1873 - val_accuracy: 0.9078
```

```
Epoch 46/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3527 - accuracy:
0.8459 - val_loss: 0.2005 - val_accuracy: 0.8940
Epoch 47/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3509 - accuracy:
0.8459 - val_loss: 0.1918 - val_accuracy: 0.9023
Epoch 48/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3505 - accuracy:
0.8452 - val_loss: 0.2098 - val_accuracy: 0.8885
Epoch 49/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3467 - accuracy:
0.8481 - val_loss: 0.2223 - val_accuracy: 0.8850
Epoch 50/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3462 - accuracy:
0.8484 - val_loss: 0.2164 - val_accuracy: 0.8854
Epoch 51/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3444 - accuracy:
0.8498 - val_loss: 0.1940 - val_accuracy: 0.8995
Epoch 52/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3415 - accuracy:
0.8513 - val_loss: 0.2055 - val_accuracy: 0.8940
Epoch 53/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3413 - accuracy:
0.8493 - val_loss: 0.1963 - val_accuracy: 0.8995
Epoch 54/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3388 - accuracy:
0.8514 - val_loss: 0.1918 - val_accuracy: 0.9027
Epoch 55/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3374 - accuracy:
0.8516 - val_loss: 0.1919 - val_accuracy: 0.9023
Epoch 56/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3352 - accuracy:
0.8551 - val_loss: 0.1842 - val_accuracy: 0.9078
Epoch 57/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3336 - accuracy:
0.8564 - val_loss: 0.1844 - val_accuracy: 0.9066
Epoch 58/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3322 - accuracy:
0.8552 - val_loss: 0.2034 - val_accuracy: 0.8956
Epoch 59/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3318 - accuracy:
0.8571 - val_loss: 0.2149 - val_accuracy: 0.8897
Epoch 60/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3295 - accuracy:
0.8568 - val_loss: 0.1800 - val_accuracy: 0.9097
Epoch 61/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3280 - accuracy:
0.8578 - val_loss: 0.1800 - val_accuracy: 0.9101
Epoch 62/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3269 - accuracy:
0.8579 - val_loss: 0.1945 - val_accuracy: 0.9003
Epoch 63/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3262 - accuracy:
0.8585 - val_loss: 0.1740 - val_accuracy: 0.9117
Epoch 64/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3252 - accuracy:
0.8572 - val_loss: 0.1792 - val_accuracy: 0.9093
Epoch 65/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3239 - accuracy:
0.8586 - val_loss: 0.1884 - val_accuracy: 0.9050
Epoch 66/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3228 - accuracy:
0.8602 - val_loss: 0.1877 - val_accuracy: 0.9066
Epoch 67/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3217 - accuracy:
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0.8613 - val_loss: 0.1802 - val_accuracy: 0.9089
Epoch 68/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3211 - accuracy:
0.8619 - val_loss: 0.1846 - val_accuracy: 0.9062
Epoch 69/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3201 - accuracy:
0.8615 - val_loss: 0.1976 - val_accuracy: 0.9011
Epoch 70/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3204 - accuracy:
0.8604 - val_loss: 0.1721 - val_accuracy: 0.9129
Epoch 71/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3192 - accuracy:
0.8613 - val_loss: 0.1777 - val_accuracy: 0.9105
Epoch 72/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3180 - accuracy:
0.8608 - val_loss: 0.1842 - val_accuracy: 0.9074
Epoch 73/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3181 - accuracy:
0.8606 - val_loss: 0.1938 - val_accuracy: 0.9015
Epoch 74/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3172 - accuracy:
0.8616 - val_loss: 0.1927 - val_accuracy: 0.9050
Epoch 75/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3175 - accuracy:
0.8620 - val_loss: 0.1757 - val_accuracy: 0.9113
Epoch 76/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3167 - accuracy:
0.8624 - val_loss: 0.1929 - val_accuracy: 0.9054
Epoch 77/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3162 - accuracy:
0.8625 - val_loss: 0.1908 - val_accuracy: 0.9054
Epoch 78/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3164 - accuracy:
0.8628 - val_loss: 0.1897 - val_accuracy: 0.9062
Epoch 79/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3149 - accuracy:
0.8624 - val_loss: 0.2062 - val_accuracy: 0.8956
Epoch 80/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3149 - accuracy:
0.8633 - val_loss: 0.2147 - val_accuracy: 0.8932
Epoch 81/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3171 - accuracy:
0.8629 - val_loss: 0.2365 - val_accuracy: 0.8772
Epoch 82/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3214 - accuracy:
0.8590 - val_loss: 0.2411 - val_accuracy: 0.8756
Epoch 83/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3203 - accuracy:
0.8592 - val_loss: 0.2045 - val_accuracy: 0.8984
Epoch 84/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3152 - accuracy:
0.8647 - val_loss: 0.1989 - val_accuracy: 0.8987
Epoch 85/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3130 - accuracy:
0.8634 - val_loss: 0.1797 - val_accuracy: 0.9086
Epoch 86/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3121 - accuracy:
0.8662 - val_loss: 0.1800 - val_accuracy: 0.9089
Epoch 87/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3123 - accuracy:
0.8639 - val_loss: 0.1748 - val_accuracy: 0.9117
Epoch 88/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3127 - accuracy:
0.8642 - val_loss: 0.1651 - val_accuracy: 0.9164
Epoch 89/1000
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11/11 [==============================] - 0s 4ms/step - loss: 0.3113 - accuracy:
0.8650 - val_loss: 0.1790 - val_accuracy: 0.9097
Epoch 90/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3115 - accuracy:
0.8631 - val_loss: 0.1840 - val_accuracy: 0.9078
Epoch 91/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3107 - accuracy:
0.8659 - val_loss: 0.1630 - val_accuracy: 0.9184
Epoch 92/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3115 - accuracy:
0.8640 - val_loss: 0.1811 - val_accuracy: 0.9086
Epoch 93/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3106 - accuracy:
0.8659 - val_loss: 0.1683 - val_accuracy: 0.9160
Epoch 94/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3104 - accuracy:
0.8651 - val_loss: 0.1845 - val_accuracy: 0.9062
Epoch 95/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3097 - accuracy:
0.8658 - val_loss: 0.1811 - val_accuracy: 0.9093
Epoch 96/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3097 - accuracy:
0.8657 - val_loss: 0.1603 - val_accuracy: 0.9207
Epoch 97/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3117 - accuracy:
0.8643 - val_loss: 0.1453 - val_accuracy: 0.9301
Epoch 98/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3140 - accuracy:
0.8620 - val_loss: 0.1641 - val_accuracy: 0.9184
Epoch 99/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3103 - accuracy:
0.8657 - val_loss: 0.1626 - val_accuracy: 0.9180
Epoch 100/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3095 - accuracy:
0.8640 - val_loss: 0.1773 - val_accuracy: 0.9097
Epoch 101/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3114 - accuracy:
0.8639 - val_loss: 0.1717 - val_accuracy: 0.9141
Epoch 102/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3085 - accuracy:
0.8655 - val_loss: 0.1644 - val_accuracy: 0.9180
Epoch 103/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3082 - accuracy:
0.8656 - val_loss: 0.1944 - val_accuracy: 0.9031
Epoch 104/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3091 - accuracy:
0.8658 - val_loss: 0.1956 - val_accuracy: 0.9027
Epoch 105/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3088 - accuracy:
0.8658 - val_loss: 0.1806 - val_accuracy: 0.9066
Epoch 106/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3087 - accuracy:
0.8659 - val_loss: 0.2003 - val_accuracy: 0.8987
Epoch 107/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3085 - accuracy:
0.8658 - val_loss: 0.1682 - val_accuracy: 0.9152
Epoch 108/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3079 - accuracy:
0.8673 - val_loss: 0.1647 - val_accuracy: 0.9203
Epoch 109/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3073 - accuracy:
0.8672 - val_loss: 0.1851 - val_accuracy: 0.9066
Epoch 110/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3077 - accuracy:
0.8663 - val_loss: 0.1848 - val_accuracy: 0.9074
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Epoch 111/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3078 - accuracy:
0.8664 - val_loss: 0.1730 - val_accuracy: 0.9129
Epoch 112/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3078 - accuracy:
0.8653 - val_loss: 0.1696 - val_accuracy: 0.9152
Epoch 113/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3067 - accuracy:
0.8661 - val_loss: 0.1894 - val_accuracy: 0.9054
Epoch 114/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3072 - accuracy:
0.8666 - val_loss: 0.1870 - val_accuracy: 0.9058
Epoch 115/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3074 - accuracy:
0.8676 - val_loss: 0.1791 - val_accuracy: 0.9101
Epoch 116/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3064 - accuracy:
0.8671 - val_loss: 0.1632 - val_accuracy: 0.9188
Epoch 117/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3069 - accuracy:
0.8682 - val_loss: 0.1799 - val_accuracy: 0.9101
Epoch 118/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3067 - accuracy:
0.8672 - val_loss: 0.1764 - val_accuracy: 0.9109
Epoch 119/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3065 - accuracy:
0.8673 - val_loss: 0.1890 - val_accuracy: 0.9062
Epoch 120/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3056 - accuracy:
0.8686 - val_loss: 0.1597 - val_accuracy: 0.9215
Epoch 121/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3065 - accuracy:
0.8660 - val_loss: 0.1628 - val_accuracy: 0.9188
Epoch 122/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3073 - accuracy:
0.8661 - val_loss: 0.1497 - val_accuracy: 0.9254
Epoch 123/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3069 - accuracy:
0.8654 - val_loss: 0.1608 - val_accuracy: 0.9203
Epoch 124/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3064 - accuracy:
0.8667 - val_loss: 0.1656 - val_accuracy: 0.9160
Epoch 125/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3056 - accuracy:
0.8677 - val_loss: 0.1523 - val_accuracy: 0.9258
Epoch 126/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3075 - accuracy:
0.8673 - val_loss: 0.1616 - val_accuracy: 0.9211
Epoch 127/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3063 - accuracy:
0.8660 - val_loss: 0.1601 - val_accuracy: 0.9223
Epoch 128/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3072 - accuracy:
0.8657 - val_loss: 0.1684 - val_accuracy: 0.9144
Epoch 129/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3058 - accuracy:
0.8677 - val_loss: 0.1885 - val_accuracy: 0.9058
Epoch 130/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3047 - accuracy:
0.8672 - val_loss: 0.1978 - val_accuracy: 0.9007
Epoch 131/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3072 - accuracy:
0.8654 - val_loss: 0.2013 - val_accuracy: 0.8995
Epoch 132/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3057 - accuracy:
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0.8684 - val_loss: 0.1774 - val_accuracy: 0.9097
Epoch 133/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3043 - accuracy:
0.8675 - val_loss: 0.1700 - val_accuracy: 0.9148
Epoch 134/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3041 - accuracy:
0.8681 - val_loss: 0.1621 - val_accuracy: 0.9199
Epoch 135/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3042 - accuracy:
0.8681 - val_loss: 0.1724 - val_accuracy: 0.9137
Epoch 136/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3042 - accuracy:
0.8667 - val_loss: 0.1562 - val_accuracy: 0.9227
Epoch 137/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3061 - accuracy:
0.8669 - val_loss: 0.1398 - val_accuracy: 0.9349
Epoch 138/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3063 - accuracy:
0.8656 - val_loss: 0.1548 - val_accuracy: 0.9246
Epoch 139/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3059 - accuracy:
0.8674 - val_loss: 0.1493 - val_accuracy: 0.9270
Epoch 140/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3052 - accuracy:
0.8676 - val_loss: 0.1510 - val_accuracy: 0.9246
Epoch 141/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3044 - accuracy:
0.8665 - val_loss: 0.1696 - val_accuracy: 0.9144
Epoch 142/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3035 - accuracy:
0.8686 - val_loss: 0.1486 - val_accuracy: 0.9286
Epoch 143/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3076 - accuracy:
0.8655 - val_loss: 0.1460 - val_accuracy: 0.9282
Epoch 144/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3053 - accuracy:
0.8670 - val_loss: 0.1526 - val_accuracy: 0.9262
Epoch 145/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3054 - accuracy:
0.8693 - val_loss: 0.1593 - val_accuracy: 0.9207
Epoch 146/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3035 - accuracy:
0.8679 - val_loss: 0.1591 - val_accuracy: 0.9219
Epoch 147/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3035 - accuracy:
0.8684 - val_loss: 0.1644 - val_accuracy: 0.9195
Epoch 148/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3028 - accuracy:
0.8691 - val_loss: 0.1860 - val_accuracy: 0.9078
Epoch 149/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3026 - accuracy:
0.8693 - val_loss: 0.1737 - val_accuracy: 0.9125
Epoch 150/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3026 - accuracy:
0.8685 - val_loss: 0.1710 - val_accuracy: 0.9144
Epoch 151/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3028 - accuracy:
0.8687 - val_loss: 0.1716 - val_accuracy: 0.9129
Epoch 152/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3023 - accuracy:
0.8696 - val_loss: 0.1665 - val_accuracy: 0.9188
Epoch 153/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3038 - accuracy:
0.8678 - val_loss: 0.1600 - val_accuracy: 0.9203
Epoch 154/1000
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11/11 [==============================] - 0s 4ms/step - loss: 0.3052 - accuracy:
0.8674 - val_loss: 0.1661 - val_accuracy: 0.9184
Epoch 155/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3037 - accuracy:
0.8695 - val_loss: 0.1563 - val_accuracy: 0.9227
Epoch 156/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3042 - accuracy:
0.8675 - val_loss: 0.1647 - val_accuracy: 0.9184
Epoch 157/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3044 - accuracy:
0.8659 - val_loss: 0.1791 - val_accuracy: 0.9109
Epoch 158/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3029 - accuracy:
0.8683 - val_loss: 0.1648 - val_accuracy: 0.9195
Epoch 159/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3023 - accuracy:
0.8685 - val_loss: 0.1753 - val_accuracy: 0.9121
Epoch 160/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3017 - accuracy:
0.8694 - val_loss: 0.1868 - val_accuracy: 0.9054
Epoch 161/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3021 - accuracy:
0.8686 - val_loss: 0.1870 - val_accuracy: 0.9070
Epoch 162/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3028 - accuracy:
0.8675 - val_loss: 0.1819 - val_accuracy: 0.9086
Epoch 163/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3024 - accuracy:
0.8695 - val_loss: 0.1801 - val_accuracy: 0.9101
Epoch 164/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3025 - accuracy:
0.8690 - val_loss: 0.1896 - val_accuracy: 0.9050
Epoch 165/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3026 - accuracy:
0.8684 - val_loss: 0.1581 - val_accuracy: 0.9219
Epoch 166/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3032 - accuracy:
0.8687 - val_loss: 0.1784 - val_accuracy: 0.9089
Epoch 167/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3017 - accuracy:
0.8694 - val_loss: 0.1710 - val_accuracy: 0.9141
Epoch 168/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3025 - accuracy:
0.8694 - val_loss: 0.1583 - val_accuracy: 0.9219
Epoch 169/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3019 - accuracy:
0.8707 - val_loss: 0.1712 - val_accuracy: 0.9137
Epoch 170/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3025 - accuracy:
0.8701 - val_loss: 0.1724 - val_accuracy: 0.9152
Epoch 171/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3021 - accuracy:
0.8688 - val_loss: 0.1589 - val_accuracy: 0.9219
Epoch 172/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3017 - accuracy:
0.8694 - val_loss: 0.1708 - val_accuracy: 0.9148
Epoch 173/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3009 - accuracy:
0.8700 - val_loss: 0.1674 - val_accuracy: 0.9164
Epoch 174/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3009 - accuracy:
0.8706 - val_loss: 0.1690 - val_accuracy: 0.9152
Epoch 175/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3008 - accuracy:
0.8698 - val_loss: 0.1677 - val_accuracy: 0.9164
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Epoch 176/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3009 - accuracy:
0.8693 - val_loss: 0.1773 - val_accuracy: 0.9133
Epoch 177/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2999 - accuracy:
0.8694 - val_loss: 0.1642 - val_accuracy: 0.9172
Epoch 178/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2999 - accuracy:
0.8707 - val_loss: 0.1770 - val_accuracy: 0.9133
Epoch 179/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3007 - accuracy:
0.8708 - val_loss: 0.1831 - val_accuracy: 0.9097
Epoch 180/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3013 - accuracy:
0.8698 - val_loss: 0.1591 - val_accuracy: 0.9207
Epoch 181/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3008 - accuracy:
0.8687 - val_loss: 0.1591 - val_accuracy: 0.9219
Epoch 182/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3015 - accuracy:
0.8697 - val_loss: 0.1494 - val_accuracy: 0.9270
Epoch 183/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3021 - accuracy:
0.8697 - val_loss: 0.1519 - val_accuracy: 0.9246
Epoch 184/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3007 - accuracy:
0.8690 - val_loss: 0.1564 - val_accuracy: 0.9235
Epoch 185/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3007 - accuracy:
0.8695 - val_loss: 0.1652 - val_accuracy: 0.9180
Epoch 186/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3003 - accuracy:
0.8708 - val_loss: 0.1530 - val_accuracy: 0.9266
Epoch 187/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3015 - accuracy:
0.8681 - val_loss: 0.1541 - val_accuracy: 0.9246
Epoch 188/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3005 - accuracy:
0.8700 - val_loss: 0.1855 - val_accuracy: 0.9074
Epoch 189/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3005 - accuracy:
0.8711 - val_loss: 0.1526 - val_accuracy: 0.9243
Epoch 190/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2997 - accuracy:
0.8703 - val_loss: 0.1750 - val_accuracy: 0.9141
Epoch 191/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2994 - accuracy:
0.8696 - val_loss: 0.1886 - val_accuracy: 0.9058
Epoch 192/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3001 - accuracy:
0.8692 - val_loss: 0.1989 - val_accuracy: 0.9011
Epoch 193/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3006 - accuracy:
0.8704 - val_loss: 0.2040 - val_accuracy: 0.8960
Epoch 194/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3013 - accuracy:
0.8693 - val_loss: 0.1765 - val_accuracy: 0.9141
Epoch 195/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3019 - accuracy:
0.8690 - val_loss: 0.1698 - val_accuracy: 0.9152
Epoch 196/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2993 - accuracy:
0.8713 - val_loss: 0.1876 - val_accuracy: 0.9054
Epoch 197/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3007 - accuracy:
```

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0.8691 - val_loss: 0.1975 - val_accuracy: 0.9007
Epoch 198/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3016 - accuracy:
0.8682 - val_loss: 0.1872 - val_accuracy: 0.9066
Epoch 199/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2996 - accuracy:
0.8713 - val_loss: 0.1616 - val_accuracy: 0.9192
Epoch 200/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2997 - accuracy:
0.8712 - val_loss: 0.1419 - val_accuracy: 0.9325
Epoch 201/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3016 - accuracy:
0.8707 - val_loss: 0.1683 - val_accuracy: 0.9176
Epoch 202/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2988 - accuracy:
0.8718 - val_loss: 0.1598 - val_accuracy: 0.9199
Epoch 203/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2986 - accuracy:
0.8713 - val_loss: 0.1629 - val_accuracy: 0.9184
Epoch 204/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2992 - accuracy:
0.8700 - val_loss: 0.1749 - val_accuracy: 0.9133
Epoch 205/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2987 - accuracy:
0.8714 - val_loss: 0.1737 - val_accuracy: 0.9117
Epoch 206/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2992 - accuracy:
0.8714 - val_loss: 0.1574 - val_accuracy: 0.9223
Epoch 207/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2991 - accuracy:
0.8710 - val_loss: 0.1593 - val_accuracy: 0.9223
Epoch 208/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2987 - accuracy:
0.8706 - val_loss: 0.1513 - val_accuracy: 0.9262
Epoch 209/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2988 - accuracy:
0.8710 - val_loss: 0.1571 - val_accuracy: 0.9227
Epoch 210/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2991 - accuracy:
0.8713 - val_loss: 0.1549 - val_accuracy: 0.9223
Epoch 211/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2984 - accuracy:
0.8709 - val_loss: 0.1672 - val_accuracy: 0.9176
Epoch 212/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2986 - accuracy:
0.8724 - val_loss: 0.1532 - val_accuracy: 0.9246
Epoch 213/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2989 - accuracy:
0.8702 - val_loss: 0.1476 - val_accuracy: 0.9266
Epoch 214/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.3001 - accuracy:
0.8700 - val_loss: 0.1500 - val_accuracy: 0.9266
Epoch 215/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2994 - accuracy:
0.8684 - val_loss: 0.1464 - val_accuracy: 0.9286
Epoch 216/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2988 - accuracy:
0.8684 - val_loss: 0.1546 - val_accuracy: 0.9246
Epoch 217/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2990 - accuracy:
0.8705 - val_loss: 0.1595 - val_accuracy: 0.9199
Epoch 218/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2985 - accuracy:
0.8720 - val_loss: 0.1539 - val_accuracy: 0.9250
Epoch 219/1000
```

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11/11 [==============================] - 0s 3ms/step - loss: 0.2997 - accuracy:
0.8686 - val_loss: 0.1486 - val_accuracy: 0.9262
Epoch 220/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2984 - accuracy:
0.8725 - val_loss: 0.1904 - val_accuracy: 0.9050
Epoch 221/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2996 - accuracy:
0.8707 - val_loss: 0.1836 - val_accuracy: 0.9082
Epoch 222/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2979 - accuracy:
0.8704 - val_loss: 0.1925 - val_accuracy: 0.9031
Epoch 223/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2983 - accuracy:
0.8697 - val_loss: 0.1671 - val_accuracy: 0.9176
Epoch 224/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2972 - accuracy:
0.8709 - val_loss: 0.1818 - val_accuracy: 0.9078
Epoch 225/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2978 - accuracy:
0.8712 - val_loss: 0.1795 - val_accuracy: 0.9089
Epoch 226/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2974 - accuracy:
0.8722 - val_loss: 0.1661 - val_accuracy: 0.9164
Epoch 227/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2975 - accuracy:
0.8712 - val_loss: 0.1641 - val_accuracy: 0.9199
Epoch 228/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2974 - accuracy:
0.8712 - val_loss: 0.1848 - val_accuracy: 0.9082
Epoch 229/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2981 - accuracy:
0.8726 - val_loss: 0.1936 - val_accuracy: 0.9027
Epoch 230/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2977 - accuracy:
0.8723 - val_loss: 0.1700 - val_accuracy: 0.9156
Epoch 231/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2968 - accuracy:
0.8717 - val_loss: 0.1820 - val_accuracy: 0.9109
Epoch 232/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2970 - accuracy:
0.8727 - val_loss: 0.1663 - val_accuracy: 0.9156
Epoch 233/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2970 - accuracy:
0.8708 - val_loss: 0.1689 - val_accuracy: 0.9156
Epoch 234/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2969 - accuracy:
0.8702 - val_loss: 0.1778 - val_accuracy: 0.9109
Epoch 235/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2968 - accuracy:
0.8719 - val_loss: 0.1574 - val_accuracy: 0.9203
Epoch 236/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2982 - accuracy:
0.8717 - val_loss: 0.1609 - val_accuracy: 0.9211
Epoch 237/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2971 - accuracy:
0.8724 - val_loss: 0.1663 - val_accuracy: 0.9176
Epoch 238/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2976 - accuracy:
0.8731 - val_loss: 0.1525 - val_accuracy: 0.9266
Epoch 239/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2997 - accuracy:
0.8701 - val_loss: 0.1559 - val_accuracy: 0.9239
Epoch 240/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2965 - accuracy:
0.8710 - val_loss: 0.1703 - val_accuracy: 0.9168
```

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Epoch 241/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2982 - accuracy:
0.8730 - val_loss: 0.1758 - val_accuracy: 0.9105
Epoch 242/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2982 - accuracy:
0.8701 - val_loss: 0.1680 - val_accuracy: 0.9164
Epoch 243/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2961 - accuracy:
0.8696 - val_loss: 0.1832 - val_accuracy: 0.9074
Epoch 244/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2965 - accuracy:
0.8724 - val_loss: 0.1838 - val_accuracy: 0.9078
Epoch 245/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2967 - accuracy:
0.8714 - val_loss: 0.1555 - val_accuracy: 0.9235
Epoch 246/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2965 - accuracy:
0.8711 - val_loss: 0.1531 - val_accuracy: 0.9262
Epoch 247/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2977 - accuracy:
0.8722 - val_loss: 0.1372 - val_accuracy: 0.9329
Epoch 248/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.3011 - accuracy:
0.8684 - val_loss: 0.1419 - val_accuracy: 0.9297
Epoch 249/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2981 - accuracy:
0.8705 - val_loss: 0.1385 - val_accuracy: 0.9333
Epoch 250/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2982 - accuracy:
0.8719 - val_loss: 0.1434 - val_accuracy: 0.9309
Epoch 251/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2963 - accuracy:
0.8712 - val_loss: 0.1600 - val_accuracy: 0.9199
Epoch 252/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2954 - accuracy:
0.8713 - val_loss: 0.1895 - val_accuracy: 0.9042
Epoch 253/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2976 - accuracy:
0.8724 - val_loss: 0.1891 - val_accuracy: 0.9046
Epoch 254/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2972 - accuracy:
0.8719 - val_loss: 0.1798 - val_accuracy: 0.9093
Epoch 255/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2963 - accuracy:
0.8703 - val_loss: 0.1696 - val_accuracy: 0.9168
Epoch 256/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2957 - accuracy:
0.8710 - val_loss: 0.1675 - val_accuracy: 0.9156
Epoch 257/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2954 - accuracy:
0.8722 - val_loss: 0.1582 - val_accuracy: 0.9195
Epoch 258/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2957 - accuracy:
0.8725 - val_loss: 0.1741 - val_accuracy: 0.9137
Epoch 259/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2969 - accuracy:
0.8713 - val_loss: 0.1753 - val_accuracy: 0.9121
Epoch 260/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2953 - accuracy:
0.8712 - val_loss: 0.1929 - val_accuracy: 0.9031
Epoch 261/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2972 - accuracy:
0.8725 - val_loss: 0.1892 - val_accuracy: 0.9062
Epoch 262/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2965 - accuracy:
```

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0.8724 - val_loss: 0.1798 - val_accuracy: 0.9105
Epoch 263/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2950 - accuracy:
0.8724 - val_loss: 0.1649 - val_accuracy: 0.9160
Epoch 264/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2949 - accuracy:
0.8713 - val_loss: 0.1525 - val_accuracy: 0.9250
Epoch 265/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2951 - accuracy:
0.8726 - val_loss: 0.1656 - val_accuracy: 0.9160
Epoch 266/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2949 - accuracy:
0.8734 - val_loss: 0.1783 - val_accuracy: 0.9113
Epoch 267/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2951 - accuracy:
0.8709 - val_loss: 0.1805 - val_accuracy: 0.9097
Epoch 268/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2964 - accuracy:
0.8721 - val_loss: 0.1799 - val_accuracy: 0.9097
Epoch 269/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2949 - accuracy:
0.8737 - val_loss: 0.1829 - val_accuracy: 0.9086
Epoch 270/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2962 - accuracy:
0.8720 - val_loss: 0.1791 - val_accuracy: 0.9117
Epoch 271/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2958 - accuracy:
0.8723 - val_loss: 0.1849 - val_accuracy: 0.9070
Epoch 272/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2959 - accuracy:
0.8732 - val_loss: 0.1596 - val_accuracy: 0.9199
Epoch 273/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2956 - accuracy:
0.8724 - val_loss: 0.1412 - val_accuracy: 0.9317
Epoch 274/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2965 - accuracy:
0.8718 - val_loss: 0.1473 - val_accuracy: 0.9286
Epoch 275/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2958 - accuracy:
0.8693 - val_loss: 0.1630 - val_accuracy: 0.9180
Epoch 276/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2943 - accuracy:
0.8741 - val_loss: 0.1738 - val_accuracy: 0.9141
Epoch 277/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2951 - accuracy:
0.8724 - val_loss: 0.1787 - val_accuracy: 0.9105
Epoch 278/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2950 - accuracy:
0.8720 - val_loss: 0.1842 - val_accuracy: 0.9078
Epoch 279/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2945 - accuracy:
0.8724 - val_loss: 0.1547 - val_accuracy: 0.9231
Epoch 280/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2947 - accuracy:
0.8726 - val_loss: 0.1410 - val_accuracy: 0.9313
Epoch 281/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2949 - accuracy:
0.8726 - val_loss: 0.1639 - val_accuracy: 0.9180
Epoch 282/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2948 - accuracy:
0.8715 - val_loss: 0.1614 - val_accuracy: 0.9188
Epoch 283/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2940 - accuracy:
0.8716 - val_loss: 0.1696 - val_accuracy: 0.9152
Epoch 284/1000
```

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11/11 [==============================] - 0s 3ms/step - loss: 0.2941 - accuracy:
0.8728 - val_loss: 0.1749 - val_accuracy: 0.9133
Epoch 285/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2954 - accuracy:
0.8730 - val_loss: 0.1763 - val_accuracy: 0.9129
Epoch 286/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2947 - accuracy:
0.8722 - val_loss: 0.1635 - val_accuracy: 0.9176
Epoch 287/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2937 - accuracy:
0.8729 - val_loss: 0.1416 - val_accuracy: 0.9325
Epoch 288/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2958 - accuracy:
0.8707 - val_loss: 0.1632 - val_accuracy: 0.9188
Epoch 289/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2938 - accuracy:
0.8731 - val_loss: 0.1764 - val_accuracy: 0.9129
Epoch 290/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2940 - accuracy:
0.8726 - val_loss: 0.1793 - val_accuracy: 0.9117
Epoch 291/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2939 - accuracy:
0.8715 - val_loss: 0.1824 - val_accuracy: 0.9086
Epoch 292/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2939 - accuracy:
0.8720 - val_loss: 0.1925 - val_accuracy: 0.9050
Epoch 293/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2943 - accuracy:
0.8731 - val_loss: 0.1832 - val_accuracy: 0.9093
Epoch 294/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2937 - accuracy:
0.8735 - val_loss: 0.2019 - val_accuracy: 0.9011
Epoch 295/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2967 - accuracy:
0.8712 - val_loss: 0.1854 - val_accuracy: 0.9074
Epoch 296/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2940 - accuracy:
0.8734 - val_loss: 0.1927 - val_accuracy: 0.9038
Epoch 297/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2947 - accuracy:
0.8732 - val_loss: 0.1765 - val_accuracy: 0.9125
Epoch 298/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2945 - accuracy:
0.8737 - val_loss: 0.1603 - val_accuracy: 0.9215
Epoch 299/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2946 - accuracy:
0.8716 - val_loss: 0.1649 - val_accuracy: 0.9172
Epoch 300/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2937 - accuracy:
0.8717 - val_loss: 0.1608 - val_accuracy: 0.9192
Epoch 301/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2931 - accuracy:
0.8717 - val_loss: 0.1808 - val_accuracy: 0.9101
Epoch 302/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2934 - accuracy:
0.8719 - val_loss: 0.1776 - val_accuracy: 0.9133
Epoch 303/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2942 - accuracy:
0.8734 - val_loss: 0.1728 - val_accuracy: 0.9152
Epoch 304/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2946 - accuracy:
0.8727 - val_loss: 0.1645 - val_accuracy: 0.9180
Epoch 305/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2955 - accuracy:
0.8744 - val_loss: 0.1423 - val_accuracy: 0.9290
```

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Epoch 306/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2933 - accuracy:
0.8753 - val_loss: 0.1486 - val_accuracy: 0.9282
Epoch 307/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2952 - accuracy:
0.8725 - val_loss: 0.1465 - val_accuracy: 0.9282
Epoch 308/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2956 - accuracy:
0.8719 - val_loss: 0.1547 - val_accuracy: 0.9239
Epoch 309/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2938 - accuracy:
0.8732 - val_loss: 0.1487 - val_accuracy: 0.9270
Epoch 310/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2938 - accuracy:
0.8726 - val_loss: 0.1540 - val_accuracy: 0.9243
Epoch 311/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2948 - accuracy:
0.8726 - val_loss: 0.1541 - val_accuracy: 0.9239
Epoch 312/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2923 - accuracy:
0.8737 - val_loss: 0.1593 - val_accuracy: 0.9227
Epoch 313/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2928 - accuracy:
0.8733 - val_loss: 0.1634 - val_accuracy: 0.9184
Epoch 314/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2931 - accuracy:
0.8728 - val_loss: 0.1616 - val_accuracy: 0.9207
Epoch 315/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2942 - accuracy:
0.8713 - val_loss: 0.1513 - val_accuracy: 0.9270
Epoch 316/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2936 - accuracy:
0.8735 - val_loss: 0.1418 - val_accuracy: 0.9309
Epoch 317/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2945 - accuracy:
0.8721 - val_loss: 0.1423 - val_accuracy: 0.9301
Epoch 318/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2928 - accuracy:
0.8733 - val_loss: 0.1584 - val_accuracy: 0.9227
Epoch 319/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2923 - accuracy:
0.8745 - val_loss: 0.1532 - val_accuracy: 0.9243
Epoch 320/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2927 - accuracy:
0.8716 - val_loss: 0.1631 - val_accuracy: 0.9207
Epoch 321/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2932 - accuracy:
0.8739 - val_loss: 0.1477 - val_accuracy: 0.9286
Epoch 322/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2936 - accuracy:
0.8741 - val_loss: 0.1412 - val_accuracy: 0.9313
Epoch 323/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2941 - accuracy:
0.8722 - val_loss: 0.1445 - val_accuracy: 0.9290
Epoch 324/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2937 - accuracy:
0.8743 - val_loss: 0.1585 - val_accuracy: 0.9219
Epoch 325/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2921 - accuracy:
0.8728 - val_loss: 0.1651 - val_accuracy: 0.9164
Epoch 326/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2921 - accuracy:
0.8735 - val_loss: 0.1779 - val_accuracy: 0.9117
Epoch 327/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2918 - accuracy:
```

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0.8733 - val_loss: 0.1744 - val_accuracy: 0.9137
Epoch 328/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2918 - accuracy:
0.8745 - val_loss: 0.1707 - val_accuracy: 0.9156
Epoch 329/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2929 - accuracy:
0.8724 - val_loss: 0.1738 - val_accuracy: 0.9144
Epoch 330/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2917 - accuracy:
0.8740 - val_loss: 0.1686 - val_accuracy: 0.9156
Epoch 331/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2917 - accuracy:
0.8736 - val_loss: 0.1524 - val_accuracy: 0.9258
Epoch 332/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2918 - accuracy:
0.8736 - val_loss: 0.1732 - val_accuracy: 0.9156
Epoch 333/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2928 - accuracy:
0.8739 - val_loss: 0.1501 - val_accuracy: 0.9278
Epoch 334/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2926 - accuracy:
0.8734 - val_loss: 0.1557 - val_accuracy: 0.9243
Epoch 335/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2916 - accuracy:
0.8746 - val_loss: 0.1744 - val_accuracy: 0.9141
Epoch 336/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2925 - accuracy:
0.8736 - val_loss: 0.1851 - val_accuracy: 0.9089
Epoch 337/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2933 - accuracy:
0.8745 - val_loss: 0.1821 - val_accuracy: 0.9097
Epoch 338/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2945 - accuracy:
0.8731 - val_loss: 0.1762 - val_accuracy: 0.9137
Epoch 339/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2915 - accuracy:
0.8746 - val_loss: 0.1587 - val_accuracy: 0.9231
Epoch 340/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2930 - accuracy:
0.8720 - val_loss: 0.1595 - val_accuracy: 0.9211
Epoch 341/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2920 - accuracy:
0.8745 - val_loss: 0.1760 - val_accuracy: 0.9125
Epoch 342/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2913 - accuracy:
0.8733 - val_loss: 0.1743 - val_accuracy: 0.9137
Epoch 343/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2915 - accuracy:
0.8752 - val_loss: 0.1661 - val_accuracy: 0.9199
Epoch 344/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2915 - accuracy:
0.8743 - val_loss: 0.1791 - val_accuracy: 0.9121
Epoch 345/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2914 - accuracy:
0.8745 - val_loss: 0.1725 - val_accuracy: 0.9148
Epoch 346/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2917 - accuracy:
0.8740 - val_loss: 0.1753 - val_accuracy: 0.9125
Epoch 347/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2910 - accuracy:
0.8742 - val_loss: 0.1701 - val_accuracy: 0.9168
Epoch 348/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2905 - accuracy:
0.8752 - val_loss: 0.1707 - val_accuracy: 0.9168
Epoch 349/1000
```

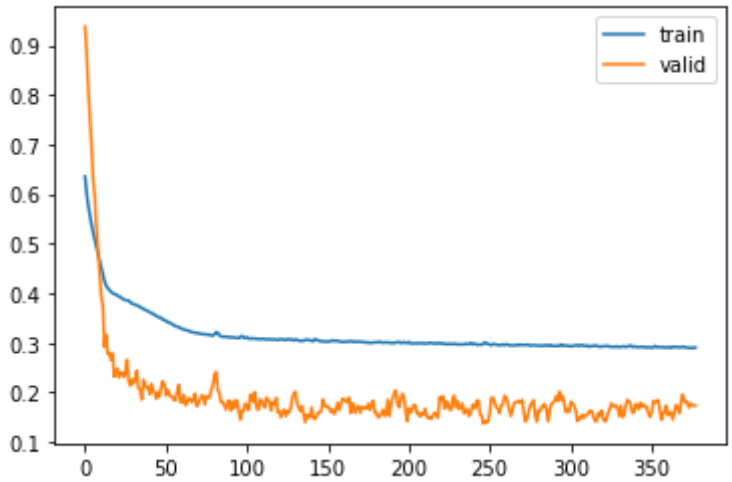
```
11/11 [==============================] - 0s 4ms/step - loss: 0.2914 - accuracy:
0.8743 - val_loss: 0.1567 - val_accuracy: 0.9235
Epoch 350/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2909 - accuracy:
0.8728 - val_loss: 0.1510 - val_accuracy: 0.9266
Epoch 351/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2905 - accuracy:
0.8749 - val_loss: 0.1588 - val_accuracy: 0.9223
Epoch 352/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2909 - accuracy:
0.8741 - val_loss: 0.1827 - val_accuracy: 0.9109
Epoch 353/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2936 - accuracy:
0.8731 - val_loss: 0.1790 - val_accuracy: 0.9117
Epoch 354/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2914 - accuracy:
0.8745 - val_loss: 0.1818 - val_accuracy: 0.9101
Epoch 355/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2918 - accuracy:
0.8741 - val_loss: 0.1848 - val_accuracy: 0.9086
Epoch 356/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2910 - accuracy:
0.8743 - val_loss: 0.1631 - val_accuracy: 0.9188
Epoch 357/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2914 - accuracy:
0.8735 - val_loss: 0.1445 - val_accuracy: 0.9290
Epoch 358/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2913 - accuracy:
0.8740 - val_loss: 0.1600 - val_accuracy: 0.9219
Epoch 359/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2905 - accuracy:
0.8742 - val_loss: 0.1588 - val_accuracy: 0.9211
Epoch 360/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2906 - accuracy:
0.8737 - val_loss: 0.1736 - val_accuracy: 0.9144
Epoch 361/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2908 - accuracy:
0.8755 - val_loss: 0.1542 - val_accuracy: 0.9243
Epoch 362/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2917 - accuracy:
0.8740 - val_loss: 0.1592 - val_accuracy: 0.9211
Epoch 363/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2897 - accuracy:
0.8745 - val_loss: 0.1595 - val_accuracy: 0.9227
Epoch 364/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2919 - accuracy:
0.8740 - val_loss: 0.1453 - val_accuracy: 0.9286
Epoch 365/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2917 - accuracy:
0.8742 - val_loss: 0.1608 - val_accuracy: 0.9227
Epoch 366/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2912 - accuracy:
0.8739 - val_loss: 0.1743 - val_accuracy: 0.9160
Epoch 367/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2908 - accuracy:
0.8741 - val_loss: 0.1720 - val_accuracy: 0.9144
Epoch 368/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2909 - accuracy:
0.8749 - val_loss: 0.1579 - val_accuracy: 0.9231
Epoch 369/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2910 - accuracy:
0.8742 - val_loss: 0.1763 - val_accuracy: 0.9141
Epoch 370/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2920 - accuracy:
0.8747 - val_loss: 0.1957 - val_accuracy: 0.9027
```

```
Epoch 371/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2917 - accuracy:
0.8763 - val_loss: 0.1855 - val_accuracy: 0.9086
Epoch 372/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2902 - accuracy:
0.8752 - val_loss: 0.1791 - val_accuracy: 0.9109
Epoch 373/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2906 - accuracy:
0.8762 - val_loss: 0.1807 - val_accuracy: 0.9101
Epoch 374/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2899 - accuracy:
0.8758 - val_loss: 0.1693 - val_accuracy: 0.9168
Epoch 375/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2897 - accuracy:
0.8758 - val_loss: 0.1772 - val_accuracy: 0.9117
Epoch 376/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2900 - accuracy:
0.8758 - val_loss: 0.1752 - val_accuracy: 0.9125
Epoch 377/1000
11/11 [==============================] - 0s 3ms/step - loss: 0.2898 - accuracy:
0.8757 - val_loss: 0.1734 - val_accuracy: 0.9148
Epoch 378/1000
11/11 [==============================] - 0s 4ms/step - loss: 0.2906 - accuracy:
0.8735 - val_loss: 0.1732 - val_accuracy: 0.9129
```

In [59]:
```
# Capturing learning history per epoch
hist2 = pd.DataFrame(hist_mod2.history)
hist2["epoch"] = hist_mod2.epoch

# Plotting accuracy at different epochs
plt.plot(hist2["loss"])
plt.plot(hist2["val_loss"])
plt.legend(("train", "valid"), loc=0)
```

Out[59]:
```
<matplotlib.legend.Legend at 0x1859d3f3310>
```



In [60]:
```
model2_score = model2.evaluate(scaled_test_X, scaled_test_y)
```

```
63/63 [==============================] - 0s 630us/step - loss: 0.3531 - accurac
y: 0.8495
```

In [61]:
```
# initialize the model
model3 = Sequential()
```

In [62]:
```
# This adds the input layer (by specifying input dimension) AND the first hidden
model3.add(
    Dense(units=24, input_dim=12, kernel_initializer="HeNormal", activation="rel
)  # input of 12 columns
# hidden layer
# model3.add(Dense(units=24, kernel_initializer="HeNormal", activation="relu"))
# Adding Dropout to prevent overfitting
model3.add(Dropout(0.5))
model3.add(Dense(16, kernel_initializer="HeNormal", activation="relu"))
# model3.add(Dense(24, kernel_initializer="HeNormal", activation="relu"))
# Adding the output layer
# we have an output of 1 node, which is the the desired dimensions of our output
model3.add(
    Dense(1, kernel_initializer="HeNormal", activation="sigmoid")
)  # Using sigmoid on output, as this is binary classification
```

In [63]:
```
# Create optimizer with default learning rate
# Compile the model
model3.compile(Adam(lr=0.001), loss="binary_crossentropy", metrics=["accuracy"])
```

In [64]:
```
model3.summary()
```

```
Model: "sequential_2"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 dense_6 (Dense)             (None, 24)                312

 dropout_1 (Dropout)         (None, 24)                0

 dense_7 (Dense)             (None, 16)                400

 dense_8 (Dense)             (None, 1)                 17

=================================================================
Total params: 729
Trainable params: 729
Non-trainable params: 0
_________________________________________________________________
```

In [65]:
```
# fitting the model
hist_mod3 = model3.fit(
    scaled_train_un_X,
    scaled_train_un_y,
    batch_size=1000,
    epochs=1000,
    validation_split=0.2,
)
```

```
Epoch 1/1000
3/3 [==============================] - 0s 63ms/step - loss: 0.7975 - accuracy:
0.4337 - val_loss: 0.6882 - val_accuracy: 0.5383
Epoch 2/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.7853 - accuracy:
0.4233 - val_loss: 0.7196 - val_accuracy: 0.4340
Epoch 3/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.7728 - accuracy:
```

```
0.4513 - val_loss: 0.7514 - val_accuracy: 0.3083
Epoch 4/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.7564 - accuracy:
0.4655 - val_loss: 0.7823 - val_accuracy: 0.2117
Epoch 5/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.7423 - accuracy:
0.4827 - val_loss: 0.8111 - val_accuracy: 0.1549
Epoch 6/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.7261 - accuracy:
0.4977 - val_loss: 0.8385 - val_accuracy: 0.1120
Epoch 7/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.7251 - accuracy:
0.5150 - val_loss: 0.8626 - val_accuracy: 0.0874
Epoch 8/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.7182 - accuracy:
0.5337 - val_loss: 0.8842 - val_accuracy: 0.0721
Epoch 9/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.7095 - accuracy:
0.5257 - val_loss: 0.9036 - val_accuracy: 0.0675
Epoch 10/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6993 - accuracy:
0.5529 - val_loss: 0.9192 - val_accuracy: 0.0537
Epoch 11/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6922 - accuracy:
0.5652 - val_loss: 0.9331 - val_accuracy: 0.0429
Epoch 12/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6825 - accuracy:
0.5744 - val_loss: 0.9446 - val_accuracy: 0.0399
Epoch 13/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6807 - accuracy:
0.5790 - val_loss: 0.9542 - val_accuracy: 0.0353
Epoch 14/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6831 - accuracy:
0.5786 - val_loss: 0.9601 - val_accuracy: 0.0337
Epoch 15/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6688 - accuracy:
0.5916 - val_loss: 0.9643 - val_accuracy: 0.0322
Epoch 16/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6714 - accuracy:
0.6070 - val_loss: 0.9679 - val_accuracy: 0.0337
Epoch 17/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6702 - accuracy:
0.6047 - val_loss: 0.9697 - val_accuracy: 0.0429
Epoch 18/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6672 - accuracy:
0.6081 - val_loss: 0.9689 - val_accuracy: 0.0690
Epoch 19/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6662 - accuracy:
0.6169 - val_loss: 0.9665 - val_accuracy: 0.0920
Epoch 20/1000
3/3 [==============================] - 0s 14ms/step - loss: 0.6674 - accuracy:
0.6074 - val_loss: 0.9625 - val_accuracy: 0.1166
Epoch 21/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6622 - accuracy:
0.6058 - val_loss: 0.9589 - val_accuracy: 0.1273
Epoch 22/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6577 - accuracy:
0.6246 - val_loss: 0.9546 - val_accuracy: 0.1380
Epoch 23/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6555 - accuracy:
0.6192 - val_loss: 0.9498 - val_accuracy: 0.1472
Epoch 24/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6543 - accuracy:
0.6277 - val_loss: 0.9423 - val_accuracy: 0.1518
Epoch 25/1000
```

```
3/3 [==============================] - 0s 11ms/step - loss: 0.6548 - accuracy:
0.6350 - val_loss: 0.9350 - val_accuracy: 0.1595
Epoch 26/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6401 - accuracy:
0.6396 - val_loss: 0.9315 - val_accuracy: 0.1641
Epoch 27/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6466 - accuracy:
0.6296 - val_loss: 0.9287 - val_accuracy: 0.1702
Epoch 28/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6391 - accuracy:
0.6415 - val_loss: 0.9270 - val_accuracy: 0.1748
Epoch 29/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6427 - accuracy:
0.6361 - val_loss: 0.9269 - val_accuracy: 0.1779
Epoch 30/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6463 - accuracy:
0.6331 - val_loss: 0.9250 - val_accuracy: 0.1810
Epoch 31/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6397 - accuracy:
0.6331 - val_loss: 0.9231 - val_accuracy: 0.1856
Epoch 32/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6406 - accuracy:
0.6369 - val_loss: 0.9220 - val_accuracy: 0.1902
Epoch 33/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6392 - accuracy:
0.6530 - val_loss: 0.9230 - val_accuracy: 0.1963
Epoch 34/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6292 - accuracy:
0.6507 - val_loss: 0.9236 - val_accuracy: 0.2025
Epoch 35/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6357 - accuracy:
0.6461 - val_loss: 0.9239 - val_accuracy: 0.2071
Epoch 36/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6316 - accuracy:
0.6472 - val_loss: 0.9223 - val_accuracy: 0.2132
Epoch 37/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6344 - accuracy:
0.6461 - val_loss: 0.9192 - val_accuracy: 0.2255
Epoch 38/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6391 - accuracy:
0.6434 - val_loss: 0.9153 - val_accuracy: 0.2362
Epoch 39/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6276 - accuracy:
0.6507 - val_loss: 0.9109 - val_accuracy: 0.2531
Epoch 40/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6298 - accuracy:
0.6507 - val_loss: 0.9084 - val_accuracy: 0.2638
Epoch 41/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6345 - accuracy:
0.6403 - val_loss: 0.9061 - val_accuracy: 0.2669
Epoch 42/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6304 - accuracy:
0.6446 - val_loss: 0.9052 - val_accuracy: 0.2776
Epoch 43/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6281 - accuracy:
0.6492 - val_loss: 0.9022 - val_accuracy: 0.2883
Epoch 44/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6261 - accuracy:
0.6614 - val_loss: 0.9007 - val_accuracy: 0.2991
Epoch 45/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6205 - accuracy:
0.6584 - val_loss: 0.8997 - val_accuracy: 0.3037
Epoch 46/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6301 - accuracy:
0.6541 - val_loss: 0.8982 - val_accuracy: 0.3083
```

```
Epoch 47/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6265 - accuracy:
0.6534 - val_loss: 0.8972 - val_accuracy: 0.3113
Epoch 48/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6203 - accuracy:
0.6591 - val_loss: 0.8951 - val_accuracy: 0.3144
Epoch 49/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6244 - accuracy:
0.6553 - val_loss: 0.8943 - val_accuracy: 0.3175
Epoch 50/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6173 - accuracy:
0.6702 - val_loss: 0.8924 - val_accuracy: 0.3206
Epoch 51/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6251 - accuracy:
0.6576 - val_loss: 0.8888 - val_accuracy: 0.3267
Epoch 52/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6234 - accuracy:
0.6587 - val_loss: 0.8846 - val_accuracy: 0.3328
Epoch 53/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6218 - accuracy:
0.6614 - val_loss: 0.8825 - val_accuracy: 0.3359
Epoch 54/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6232 - accuracy:
0.6553 - val_loss: 0.8823 - val_accuracy: 0.3374
Epoch 55/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6158 - accuracy:
0.6656 - val_loss: 0.8826 - val_accuracy: 0.3374
Epoch 56/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6193 - accuracy:
0.6610 - val_loss: 0.8807 - val_accuracy: 0.3390
Epoch 57/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6211 - accuracy:
0.6595 - val_loss: 0.8791 - val_accuracy: 0.3420
Epoch 58/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6155 - accuracy:
0.6641 - val_loss: 0.8771 - val_accuracy: 0.3466
Epoch 59/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6144 - accuracy:
0.6656 - val_loss: 0.8784 - val_accuracy: 0.3482
Epoch 60/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6152 - accuracy:
0.6710 - val_loss: 0.8794 - val_accuracy: 0.3451
Epoch 61/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6190 - accuracy:
0.6630 - val_loss: 0.8802 - val_accuracy: 0.3436
Epoch 62/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6132 - accuracy:
0.6687 - val_loss: 0.8780 - val_accuracy: 0.3497
Epoch 63/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6176 - accuracy:
0.6511 - val_loss: 0.8776 - val_accuracy: 0.3497
Epoch 64/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6171 - accuracy:
0.6706 - val_loss: 0.8753 - val_accuracy: 0.3528
Epoch 65/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6197 - accuracy:
0.6653 - val_loss: 0.8731 - val_accuracy: 0.3528
Epoch 66/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6077 - accuracy:
0.6718 - val_loss: 0.8744 - val_accuracy: 0.3528
Epoch 67/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6104 - accuracy:
0.6702 - val_loss: 0.8759 - val_accuracy: 0.3497
Epoch 68/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6099 - accuracy:
```

```
0.6656 - val_loss: 0.8781 - val_accuracy: 0.3497
Epoch 69/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6129 - accuracy:
0.6837 - val_loss: 0.8791 - val_accuracy: 0.3528
Epoch 70/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6086 - accuracy:
0.6706 - val_loss: 0.8766 - val_accuracy: 0.3528
Epoch 71/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6105 - accuracy:
0.6745 - val_loss: 0.8734 - val_accuracy: 0.3635
Epoch 72/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6025 - accuracy:
0.6863 - val_loss: 0.8715 - val_accuracy: 0.3635
Epoch 73/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6094 - accuracy:
0.6806 - val_loss: 0.8713 - val_accuracy: 0.3666
Epoch 74/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6027 - accuracy:
0.6756 - val_loss: 0.8709 - val_accuracy: 0.3666
Epoch 75/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5975 - accuracy:
0.6779 - val_loss: 0.8695 - val_accuracy: 0.3681
Epoch 76/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6145 - accuracy:
0.6672 - val_loss: 0.8684 - val_accuracy: 0.3727
Epoch 77/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6030 - accuracy:
0.6791 - val_loss: 0.8684 - val_accuracy: 0.3727
Epoch 78/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6060 - accuracy:
0.6752 - val_loss: 0.8675 - val_accuracy: 0.3742
Epoch 79/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6044 - accuracy:
0.6791 - val_loss: 0.8685 - val_accuracy: 0.3742
Epoch 80/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6034 - accuracy:
0.6902 - val_loss: 0.8689 - val_accuracy: 0.3758
Epoch 81/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6034 - accuracy:
0.6718 - val_loss: 0.8695 - val_accuracy: 0.3758
Epoch 82/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6049 - accuracy:
0.6760 - val_loss: 0.8691 - val_accuracy: 0.3773
Epoch 83/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6049 - accuracy:
0.6718 - val_loss: 0.8686 - val_accuracy: 0.3773
Epoch 84/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6050 - accuracy:
0.6929 - val_loss: 0.8666 - val_accuracy: 0.3804
Epoch 85/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5996 - accuracy:
0.6829 - val_loss: 0.8660 - val_accuracy: 0.3788
Epoch 86/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5993 - accuracy:
0.6848 - val_loss: 0.8657 - val_accuracy: 0.3804
Epoch 87/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6015 - accuracy:
0.6752 - val_loss: 0.8627 - val_accuracy: 0.3850
Epoch 88/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6016 - accuracy:
0.6833 - val_loss: 0.8594 - val_accuracy: 0.3880
Epoch 89/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5989 - accuracy:
0.6806 - val_loss: 0.8558 - val_accuracy: 0.3896
Epoch 90/1000
```

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3/3 [==============================] - 0s 12ms/step - loss: 0.6030 - accuracy:
0.6771 - val_loss: 0.8540 - val_accuracy: 0.3926
Epoch 91/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5976 - accuracy:
0.6783 - val_loss: 0.8518 - val_accuracy: 0.3957
Epoch 92/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6042 - accuracy:
0.6814 - val_loss: 0.8511 - val_accuracy: 0.3957
Epoch 93/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.6016 - accuracy:
0.6779 - val_loss: 0.8509 - val_accuracy: 0.3957
Epoch 94/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6079 - accuracy:
0.6745 - val_loss: 0.8530 - val_accuracy: 0.3957
Epoch 95/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5931 - accuracy:
0.6910 - val_loss: 0.8564 - val_accuracy: 0.3911
Epoch 96/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5953 - accuracy:
0.6883 - val_loss: 0.8602 - val_accuracy: 0.3865
Epoch 97/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5933 - accuracy:
0.6959 - val_loss: 0.8603 - val_accuracy: 0.3880
Epoch 98/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6003 - accuracy:
0.6887 - val_loss: 0.8576 - val_accuracy: 0.3896
Epoch 99/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5962 - accuracy:
0.6787 - val_loss: 0.8524 - val_accuracy: 0.3911
Epoch 100/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6010 - accuracy:
0.6814 - val_loss: 0.8473 - val_accuracy: 0.4003
Epoch 101/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.6014 - accuracy:
0.6779 - val_loss: 0.8466 - val_accuracy: 0.3972
Epoch 102/1000
3/3 [==============================] - ETA: 0s - loss: 0.5734 - accuracy: 0.71 -
0s 12ms/step - loss: 0.5997 - accuracy: 0.6806 - val_loss: 0.8482 - val_accurac
y: 0.3926
Epoch 103/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5910 - accuracy:
0.6821 - val_loss: 0.8504 - val_accuracy: 0.3865
Epoch 104/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5927 - accuracy:
0.6913 - val_loss: 0.8536 - val_accuracy: 0.3865
Epoch 105/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5885 - accuracy:
0.6837 - val_loss: 0.8543 - val_accuracy: 0.3880
Epoch 106/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5928 - accuracy:
0.6921 - val_loss: 0.8555 - val_accuracy: 0.3880
Epoch 107/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5909 - accuracy:
0.6879 - val_loss: 0.8562 - val_accuracy: 0.3865
Epoch 108/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5973 - accuracy:
0.6875 - val_loss: 0.8555 - val_accuracy: 0.3942
Epoch 109/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5905 - accuracy:
0.6863 - val_loss: 0.8537 - val_accuracy: 0.4049
Epoch 110/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5960 - accuracy:
0.6910 - val_loss: 0.8503 - val_accuracy: 0.4110
Epoch 111/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5969 - accuracy:
```

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0.6844 - val_loss: 0.8470 - val_accuracy: 0.4156
Epoch 112/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5873 - accuracy:
0.6902 - val_loss: 0.8484 - val_accuracy: 0.4156
Epoch 113/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5949 - accuracy:
0.6848 - val_loss: 0.8476 - val_accuracy: 0.4156
Epoch 114/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5965 - accuracy:
0.6817 - val_loss: 0.8461 - val_accuracy: 0.4218
Epoch 115/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5893 - accuracy:
0.6979 - val_loss: 0.8435 - val_accuracy: 0.4264
Epoch 116/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5968 - accuracy:
0.6748 - val_loss: 0.8437 - val_accuracy: 0.4248
Epoch 117/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5986 - accuracy:
0.6798 - val_loss: 0.8442 - val_accuracy: 0.4233
Epoch 118/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5895 - accuracy:
0.6856 - val_loss: 0.8461 - val_accuracy: 0.4202
Epoch 119/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5926 - accuracy:
0.6921 - val_loss: 0.8471 - val_accuracy: 0.4172
Epoch 120/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5912 - accuracy:
0.6848 - val_loss: 0.8478 - val_accuracy: 0.4126
Epoch 121/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5960 - accuracy:
0.6741 - val_loss: 0.8505 - val_accuracy: 0.4110
Epoch 122/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5956 - accuracy:
0.6821 - val_loss: 0.8528 - val_accuracy: 0.4110
Epoch 123/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5873 - accuracy:
0.6806 - val_loss: 0.8528 - val_accuracy: 0.4095
Epoch 124/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5900 - accuracy:
0.6933 - val_loss: 0.8516 - val_accuracy: 0.4126
Epoch 125/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5899 - accuracy:
0.6917 - val_loss: 0.8507 - val_accuracy: 0.4141
Epoch 126/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5933 - accuracy:
0.6913 - val_loss: 0.8511 - val_accuracy: 0.4141
Epoch 127/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5835 - accuracy:
0.6890 - val_loss: 0.8478 - val_accuracy: 0.4172
Epoch 128/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5944 - accuracy:
0.6856 - val_loss: 0.8414 - val_accuracy: 0.4187
Epoch 129/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5897 - accuracy:
0.6921 - val_loss: 0.8376 - val_accuracy: 0.4202
Epoch 130/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5944 - accuracy:
0.6867 - val_loss: 0.8369 - val_accuracy: 0.4218
Epoch 131/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5864 - accuracy:
0.6967 - val_loss: 0.8353 - val_accuracy: 0.4279
Epoch 132/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5829 - accuracy:
0.7025 - val_loss: 0.8369 - val_accuracy: 0.4294
Epoch 133/1000
```

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3/3 [==============================] - 0s 11ms/step - loss: 0.5843 - accuracy:
0.6986 - val_loss: 0.8390 - val_accuracy: 0.4294
Epoch 134/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5917 - accuracy:
0.6917 - val_loss: 0.8411 - val_accuracy: 0.4279
Epoch 135/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5812 - accuracy:
0.6963 - val_loss: 0.8415 - val_accuracy: 0.4279
Epoch 136/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5864 - accuracy:
0.6917 - val_loss: 0.8439 - val_accuracy: 0.4279
Epoch 137/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5884 - accuracy:
0.6944 - val_loss: 0.8450 - val_accuracy: 0.4294
Epoch 138/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5869 - accuracy:
0.6894 - val_loss: 0.8463 - val_accuracy: 0.4279
Epoch 139/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5786 - accuracy:
0.6982 - val_loss: 0.8484 - val_accuracy: 0.4294
Epoch 140/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5842 - accuracy:
0.6944 - val_loss: 0.8502 - val_accuracy: 0.4279
Epoch 141/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5859 - accuracy:
0.6906 - val_loss: 0.8501 - val_accuracy: 0.4279
Epoch 142/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5803 - accuracy:
0.6863 - val_loss: 0.8480 - val_accuracy: 0.4294
Epoch 143/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5901 - accuracy:
0.6817 - val_loss: 0.8446 - val_accuracy: 0.4356
Epoch 144/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5889 - accuracy:
0.6894 - val_loss: 0.8407 - val_accuracy: 0.4387
Epoch 145/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5931 - accuracy:
0.6844 - val_loss: 0.8392 - val_accuracy: 0.4387
Epoch 146/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5767 - accuracy:
0.7048 - val_loss: 0.8392 - val_accuracy: 0.4387
Epoch 147/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5830 - accuracy:
0.6944 - val_loss: 0.8400 - val_accuracy: 0.4371
Epoch 148/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5776 - accuracy:
0.6998 - val_loss: 0.8429 - val_accuracy: 0.4387
Epoch 149/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5810 - accuracy:
0.6913 - val_loss: 0.8432 - val_accuracy: 0.4371
Epoch 150/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5872 - accuracy:
0.6894 - val_loss: 0.8420 - val_accuracy: 0.4402
Epoch 151/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5828 - accuracy:
0.6936 - val_loss: 0.8418 - val_accuracy: 0.4417
Epoch 152/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5796 - accuracy:
0.6959 - val_loss: 0.8408 - val_accuracy: 0.4433
Epoch 153/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5745 - accuracy:
0.7002 - val_loss: 0.8375 - val_accuracy: 0.4463
Epoch 154/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5799 - accuracy:
0.6994 - val_loss: 0.8353 - val_accuracy: 0.4494
```

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Epoch 155/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5757 - accuracy:
0.7005 - val_loss: 0.8352 - val_accuracy: 0.4509
Epoch 156/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5803 - accuracy:
0.6986 - val_loss: 0.8358 - val_accuracy: 0.4525
Epoch 157/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5780 - accuracy:
0.7005 - val_loss: 0.8388 - val_accuracy: 0.4525
Epoch 158/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5748 - accuracy:
0.7017 - val_loss: 0.8418 - val_accuracy: 0.4494
Epoch 159/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5810 - accuracy:
0.6944 - val_loss: 0.8424 - val_accuracy: 0.4494
Epoch 160/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5758 - accuracy:
0.7036 - val_loss: 0.8418 - val_accuracy: 0.4540
Epoch 161/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5788 - accuracy:
0.7059 - val_loss: 0.8392 - val_accuracy: 0.4586
Epoch 162/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5815 - accuracy:
0.6871 - val_loss: 0.8385 - val_accuracy: 0.4571
Epoch 163/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5811 - accuracy:
0.6860 - val_loss: 0.8394 - val_accuracy: 0.4540
Epoch 164/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5807 - accuracy:
0.6956 - val_loss: 0.8403 - val_accuracy: 0.4555
Epoch 165/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5775 - accuracy:
0.7013 - val_loss: 0.8389 - val_accuracy: 0.4586
Epoch 166/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5828 - accuracy:
0.6902 - val_loss: 0.8371 - val_accuracy: 0.4586
Epoch 167/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5776 - accuracy:
0.7009 - val_loss: 0.8368 - val_accuracy: 0.4632
Epoch 168/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5759 - accuracy:
0.7082 - val_loss: 0.8352 - val_accuracy: 0.4647
Epoch 169/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5780 - accuracy:
0.6994 - val_loss: 0.8322 - val_accuracy: 0.4709
Epoch 170/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5779 - accuracy:
0.7124 - val_loss: 0.8288 - val_accuracy: 0.4724
Epoch 171/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5728 - accuracy:
0.7032 - val_loss: 0.8284 - val_accuracy: 0.4770
Epoch 172/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5759 - accuracy:
0.6979 - val_loss: 0.8290 - val_accuracy: 0.4755
Epoch 173/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5687 - accuracy:
0.7067 - val_loss: 0.8306 - val_accuracy: 0.4739
Epoch 174/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5711 - accuracy:
0.7021 - val_loss: 0.8304 - val_accuracy: 0.4739
Epoch 175/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5745 - accuracy:
0.7025 - val_loss: 0.8297 - val_accuracy: 0.4755
Epoch 176/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5693 - accuracy:
```

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0.7140 - val_loss: 0.8314 - val_accuracy: 0.4739
Epoch 177/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5746 - accuracy:
0.7013 - val_loss: 0.8314 - val_accuracy: 0.4755
Epoch 178/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5731 - accuracy:
0.6990 - val_loss: 0.8288 - val_accuracy: 0.4801
Epoch 179/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5715 - accuracy:
0.7036 - val_loss: 0.8297 - val_accuracy: 0.4785
Epoch 180/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5708 - accuracy:
0.7051 - val_loss: 0.8281 - val_accuracy: 0.4816
Epoch 181/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5637 - accuracy:
0.7113 - val_loss: 0.8255 - val_accuracy: 0.4831
Epoch 182/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5636 - accuracy:
0.7163 - val_loss: 0.8223 - val_accuracy: 0.4893
Epoch 183/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5667 - accuracy:
0.7143 - val_loss: 0.8214 - val_accuracy: 0.4877
Epoch 184/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5749 - accuracy:
0.7071 - val_loss: 0.8226 - val_accuracy: 0.4847
Epoch 185/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5724 - accuracy:
0.6944 - val_loss: 0.8261 - val_accuracy: 0.4831
Epoch 186/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5673 - accuracy:
0.7021 - val_loss: 0.8285 - val_accuracy: 0.4816
Epoch 187/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5745 - accuracy:
0.7132 - val_loss: 0.8312 - val_accuracy: 0.4801
Epoch 188/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5729 - accuracy:
0.6986 - val_loss: 0.8288 - val_accuracy: 0.4816
Epoch 189/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5688 - accuracy:
0.7044 - val_loss: 0.8283 - val_accuracy: 0.4801
Epoch 190/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5689 - accuracy:
0.7094 - val_loss: 0.8273 - val_accuracy: 0.4831
Epoch 191/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5639 - accuracy:
0.7113 - val_loss: 0.8242 - val_accuracy: 0.4847
Epoch 192/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5672 - accuracy:
0.7105 - val_loss: 0.8273 - val_accuracy: 0.4801
Epoch 193/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5760 - accuracy:
0.7005 - val_loss: 0.8291 - val_accuracy: 0.4785
Epoch 194/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5609 - accuracy:
0.7182 - val_loss: 0.8309 - val_accuracy: 0.4770
Epoch 195/1000
3/3 [==============================] - 0s 13ms/step - loss: 0.5606 - accuracy:
0.7048 - val_loss: 0.8311 - val_accuracy: 0.4785
Epoch 196/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5614 - accuracy:
0.7094 - val_loss: 0.8272 - val_accuracy: 0.4816
Epoch 197/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5645 - accuracy:
0.7097 - val_loss: 0.8256 - val_accuracy: 0.4816
Epoch 198/1000
```

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3/3 [==============================] - 0s 11ms/step - loss: 0.5659 - accuracy:
0.7059 - val_loss: 0.8221 - val_accuracy: 0.4877
Epoch 199/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5688 - accuracy:
0.7055 - val_loss: 0.8193 - val_accuracy: 0.4862
Epoch 200/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5640 - accuracy:
0.7120 - val_loss: 0.8174 - val_accuracy: 0.4877
Epoch 201/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5661 - accuracy:
0.7136 - val_loss: 0.8183 - val_accuracy: 0.4862
Epoch 202/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5580 - accuracy:
0.7174 - val_loss: 0.8219 - val_accuracy: 0.4862
Epoch 203/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5623 - accuracy:
0.7113 - val_loss: 0.8208 - val_accuracy: 0.4877
Epoch 204/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5641 - accuracy:
0.7028 - val_loss: 0.8202 - val_accuracy: 0.4893
Epoch 205/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5596 - accuracy:
0.7239 - val_loss: 0.8180 - val_accuracy: 0.4954
Epoch 206/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5617 - accuracy:
0.7097 - val_loss: 0.8177 - val_accuracy: 0.4923
Epoch 207/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5581 - accuracy:
0.7094 - val_loss: 0.8182 - val_accuracy: 0.4923
Epoch 208/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5701 - accuracy:
0.7155 - val_loss: 0.8201 - val_accuracy: 0.4908
Epoch 209/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5624 - accuracy:
0.7128 - val_loss: 0.8210 - val_accuracy: 0.4893
Epoch 210/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5604 - accuracy:
0.7128 - val_loss: 0.8203 - val_accuracy: 0.4923
Epoch 211/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5576 - accuracy:
0.7232 - val_loss: 0.8188 - val_accuracy: 0.4939
Epoch 212/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5598 - accuracy:
0.7189 - val_loss: 0.8153 - val_accuracy: 0.4954
Epoch 213/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5636 - accuracy:
0.7086 - val_loss: 0.8146 - val_accuracy: 0.4985
Epoch 214/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5604 - accuracy:
0.7220 - val_loss: 0.8190 - val_accuracy: 0.4923
Epoch 215/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5609 - accuracy:
0.7124 - val_loss: 0.8235 - val_accuracy: 0.4893
Epoch 216/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5661 - accuracy:
0.7147 - val_loss: 0.8252 - val_accuracy: 0.4877
Epoch 217/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5622 - accuracy:
0.7094 - val_loss: 0.8256 - val_accuracy: 0.4877
Epoch 218/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5585 - accuracy:
0.7128 - val_loss: 0.8248 - val_accuracy: 0.4862
Epoch 219/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5628 - accuracy:
0.7025 - val_loss: 0.8263 - val_accuracy: 0.4862
```

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Epoch 220/1000
3/3 [==============================] - 0s 13ms/step - loss: 0.5615 - accuracy:
0.7059 - val_loss: 0.8270 - val_accuracy: 0.4862
Epoch 221/1000
3/3 [==============================] - 0s 13ms/step - loss: 0.5598 - accuracy:
0.7182 - val_loss: 0.8253 - val_accuracy: 0.4862
Epoch 222/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5613 - accuracy:
0.7140 - val_loss: 0.8280 - val_accuracy: 0.4847
Epoch 223/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5557 - accuracy:
0.7239 - val_loss: 0.8238 - val_accuracy: 0.4862
Epoch 224/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5537 - accuracy:
0.7193 - val_loss: 0.8177 - val_accuracy: 0.4923
Epoch 225/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5548 - accuracy:
0.7189 - val_loss: 0.8128 - val_accuracy: 0.4969
Epoch 226/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5605 - accuracy:
0.7044 - val_loss: 0.8153 - val_accuracy: 0.4969
Epoch 227/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5574 - accuracy:
0.7193 - val_loss: 0.8179 - val_accuracy: 0.4939
Epoch 228/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5560 - accuracy:
0.7166 - val_loss: 0.8199 - val_accuracy: 0.4923
Epoch 229/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5565 - accuracy:
0.7174 - val_loss: 0.8218 - val_accuracy: 0.4908
Epoch 230/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5612 - accuracy:
0.7124 - val_loss: 0.8228 - val_accuracy: 0.4893
Epoch 231/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5644 - accuracy:
0.7067 - val_loss: 0.8190 - val_accuracy: 0.4893
Epoch 232/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5588 - accuracy:
0.7140 - val_loss: 0.8152 - val_accuracy: 0.4908
Epoch 233/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5573 - accuracy:
0.7155 - val_loss: 0.8109 - val_accuracy: 0.4908
Epoch 234/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5580 - accuracy:
0.7120 - val_loss: 0.8105 - val_accuracy: 0.4908
Epoch 235/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5572 - accuracy:
0.7166 - val_loss: 0.8119 - val_accuracy: 0.4908
Epoch 236/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5636 - accuracy:
0.7071 - val_loss: 0.8137 - val_accuracy: 0.4908
Epoch 237/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5538 - accuracy:
0.7186 - val_loss: 0.8168 - val_accuracy: 0.4908
Epoch 238/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5592 - accuracy:
0.7128 - val_loss: 0.8155 - val_accuracy: 0.4923
Epoch 239/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5533 - accuracy:
0.7166 - val_loss: 0.8142 - val_accuracy: 0.4923
Epoch 240/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5564 - accuracy:
0.7124 - val_loss: 0.8099 - val_accuracy: 0.4939
Epoch 241/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5580 - accuracy:
```

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0.7189 - val_loss: 0.8055 - val_accuracy: 0.4985
Epoch 242/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5561 - accuracy:
0.7078 - val_loss: 0.8076 - val_accuracy: 0.4939
Epoch 243/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5564 - accuracy:
0.7174 - val_loss: 0.8079 - val_accuracy: 0.4939
Epoch 244/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5562 - accuracy:
0.7151 - val_loss: 0.8110 - val_accuracy: 0.4908
Epoch 245/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5518 - accuracy:
0.7247 - val_loss: 0.8170 - val_accuracy: 0.4893
Epoch 246/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5593 - accuracy:
0.7255 - val_loss: 0.8202 - val_accuracy: 0.4877
Epoch 247/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5611 - accuracy:
0.7113 - val_loss: 0.8206 - val_accuracy: 0.4893
Epoch 248/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5471 - accuracy:
0.7304 - val_loss: 0.8191 - val_accuracy: 0.4877
Epoch 249/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5630 - accuracy:
0.7090 - val_loss: 0.8179 - val_accuracy: 0.4908
Epoch 250/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5605 - accuracy:
0.7078 - val_loss: 0.8134 - val_accuracy: 0.4923
Epoch 251/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5511 - accuracy:
0.7159 - val_loss: 0.8088 - val_accuracy: 0.4939
Epoch 252/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5578 - accuracy:
0.7097 - val_loss: 0.8032 - val_accuracy: 0.4954
Epoch 253/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5567 - accuracy:
0.7132 - val_loss: 0.7994 - val_accuracy: 0.4969
Epoch 254/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5525 - accuracy:
0.7163 - val_loss: 0.7988 - val_accuracy: 0.4969
Epoch 255/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5590 - accuracy:
0.7186 - val_loss: 0.8013 - val_accuracy: 0.4954
Epoch 256/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5554 - accuracy:
0.7143 - val_loss: 0.8058 - val_accuracy: 0.4939
Epoch 257/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5500 - accuracy:
0.7155 - val_loss: 0.8121 - val_accuracy: 0.4939
Epoch 258/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5449 - accuracy:
0.7297 - val_loss: 0.8165 - val_accuracy: 0.4939
Epoch 259/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5483 - accuracy:
0.7251 - val_loss: 0.8120 - val_accuracy: 0.4954
Epoch 260/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5560 - accuracy:
0.7189 - val_loss: 0.8079 - val_accuracy: 0.4969
Epoch 261/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5530 - accuracy:
0.7193 - val_loss: 0.8047 - val_accuracy: 0.4985
Epoch 262/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5525 - accuracy:
0.7113 - val_loss: 0.8015 - val_accuracy: 0.5031
Epoch 263/1000
```

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3/3 [==============================] - 0s 12ms/step - loss: 0.5495 - accuracy:
0.7189 - val_loss: 0.8011 - val_accuracy: 0.5031
Epoch 264/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5474 - accuracy:
0.7289 - val_loss: 0.8052 - val_accuracy: 0.5015
Epoch 265/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5542 - accuracy:
0.7132 - val_loss: 0.8108 - val_accuracy: 0.5015
Epoch 266/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5520 - accuracy:
0.7109 - val_loss: 0.8136 - val_accuracy: 0.5015
Epoch 267/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5517 - accuracy:
0.7117 - val_loss: 0.8173 - val_accuracy: 0.4985
Epoch 268/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5464 - accuracy:
0.7243 - val_loss: 0.8192 - val_accuracy: 0.4985
Epoch 269/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5553 - accuracy:
0.7166 - val_loss: 0.8189 - val_accuracy: 0.4985
Epoch 270/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5425 - accuracy:
0.7224 - val_loss: 0.8178 - val_accuracy: 0.5000
Epoch 271/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5475 - accuracy:
0.7205 - val_loss: 0.8133 - val_accuracy: 0.5015
Epoch 272/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5478 - accuracy:
0.7289 - val_loss: 0.8087 - val_accuracy: 0.5015
Epoch 273/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5510 - accuracy:
0.7163 - val_loss: 0.8120 - val_accuracy: 0.4985
Epoch 274/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5418 - accuracy:
0.7278 - val_loss: 0.8097 - val_accuracy: 0.4985
Epoch 275/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5489 - accuracy:
0.7186 - val_loss: 0.8079 - val_accuracy: 0.4985
Epoch 276/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5591 - accuracy:
0.7232 - val_loss: 0.8048 - val_accuracy: 0.5015
Epoch 277/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5523 - accuracy:
0.7235 - val_loss: 0.8029 - val_accuracy: 0.5046
Epoch 278/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5424 - accuracy:
0.7255 - val_loss: 0.8035 - val_accuracy: 0.5015
Epoch 279/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5560 - accuracy:
0.7155 - val_loss: 0.8005 - val_accuracy: 0.5046
Epoch 280/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5417 - accuracy:
0.7297 - val_loss: 0.7985 - val_accuracy: 0.5077
Epoch 281/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5489 - accuracy:
0.7178 - val_loss: 0.7995 - val_accuracy: 0.5077
Epoch 282/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5495 - accuracy:
0.7232 - val_loss: 0.8019 - val_accuracy: 0.5015
Epoch 283/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5435 - accuracy:
0.7216 - val_loss: 0.8083 - val_accuracy: 0.4939
Epoch 284/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5529 - accuracy:
0.7136 - val_loss: 0.8107 - val_accuracy: 0.4939
```

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Epoch 285/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5457 - accuracy:
0.7235 - val_loss: 0.8103 - val_accuracy: 0.4985
Epoch 286/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5474 - accuracy:
0.7243 - val_loss: 0.8080 - val_accuracy: 0.5000
Epoch 287/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5418 - accuracy:
0.7304 - val_loss: 0.8063 - val_accuracy: 0.5000
Epoch 288/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5509 - accuracy:
0.7147 - val_loss: 0.8011 - val_accuracy: 0.5061
Epoch 289/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5478 - accuracy:
0.7197 - val_loss: 0.7993 - val_accuracy: 0.5092
Epoch 290/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5446 - accuracy:
0.7262 - val_loss: 0.7991 - val_accuracy: 0.5092
Epoch 291/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5481 - accuracy:
0.7339 - val_loss: 0.7962 - val_accuracy: 0.5107
Epoch 292/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5456 - accuracy:
0.7205 - val_loss: 0.7978 - val_accuracy: 0.5092
Epoch 293/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5373 - accuracy:
0.7197 - val_loss: 0.8014 - val_accuracy: 0.5092
Epoch 294/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5457 - accuracy:
0.7251 - val_loss: 0.8078 - val_accuracy: 0.5015
Epoch 295/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5431 - accuracy:
0.7297 - val_loss: 0.8098 - val_accuracy: 0.5000
Epoch 296/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5476 - accuracy:
0.7228 - val_loss: 0.8119 - val_accuracy: 0.5000
Epoch 297/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5415 - accuracy:
0.7281 - val_loss: 0.8127 - val_accuracy: 0.5000
Epoch 298/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5491 - accuracy:
0.7220 - val_loss: 0.8098 - val_accuracy: 0.5000
Epoch 299/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5474 - accuracy:
0.7243 - val_loss: 0.8049 - val_accuracy: 0.5046
Epoch 300/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5417 - accuracy:
0.7331 - val_loss: 0.8047 - val_accuracy: 0.5046
Epoch 301/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5506 - accuracy:
0.7143 - val_loss: 0.8028 - val_accuracy: 0.5077
Epoch 302/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5429 - accuracy:
0.7304 - val_loss: 0.8020 - val_accuracy: 0.5046
Epoch 303/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5444 - accuracy:
0.7186 - val_loss: 0.8025 - val_accuracy: 0.5015
Epoch 304/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5490 - accuracy:
0.7228 - val_loss: 0.8027 - val_accuracy: 0.5000
Epoch 305/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5394 - accuracy:
0.7343 - val_loss: 0.8050 - val_accuracy: 0.4985
Epoch 306/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5416 - accuracy:
```

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0.7281 - val_loss: 0.8035 - val_accuracy: 0.4985
Epoch 307/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5436 - accuracy:
0.7239 - val_loss: 0.8022 - val_accuracy: 0.4985
Epoch 308/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5462 - accuracy:
0.7251 - val_loss: 0.8065 - val_accuracy: 0.4954
Epoch 309/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5448 - accuracy:
0.7247 - val_loss: 0.8047 - val_accuracy: 0.5000
Epoch 310/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5370 - accuracy:
0.7347 - val_loss: 0.8058 - val_accuracy: 0.5000
Epoch 311/1000
3/3 [==============================] - ETA: 0s - loss: 0.5365 - accuracy: 0.73 -
0s 12ms/step - loss: 0.5406 - accuracy: 0.7293 - val_loss: 0.8039 - val_accurac
y: 0.5046
Epoch 312/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5488 - accuracy:
0.7262 - val_loss: 0.7997 - val_accuracy: 0.5061
Epoch 313/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5410 - accuracy:
0.7343 - val_loss: 0.7975 - val_accuracy: 0.5077
Epoch 314/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5399 - accuracy:
0.7327 - val_loss: 0.7947 - val_accuracy: 0.5138
Epoch 315/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5366 - accuracy:
0.7362 - val_loss: 0.7945 - val_accuracy: 0.5169
Epoch 316/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5431 - accuracy:
0.7301 - val_loss: 0.7943 - val_accuracy: 0.5199
Epoch 317/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5343 - accuracy:
0.7350 - val_loss: 0.8017 - val_accuracy: 0.5123
Epoch 318/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5344 - accuracy:
0.7312 - val_loss: 0.8065 - val_accuracy: 0.5107
Epoch 319/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5426 - accuracy:
0.7209 - val_loss: 0.8124 - val_accuracy: 0.5092
Epoch 320/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5398 - accuracy:
0.7304 - val_loss: 0.8096 - val_accuracy: 0.5107
Epoch 321/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5372 - accuracy:
0.7308 - val_loss: 0.8056 - val_accuracy: 0.5107
Epoch 322/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5385 - accuracy:
0.7297 - val_loss: 0.7985 - val_accuracy: 0.5153
Epoch 323/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5327 - accuracy:
0.7320 - val_loss: 0.7891 - val_accuracy: 0.5199
Epoch 324/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5385 - accuracy:
0.7301 - val_loss: 0.7821 - val_accuracy: 0.5245
Epoch 325/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5396 - accuracy:
0.7266 - val_loss: 0.7773 - val_accuracy: 0.5291
Epoch 326/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5471 - accuracy:
0.7312 - val_loss: 0.7754 - val_accuracy: 0.5307
Epoch 327/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5373 - accuracy:
0.7354 - val_loss: 0.7771 - val_accuracy: 0.5337
```

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Epoch 328/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5298 - accuracy:
0.7400 - val_loss: 0.7903 - val_accuracy: 0.5230
Epoch 329/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5326 - accuracy:
0.7347 - val_loss: 0.7959 - val_accuracy: 0.5184
Epoch 330/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5437 - accuracy:
0.7232 - val_loss: 0.7981 - val_accuracy: 0.5184
Epoch 331/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5385 - accuracy:
0.7285 - val_loss: 0.8008 - val_accuracy: 0.5199
Epoch 332/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5316 - accuracy:
0.7320 - val_loss: 0.8054 - val_accuracy: 0.5138
Epoch 333/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5425 - accuracy:
0.7239 - val_loss: 0.8094 - val_accuracy: 0.5107
Epoch 334/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5374 - accuracy:
0.7281 - val_loss: 0.8055 - val_accuracy: 0.5123
Epoch 335/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5281 - accuracy:
0.7465 - val_loss: 0.7972 - val_accuracy: 0.5184
Epoch 336/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5360 - accuracy:
0.7381 - val_loss: 0.7903 - val_accuracy: 0.5245
Epoch 337/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5402 - accuracy:
0.7270 - val_loss: 0.7875 - val_accuracy: 0.5276
Epoch 338/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5419 - accuracy:
0.7228 - val_loss: 0.7913 - val_accuracy: 0.5261
Epoch 339/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5348 - accuracy:
0.7274 - val_loss: 0.7971 - val_accuracy: 0.5184
Epoch 340/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5430 - accuracy:
0.7239 - val_loss: 0.8063 - val_accuracy: 0.5107
Epoch 341/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5346 - accuracy:
0.7316 - val_loss: 0.8116 - val_accuracy: 0.5092
Epoch 342/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5355 - accuracy:
0.7327 - val_loss: 0.8112 - val_accuracy: 0.5077
Epoch 343/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5395 - accuracy:
0.7320 - val_loss: 0.8086 - val_accuracy: 0.5107
Epoch 344/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5398 - accuracy:
0.7220 - val_loss: 0.8053 - val_accuracy: 0.5138
Epoch 345/1000
3/3 [==============================] - 0s 13ms/step - loss: 0.5449 - accuracy:
0.7255 - val_loss: 0.8004 - val_accuracy: 0.5169
Epoch 346/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5406 - accuracy:
0.7209 - val_loss: 0.7975 - val_accuracy: 0.5169
Epoch 347/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5434 - accuracy:
0.7304 - val_loss: 0.7961 - val_accuracy: 0.5169
Epoch 348/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5441 - accuracy:
0.7278 - val_loss: 0.8001 - val_accuracy: 0.5153
Epoch 349/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5339 - accuracy:
```

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0.7343 - val_loss: 0.8031 - val_accuracy: 0.5123
Epoch 350/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5414 - accuracy:
0.7228 - val_loss: 0.8033 - val_accuracy: 0.5123
Epoch 351/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5371 - accuracy:
0.7297 - val_loss: 0.8052 - val_accuracy: 0.5077
Epoch 352/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5404 - accuracy:
0.7316 - val_loss: 0.8039 - val_accuracy: 0.5092
Epoch 353/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5343 - accuracy:
0.7373 - val_loss: 0.8003 - val_accuracy: 0.5138
Epoch 354/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5331 - accuracy:
0.7293 - val_loss: 0.7988 - val_accuracy: 0.5138
Epoch 355/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5334 - accuracy:
0.7362 - val_loss: 0.7941 - val_accuracy: 0.5215
Epoch 356/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5378 - accuracy:
0.7304 - val_loss: 0.7929 - val_accuracy: 0.5261
Epoch 357/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5396 - accuracy:
0.7301 - val_loss: 0.7917 - val_accuracy: 0.5261
Epoch 358/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5285 - accuracy:
0.7396 - val_loss: 0.7932 - val_accuracy: 0.5230
Epoch 359/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5298 - accuracy:
0.7381 - val_loss: 0.7937 - val_accuracy: 0.5215
Epoch 360/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5414 - accuracy:
0.7251 - val_loss: 0.7963 - val_accuracy: 0.5169
Epoch 361/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5333 - accuracy:
0.7366 - val_loss: 0.7969 - val_accuracy: 0.5138
Epoch 362/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5316 - accuracy:
0.7358 - val_loss: 0.8001 - val_accuracy: 0.5123
Epoch 363/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5299 - accuracy:
0.7339 - val_loss: 0.8021 - val_accuracy: 0.5123
Epoch 364/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5326 - accuracy:
0.7354 - val_loss: 0.8048 - val_accuracy: 0.5107
Epoch 365/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5398 - accuracy:
0.7216 - val_loss: 0.8069 - val_accuracy: 0.5092
Epoch 366/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5327 - accuracy:
0.7370 - val_loss: 0.8047 - val_accuracy: 0.5092
Epoch 367/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5341 - accuracy:
0.7331 - val_loss: 0.7981 - val_accuracy: 0.5153
Epoch 368/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5383 - accuracy:
0.7281 - val_loss: 0.7885 - val_accuracy: 0.5199
Epoch 369/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5260 - accuracy:
0.7389 - val_loss: 0.7828 - val_accuracy: 0.5245
Epoch 370/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5296 - accuracy:
0.7347 - val_loss: 0.7831 - val_accuracy: 0.5276
Epoch 371/1000
```

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3/3 [==============================] - 0s 12ms/step - loss: 0.5283 - accuracy:
0.7416 - val_loss: 0.7875 - val_accuracy: 0.5245
Epoch 372/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5316 - accuracy:
0.7308 - val_loss: 0.7890 - val_accuracy: 0.5230
Epoch 373/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5307 - accuracy:
0.7316 - val_loss: 0.7936 - val_accuracy: 0.5215
Epoch 374/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5362 - accuracy:
0.7251 - val_loss: 0.7996 - val_accuracy: 0.5169
Epoch 375/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5312 - accuracy:
0.7304 - val_loss: 0.8052 - val_accuracy: 0.5138
Epoch 376/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5274 - accuracy:
0.7377 - val_loss: 0.8101 - val_accuracy: 0.5123
Epoch 377/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5265 - accuracy:
0.7350 - val_loss: 0.8105 - val_accuracy: 0.5123
Epoch 378/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5317 - accuracy:
0.7354 - val_loss: 0.8088 - val_accuracy: 0.5123
Epoch 379/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5327 - accuracy:
0.7324 - val_loss: 0.8054 - val_accuracy: 0.5153
Epoch 380/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5283 - accuracy:
0.7316 - val_loss: 0.7990 - val_accuracy: 0.5169
Epoch 381/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5279 - accuracy:
0.7289 - val_loss: 0.7967 - val_accuracy: 0.5184
Epoch 382/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5362 - accuracy:
0.7289 - val_loss: 0.7880 - val_accuracy: 0.5245
Epoch 383/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5262 - accuracy:
0.7377 - val_loss: 0.7829 - val_accuracy: 0.5276
Epoch 384/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5327 - accuracy:
0.7347 - val_loss: 0.7798 - val_accuracy: 0.5337
Epoch 385/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5300 - accuracy:
0.7396 - val_loss: 0.7748 - val_accuracy: 0.5353
Epoch 386/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5302 - accuracy:
0.7435 - val_loss: 0.7790 - val_accuracy: 0.5353
Epoch 387/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5290 - accuracy:
0.7377 - val_loss: 0.7830 - val_accuracy: 0.5337
Epoch 388/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5324 - accuracy:
0.7320 - val_loss: 0.7862 - val_accuracy: 0.5322
Epoch 389/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5278 - accuracy:
0.7381 - val_loss: 0.7873 - val_accuracy: 0.5307
Epoch 390/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5248 - accuracy:
0.7347 - val_loss: 0.7927 - val_accuracy: 0.5261
Epoch 391/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5250 - accuracy:
0.7393 - val_loss: 0.7914 - val_accuracy: 0.5230
Epoch 392/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5297 - accuracy:
0.7335 - val_loss: 0.7891 - val_accuracy: 0.5215
```

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Epoch 393/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5439 - accuracy:
0.7216 - val_loss: 0.7866 - val_accuracy: 0.5245
Epoch 394/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5266 - accuracy:
0.7381 - val_loss: 0.7807 - val_accuracy: 0.5291
Epoch 395/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5272 - accuracy:
0.7281 - val_loss: 0.7800 - val_accuracy: 0.5291
Epoch 396/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5280 - accuracy:
0.7331 - val_loss: 0.7809 - val_accuracy: 0.5245
Epoch 397/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5252 - accuracy:
0.7439 - val_loss: 0.7798 - val_accuracy: 0.5261
Epoch 398/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5287 - accuracy:
0.7335 - val_loss: 0.7856 - val_accuracy: 0.5245
Epoch 399/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5272 - accuracy:
0.7373 - val_loss: 0.7939 - val_accuracy: 0.5199
Epoch 400/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5289 - accuracy:
0.7373 - val_loss: 0.8008 - val_accuracy: 0.5169
Epoch 401/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5265 - accuracy:
0.7404 - val_loss: 0.8041 - val_accuracy: 0.5153
Epoch 402/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5116 - accuracy:
0.7515 - val_loss: 0.8040 - val_accuracy: 0.5169
Epoch 403/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5235 - accuracy:
0.7377 - val_loss: 0.7999 - val_accuracy: 0.5230
Epoch 404/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5248 - accuracy:
0.7381 - val_loss: 0.7908 - val_accuracy: 0.5245
Epoch 405/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5264 - accuracy:
0.7362 - val_loss: 0.7861 - val_accuracy: 0.5261
Epoch 406/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5259 - accuracy:
0.7347 - val_loss: 0.7817 - val_accuracy: 0.5291
Epoch 407/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5269 - accuracy:
0.7396 - val_loss: 0.7829 - val_accuracy: 0.5276
Epoch 408/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5307 - accuracy:
0.7423 - val_loss: 0.7897 - val_accuracy: 0.5230
Epoch 409/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5282 - accuracy:
0.7312 - val_loss: 0.7969 - val_accuracy: 0.5184
Epoch 410/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5331 - accuracy:
0.7347 - val_loss: 0.8020 - val_accuracy: 0.5169
Epoch 411/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5272 - accuracy:
0.7400 - val_loss: 0.7981 - val_accuracy: 0.5153
Epoch 412/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5252 - accuracy:
0.7393 - val_loss: 0.7932 - val_accuracy: 0.5169
Epoch 413/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5233 - accuracy:
0.7385 - val_loss: 0.7893 - val_accuracy: 0.5184
Epoch 414/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5237 - accuracy:
```

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0.7373 - val_loss: 0.7858 - val_accuracy: 0.5199
Epoch 415/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5272 - accuracy:
0.7396 - val_loss: 0.7815 - val_accuracy: 0.5199
Epoch 416/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5286 - accuracy:
0.7347 - val_loss: 0.7769 - val_accuracy: 0.5215
Epoch 417/1000
3/3 [==============================] - 0s 13ms/step - loss: 0.5307 - accuracy:
0.7304 - val_loss: 0.7793 - val_accuracy: 0.5199
Epoch 418/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5276 - accuracy:
0.7412 - val_loss: 0.7832 - val_accuracy: 0.5184
Epoch 419/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5294 - accuracy:
0.7304 - val_loss: 0.7848 - val_accuracy: 0.5169
Epoch 420/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5352 - accuracy:
0.7301 - val_loss: 0.7799 - val_accuracy: 0.5184
Epoch 421/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5371 - accuracy:
0.7312 - val_loss: 0.7764 - val_accuracy: 0.5184
Epoch 422/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5195 - accuracy:
0.7350 - val_loss: 0.7775 - val_accuracy: 0.5184
Epoch 423/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5223 - accuracy:
0.7370 - val_loss: 0.7825 - val_accuracy: 0.5199
Epoch 424/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5246 - accuracy:
0.7281 - val_loss: 0.7848 - val_accuracy: 0.5215
Epoch 425/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5246 - accuracy:
0.7343 - val_loss: 0.7898 - val_accuracy: 0.5199
Epoch 426/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5229 - accuracy:
0.7350 - val_loss: 0.7889 - val_accuracy: 0.5199
Epoch 427/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5237 - accuracy:
0.7366 - val_loss: 0.7841 - val_accuracy: 0.5215
Epoch 428/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5255 - accuracy:
0.7304 - val_loss: 0.7808 - val_accuracy: 0.5245
Epoch 429/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5183 - accuracy:
0.7431 - val_loss: 0.7848 - val_accuracy: 0.5230
Epoch 430/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5245 - accuracy:
0.7362 - val_loss: 0.7858 - val_accuracy: 0.5230
Epoch 431/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5182 - accuracy:
0.7462 - val_loss: 0.7899 - val_accuracy: 0.5230
Epoch 432/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5165 - accuracy:
0.7450 - val_loss: 0.7879 - val_accuracy: 0.5245
Epoch 433/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5176 - accuracy:
0.7393 - val_loss: 0.7823 - val_accuracy: 0.5291
Epoch 434/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5206 - accuracy:
0.7450 - val_loss: 0.7806 - val_accuracy: 0.5307
Epoch 435/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5230 - accuracy:
0.7377 - val_loss: 0.7852 - val_accuracy: 0.5291
Epoch 436/1000
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3/3 [==============================] - 0s 12ms/step - loss: 0.5235 - accuracy:
0.7362 - val_loss: 0.7925 - val_accuracy: 0.5245
Epoch 437/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5264 - accuracy:
0.7458 - val_loss: 0.7980 - val_accuracy: 0.5230
Epoch 438/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5254 - accuracy:
0.7358 - val_loss: 0.7997 - val_accuracy: 0.5199
Epoch 439/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5145 - accuracy:
0.7515 - val_loss: 0.7936 - val_accuracy: 0.5215
Epoch 440/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5143 - accuracy:
0.7450 - val_loss: 0.7848 - val_accuracy: 0.5276
Epoch 441/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5193 - accuracy:
0.7396 - val_loss: 0.7772 - val_accuracy: 0.5322
Epoch 442/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5203 - accuracy:
0.7408 - val_loss: 0.7704 - val_accuracy: 0.5414
Epoch 443/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5208 - accuracy:
0.7393 - val_loss: 0.7692 - val_accuracy: 0.5414
Epoch 444/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5259 - accuracy:
0.7381 - val_loss: 0.7698 - val_accuracy: 0.5414
Epoch 445/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5249 - accuracy:
0.7308 - val_loss: 0.7749 - val_accuracy: 0.5368
Epoch 446/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5203 - accuracy:
0.7389 - val_loss: 0.7788 - val_accuracy: 0.5368
Epoch 447/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5179 - accuracy:
0.7504 - val_loss: 0.7880 - val_accuracy: 0.5291
Epoch 448/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5221 - accuracy:
0.7450 - val_loss: 0.7881 - val_accuracy: 0.5307
Epoch 449/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5141 - accuracy:
0.7446 - val_loss: 0.7830 - val_accuracy: 0.5337
Epoch 450/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5189 - accuracy:
0.7412 - val_loss: 0.7772 - val_accuracy: 0.5368
Epoch 451/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5253 - accuracy:
0.7381 - val_loss: 0.7798 - val_accuracy: 0.5353
Epoch 452/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5298 - accuracy:
0.7385 - val_loss: 0.7768 - val_accuracy: 0.5368
Epoch 453/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5195 - accuracy:
0.7312 - val_loss: 0.7728 - val_accuracy: 0.5368
Epoch 454/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5190 - accuracy:
0.7542 - val_loss: 0.7698 - val_accuracy: 0.5368
Epoch 455/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5143 - accuracy:
0.7469 - val_loss: 0.7749 - val_accuracy: 0.5353
Epoch 456/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5187 - accuracy:
0.7400 - val_loss: 0.7808 - val_accuracy: 0.5337
Epoch 457/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5205 - accuracy:
0.7492 - val_loss: 0.7841 - val_accuracy: 0.5337
```

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Epoch 458/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5247 - accuracy:
0.7373 - val_loss: 0.7791 - val_accuracy: 0.5337
Epoch 459/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5186 - accuracy:
0.7458 - val_loss: 0.7745 - val_accuracy: 0.5399
Epoch 460/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5097 - accuracy:
0.7515 - val_loss: 0.7760 - val_accuracy: 0.5399
Epoch 461/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5139 - accuracy:
0.7431 - val_loss: 0.7750 - val_accuracy: 0.5399
Epoch 462/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5160 - accuracy:
0.7454 - val_loss: 0.7759 - val_accuracy: 0.5429
Epoch 463/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5190 - accuracy:
0.7462 - val_loss: 0.7790 - val_accuracy: 0.5383
Epoch 464/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5209 - accuracy:
0.7427 - val_loss: 0.7807 - val_accuracy: 0.5414
Epoch 465/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5114 - accuracy:
0.7469 - val_loss: 0.7822 - val_accuracy: 0.5353
Epoch 466/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5205 - accuracy:
0.7347 - val_loss: 0.7825 - val_accuracy: 0.5368
Epoch 467/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5075 - accuracy:
0.7538 - val_loss: 0.7771 - val_accuracy: 0.5414
Epoch 468/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5280 - accuracy:
0.7301 - val_loss: 0.7696 - val_accuracy: 0.5445
Epoch 469/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5154 - accuracy:
0.7462 - val_loss: 0.7572 - val_accuracy: 0.5521
Epoch 470/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5244 - accuracy:
0.7358 - val_loss: 0.7549 - val_accuracy: 0.5567
Epoch 471/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5184 - accuracy:
0.7485 - val_loss: 0.7587 - val_accuracy: 0.5521
Epoch 472/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5161 - accuracy:
0.7542 - val_loss: 0.7683 - val_accuracy: 0.5491
Epoch 473/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5096 - accuracy:
0.7477 - val_loss: 0.7788 - val_accuracy: 0.5445
Epoch 474/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5177 - accuracy:
0.7385 - val_loss: 0.7806 - val_accuracy: 0.5445
Epoch 475/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5194 - accuracy:
0.7358 - val_loss: 0.7736 - val_accuracy: 0.5491
Epoch 476/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5101 - accuracy:
0.7469 - val_loss: 0.7689 - val_accuracy: 0.5521
Epoch 477/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5176 - accuracy:
0.7450 - val_loss: 0.7640 - val_accuracy: 0.5583
Epoch 478/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5225 - accuracy:
0.7400 - val_loss: 0.7600 - val_accuracy: 0.5583
Epoch 479/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5155 - accuracy:
```

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0.7423 - val_loss: 0.7606 - val_accuracy: 0.5567
Epoch 480/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5135 - accuracy:
0.7496 - val_loss: 0.7611 - val_accuracy: 0.5552
Epoch 481/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5110 - accuracy:
0.7427 - val_loss: 0.7668 - val_accuracy: 0.5491
Epoch 482/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5122 - accuracy:
0.7435 - val_loss: 0.7706 - val_accuracy: 0.5475
Epoch 483/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5133 - accuracy:
0.7385 - val_loss: 0.7723 - val_accuracy: 0.5460
Epoch 484/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5186 - accuracy:
0.7416 - val_loss: 0.7742 - val_accuracy: 0.5460
Epoch 485/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5107 - accuracy:
0.7431 - val_loss: 0.7723 - val_accuracy: 0.5460
Epoch 486/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5178 - accuracy:
0.7396 - val_loss: 0.7722 - val_accuracy: 0.5460
Epoch 487/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5151 - accuracy:
0.7431 - val_loss: 0.7757 - val_accuracy: 0.5429
Epoch 488/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5156 - accuracy:
0.7419 - val_loss: 0.7713 - val_accuracy: 0.5460
Epoch 489/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5120 - accuracy:
0.7477 - val_loss: 0.7645 - val_accuracy: 0.5491
Epoch 490/1000
3/3 [==============================] - 0s 14ms/step - loss: 0.5130 - accuracy:
0.7473 - val_loss: 0.7609 - val_accuracy: 0.5506
Epoch 491/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5106 - accuracy:
0.7416 - val_loss: 0.7612 - val_accuracy: 0.5521
Epoch 492/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5178 - accuracy:
0.7454 - val_loss: 0.7664 - val_accuracy: 0.5537
Epoch 493/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5187 - accuracy:
0.7473 - val_loss: 0.7712 - val_accuracy: 0.5506
Epoch 494/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5096 - accuracy:
0.7308 - val_loss: 0.7743 - val_accuracy: 0.5445
Epoch 495/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5130 - accuracy:
0.7492 - val_loss: 0.7720 - val_accuracy: 0.5445
Epoch 496/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5133 - accuracy:
0.7442 - val_loss: 0.7670 - val_accuracy: 0.5491
Epoch 497/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5054 - accuracy:
0.7450 - val_loss: 0.7665 - val_accuracy: 0.5491
Epoch 498/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5191 - accuracy:
0.7446 - val_loss: 0.7709 - val_accuracy: 0.5475
Epoch 499/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5117 - accuracy:
0.7458 - val_loss: 0.7768 - val_accuracy: 0.5383
Epoch 500/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5176 - accuracy:
0.7538 - val_loss: 0.7782 - val_accuracy: 0.5368
Epoch 501/1000
```

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3/3 [==============================] - 0s 12ms/step - loss: 0.5110 - accuracy:
0.7462 - val_loss: 0.7762 - val_accuracy: 0.5399
Epoch 502/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5219 - accuracy:
0.7419 - val_loss: 0.7766 - val_accuracy: 0.5368
Epoch 503/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5093 - accuracy:
0.7492 - val_loss: 0.7699 - val_accuracy: 0.5399
Epoch 504/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4990 - accuracy:
0.7584 - val_loss: 0.7680 - val_accuracy: 0.5429
Epoch 505/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5158 - accuracy:
0.7477 - val_loss: 0.7675 - val_accuracy: 0.5445
Epoch 506/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5095 - accuracy:
0.7485 - val_loss: 0.7684 - val_accuracy: 0.5429
Epoch 507/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5115 - accuracy:
0.7504 - val_loss: 0.7678 - val_accuracy: 0.5429
Epoch 508/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5141 - accuracy:
0.7477 - val_loss: 0.7728 - val_accuracy: 0.5414
Epoch 509/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5160 - accuracy:
0.7408 - val_loss: 0.7770 - val_accuracy: 0.5368
Epoch 510/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5184 - accuracy:
0.7370 - val_loss: 0.7750 - val_accuracy: 0.5368
Epoch 511/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5130 - accuracy:
0.7442 - val_loss: 0.7697 - val_accuracy: 0.5399
Epoch 512/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5149 - accuracy:
0.7408 - val_loss: 0.7636 - val_accuracy: 0.5429
Epoch 513/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5059 - accuracy:
0.7527 - val_loss: 0.7625 - val_accuracy: 0.5445
Epoch 514/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5128 - accuracy:
0.7492 - val_loss: 0.7620 - val_accuracy: 0.5429
Epoch 515/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5133 - accuracy:
0.7500 - val_loss: 0.7651 - val_accuracy: 0.5429
Epoch 516/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5111 - accuracy:
0.7450 - val_loss: 0.7636 - val_accuracy: 0.5460
Epoch 517/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5162 - accuracy:
0.7442 - val_loss: 0.7600 - val_accuracy: 0.5491
Epoch 518/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5045 - accuracy:
0.7554 - val_loss: 0.7566 - val_accuracy: 0.5552
Epoch 519/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5103 - accuracy:
0.7458 - val_loss: 0.7578 - val_accuracy: 0.5567
Epoch 520/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5132 - accuracy:
0.7427 - val_loss: 0.7628 - val_accuracy: 0.5521
Epoch 521/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5085 - accuracy:
0.7546 - val_loss: 0.7662 - val_accuracy: 0.5506
Epoch 522/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5080 - accuracy:
0.7450 - val_loss: 0.7668 - val_accuracy: 0.5491
```

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Epoch 523/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5082 - accuracy:
0.7550 - val_loss: 0.7642 - val_accuracy: 0.5506
Epoch 524/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5147 - accuracy:
0.7477 - val_loss: 0.7648 - val_accuracy: 0.5491
Epoch 525/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5107 - accuracy:
0.7508 - val_loss: 0.7572 - val_accuracy: 0.5521
Epoch 526/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5004 - accuracy:
0.7581 - val_loss: 0.7512 - val_accuracy: 0.5552
Epoch 527/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5131 - accuracy:
0.7442 - val_loss: 0.7498 - val_accuracy: 0.5537
Epoch 528/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5154 - accuracy:
0.7512 - val_loss: 0.7503 - val_accuracy: 0.5537
Epoch 529/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5087 - accuracy:
0.7446 - val_loss: 0.7538 - val_accuracy: 0.5506
Epoch 530/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5135 - accuracy:
0.7427 - val_loss: 0.7608 - val_accuracy: 0.5506
Epoch 531/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5073 - accuracy:
0.7477 - val_loss: 0.7640 - val_accuracy: 0.5506
Epoch 532/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5074 - accuracy:
0.7604 - val_loss: 0.7671 - val_accuracy: 0.5491
Epoch 533/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5017 - accuracy:
0.7554 - val_loss: 0.7675 - val_accuracy: 0.5491
Epoch 534/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5092 - accuracy:
0.7454 - val_loss: 0.7643 - val_accuracy: 0.5475
Epoch 535/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5022 - accuracy:
0.7504 - val_loss: 0.7573 - val_accuracy: 0.5537
Epoch 536/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5076 - accuracy:
0.7454 - val_loss: 0.7522 - val_accuracy: 0.5567
Epoch 537/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5092 - accuracy:
0.7442 - val_loss: 0.7497 - val_accuracy: 0.5567
Epoch 538/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5029 - accuracy:
0.7550 - val_loss: 0.7492 - val_accuracy: 0.5552
Epoch 539/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5134 - accuracy:
0.7496 - val_loss: 0.7537 - val_accuracy: 0.5537
Epoch 540/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5037 - accuracy:
0.7523 - val_loss: 0.7620 - val_accuracy: 0.5521
Epoch 541/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5065 - accuracy:
0.7508 - val_loss: 0.7685 - val_accuracy: 0.5475
Epoch 542/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5102 - accuracy:
0.7492 - val_loss: 0.7744 - val_accuracy: 0.5429
Epoch 543/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5120 - accuracy:
0.7469 - val_loss: 0.7821 - val_accuracy: 0.5322
Epoch 544/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5128 - accuracy:
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0.7504 - val_loss: 0.7808 - val_accuracy: 0.5322
Epoch 545/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4996 - accuracy:
0.7558 - val_loss: 0.7785 - val_accuracy: 0.5307
Epoch 546/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5027 - accuracy:
0.7546 - val_loss: 0.7697 - val_accuracy: 0.5429
Epoch 547/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5036 - accuracy:
0.7554 - val_loss: 0.7571 - val_accuracy: 0.5552
Epoch 548/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5143 - accuracy:
0.7481 - val_loss: 0.7503 - val_accuracy: 0.5583
Epoch 549/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5027 - accuracy:
0.7611 - val_loss: 0.7513 - val_accuracy: 0.5583
Epoch 550/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4946 - accuracy:
0.7565 - val_loss: 0.7561 - val_accuracy: 0.5567
Epoch 551/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5054 - accuracy:
0.7427 - val_loss: 0.7599 - val_accuracy: 0.5567
Epoch 552/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5004 - accuracy:
0.7569 - val_loss: 0.7624 - val_accuracy: 0.5567
Epoch 553/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5127 - accuracy:
0.7512 - val_loss: 0.7659 - val_accuracy: 0.5491
Epoch 554/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5077 - accuracy:
0.7465 - val_loss: 0.7661 - val_accuracy: 0.5475
Epoch 555/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5018 - accuracy:
0.7500 - val_loss: 0.7673 - val_accuracy: 0.5460
Epoch 556/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4976 - accuracy:
0.7527 - val_loss: 0.7694 - val_accuracy: 0.5475
Epoch 557/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5130 - accuracy:
0.7485 - val_loss: 0.7678 - val_accuracy: 0.5491
Epoch 558/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5104 - accuracy:
0.7596 - val_loss: 0.7640 - val_accuracy: 0.5506
Epoch 559/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5053 - accuracy:
0.7519 - val_loss: 0.7613 - val_accuracy: 0.5521
Epoch 560/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5041 - accuracy:
0.7550 - val_loss: 0.7608 - val_accuracy: 0.5506
Epoch 561/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5056 - accuracy:
0.7512 - val_loss: 0.7609 - val_accuracy: 0.5506
Epoch 562/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5142 - accuracy:
0.7527 - val_loss: 0.7585 - val_accuracy: 0.5506
Epoch 563/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5053 - accuracy:
0.7558 - val_loss: 0.7587 - val_accuracy: 0.5506
Epoch 564/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5064 - accuracy:
0.7504 - val_loss: 0.7601 - val_accuracy: 0.5506
Epoch 565/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5113 - accuracy:
0.7427 - val_loss: 0.7582 - val_accuracy: 0.5537
Epoch 566/1000
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3/3 [==============================] - 0s 11ms/step - loss: 0.5070 - accuracy:
0.7462 - val_loss: 0.7649 - val_accuracy: 0.5460
Epoch 567/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5166 - accuracy:
0.7496 - val_loss: 0.7707 - val_accuracy: 0.5414
Epoch 568/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5080 - accuracy:
0.7523 - val_loss: 0.7741 - val_accuracy: 0.5399
Epoch 569/1000
3/3 [==============================] - 0s 14ms/step - loss: 0.4895 - accuracy:
0.7669 - val_loss: 0.7713 - val_accuracy: 0.5399
Epoch 570/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5082 - accuracy:
0.7508 - val_loss: 0.7643 - val_accuracy: 0.5491
Epoch 571/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5056 - accuracy:
0.7500 - val_loss: 0.7499 - val_accuracy: 0.5598
Epoch 572/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5029 - accuracy:
0.7565 - val_loss: 0.7423 - val_accuracy: 0.5644
Epoch 573/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5042 - accuracy:
0.7500 - val_loss: 0.7402 - val_accuracy: 0.5644
Epoch 574/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5024 - accuracy:
0.7542 - val_loss: 0.7463 - val_accuracy: 0.5629
Epoch 575/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5073 - accuracy:
0.7523 - val_loss: 0.7494 - val_accuracy: 0.5613
Epoch 576/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5109 - accuracy:
0.7473 - val_loss: 0.7501 - val_accuracy: 0.5613
Epoch 577/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5025 - accuracy:
0.7596 - val_loss: 0.7531 - val_accuracy: 0.5583
Epoch 578/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5038 - accuracy:
0.7531 - val_loss: 0.7546 - val_accuracy: 0.5567
Epoch 579/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5036 - accuracy:
0.7550 - val_loss: 0.7539 - val_accuracy: 0.5583
Epoch 580/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5019 - accuracy:
0.7519 - val_loss: 0.7503 - val_accuracy: 0.5598
Epoch 581/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5087 - accuracy:
0.7500 - val_loss: 0.7457 - val_accuracy: 0.5660
Epoch 582/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5030 - accuracy:
0.7581 - val_loss: 0.7401 - val_accuracy: 0.5675
Epoch 583/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5025 - accuracy:
0.7450 - val_loss: 0.7439 - val_accuracy: 0.5660
Epoch 584/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5115 - accuracy:
0.7477 - val_loss: 0.7459 - val_accuracy: 0.5644
Epoch 585/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5028 - accuracy:
0.7561 - val_loss: 0.7536 - val_accuracy: 0.5598
Epoch 586/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5073 - accuracy:
0.7527 - val_loss: 0.7603 - val_accuracy: 0.5537
Epoch 587/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5042 - accuracy:
0.7531 - val_loss: 0.7596 - val_accuracy: 0.5521
```

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Epoch 588/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4998 - accuracy:
0.7569 - val_loss: 0.7546 - val_accuracy: 0.5567
Epoch 589/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5088 - accuracy:
0.7558 - val_loss: 0.7483 - val_accuracy: 0.5552
Epoch 590/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5086 - accuracy:
0.7439 - val_loss: 0.7466 - val_accuracy: 0.5598
Epoch 591/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5001 - accuracy:
0.7546 - val_loss: 0.7431 - val_accuracy: 0.5583
Epoch 592/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5077 - accuracy:
0.7523 - val_loss: 0.7434 - val_accuracy: 0.5583
Epoch 593/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5072 - accuracy:
0.7558 - val_loss: 0.7426 - val_accuracy: 0.5552
Epoch 594/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5029 - accuracy:
0.7473 - val_loss: 0.7449 - val_accuracy: 0.5521
Epoch 595/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4994 - accuracy:
0.7623 - val_loss: 0.7461 - val_accuracy: 0.5521
Epoch 596/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5003 - accuracy:
0.7573 - val_loss: 0.7522 - val_accuracy: 0.5491
Epoch 597/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5040 - accuracy:
0.7619 - val_loss: 0.7564 - val_accuracy: 0.5475
Epoch 598/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5069 - accuracy:
0.7431 - val_loss: 0.7548 - val_accuracy: 0.5521
Epoch 599/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5046 - accuracy:
0.7462 - val_loss: 0.7516 - val_accuracy: 0.5537
Epoch 600/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4954 - accuracy:
0.7573 - val_loss: 0.7501 - val_accuracy: 0.5521
Epoch 601/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5107 - accuracy:
0.7465 - val_loss: 0.7492 - val_accuracy: 0.5521
Epoch 602/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5006 - accuracy:
0.7523 - val_loss: 0.7522 - val_accuracy: 0.5521
Epoch 603/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4996 - accuracy:
0.7561 - val_loss: 0.7497 - val_accuracy: 0.5521
Epoch 604/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5077 - accuracy:
0.7485 - val_loss: 0.7477 - val_accuracy: 0.5552
Epoch 605/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5073 - accuracy:
0.7535 - val_loss: 0.7493 - val_accuracy: 0.5552
Epoch 606/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5073 - accuracy:
0.7558 - val_loss: 0.7493 - val_accuracy: 0.5552
Epoch 607/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5012 - accuracy:
0.7550 - val_loss: 0.7537 - val_accuracy: 0.5475
Epoch 608/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5032 - accuracy:
0.7634 - val_loss: 0.7526 - val_accuracy: 0.5491
Epoch 609/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4954 - accuracy:
```

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0.7550 - val_loss: 0.7546 - val_accuracy: 0.5506
Epoch 610/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5006 - accuracy:
0.7561 - val_loss: 0.7533 - val_accuracy: 0.5537
Epoch 611/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4897 - accuracy:
0.7596 - val_loss: 0.7477 - val_accuracy: 0.5583
Epoch 612/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4947 - accuracy:
0.7619 - val_loss: 0.7434 - val_accuracy: 0.5613
Epoch 613/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5051 - accuracy:
0.7481 - val_loss: 0.7399 - val_accuracy: 0.5644
Epoch 614/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4974 - accuracy:
0.7627 - val_loss: 0.7416 - val_accuracy: 0.5660
Epoch 615/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4981 - accuracy:
0.7584 - val_loss: 0.7421 - val_accuracy: 0.5675
Epoch 616/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4984 - accuracy:
0.7596 - val_loss: 0.7371 - val_accuracy: 0.5675
Epoch 617/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5017 - accuracy:
0.7488 - val_loss: 0.7336 - val_accuracy: 0.5706
Epoch 618/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5056 - accuracy:
0.7496 - val_loss: 0.7324 - val_accuracy: 0.5721
Epoch 619/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5055 - accuracy:
0.7569 - val_loss: 0.7358 - val_accuracy: 0.5690
Epoch 620/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4963 - accuracy:
0.7573 - val_loss: 0.7440 - val_accuracy: 0.5660
Epoch 621/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4969 - accuracy:
0.7642 - val_loss: 0.7487 - val_accuracy: 0.5629
Epoch 622/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5020 - accuracy:
0.7546 - val_loss: 0.7458 - val_accuracy: 0.5660
Epoch 623/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5001 - accuracy:
0.7535 - val_loss: 0.7426 - val_accuracy: 0.5690
Epoch 624/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5025 - accuracy:
0.7619 - val_loss: 0.7385 - val_accuracy: 0.5706
Epoch 625/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4924 - accuracy:
0.7546 - val_loss: 0.7423 - val_accuracy: 0.5644
Epoch 626/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4973 - accuracy:
0.7600 - val_loss: 0.7473 - val_accuracy: 0.5629
Epoch 627/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4980 - accuracy:
0.7558 - val_loss: 0.7489 - val_accuracy: 0.5598
Epoch 628/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5008 - accuracy:
0.7592 - val_loss: 0.7429 - val_accuracy: 0.5613
Epoch 629/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4997 - accuracy:
0.7496 - val_loss: 0.7415 - val_accuracy: 0.5598
Epoch 630/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5024 - accuracy:
0.7485 - val_loss: 0.7410 - val_accuracy: 0.5598
Epoch 631/1000
```

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3/3 [==============================] - 0s 11ms/step - loss: 0.4965 - accuracy:
0.7550 - val_loss: 0.7367 - val_accuracy: 0.5644
Epoch 632/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4993 - accuracy:
0.7508 - val_loss: 0.7354 - val_accuracy: 0.5675
Epoch 633/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4951 - accuracy:
0.7569 - val_loss: 0.7349 - val_accuracy: 0.5675
Epoch 634/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4969 - accuracy:
0.7569 - val_loss: 0.7350 - val_accuracy: 0.5675
Epoch 635/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4950 - accuracy:
0.7538 - val_loss: 0.7395 - val_accuracy: 0.5675
Epoch 636/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4959 - accuracy:
0.7527 - val_loss: 0.7424 - val_accuracy: 0.5644
Epoch 637/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4992 - accuracy:
0.7512 - val_loss: 0.7434 - val_accuracy: 0.5629
Epoch 638/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.5008 - accuracy:
0.7496 - val_loss: 0.7447 - val_accuracy: 0.5629
Epoch 639/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4987 - accuracy:
0.7554 - val_loss: 0.7380 - val_accuracy: 0.5660
Epoch 640/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5020 - accuracy:
0.7488 - val_loss: 0.7318 - val_accuracy: 0.5675
Epoch 641/1000
3/3 [==============================] - ETA: 0s - loss: 0.5054 - accuracy: 0.75 -
0s 11ms/step - loss: 0.4962 - accuracy: 0.7611 - val_loss: 0.7362 - val_accurac
y: 0.5644
Epoch 642/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4969 - accuracy:
0.7508 - val_loss: 0.7388 - val_accuracy: 0.5613
Epoch 643/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4950 - accuracy:
0.7569 - val_loss: 0.7406 - val_accuracy: 0.5613
Epoch 644/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4888 - accuracy:
0.7707 - val_loss: 0.7439 - val_accuracy: 0.5613
Epoch 645/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4938 - accuracy:
0.7596 - val_loss: 0.7503 - val_accuracy: 0.5613
Epoch 646/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4990 - accuracy:
0.7527 - val_loss: 0.7545 - val_accuracy: 0.5567
Epoch 647/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4922 - accuracy:
0.7650 - val_loss: 0.7537 - val_accuracy: 0.5567
Epoch 648/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4915 - accuracy:
0.7604 - val_loss: 0.7447 - val_accuracy: 0.5613
Epoch 649/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4944 - accuracy:
0.7619 - val_loss: 0.7391 - val_accuracy: 0.5660
Epoch 650/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4954 - accuracy:
0.7500 - val_loss: 0.7256 - val_accuracy: 0.5782
Epoch 651/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4861 - accuracy:
0.7722 - val_loss: 0.7198 - val_accuracy: 0.5828
Epoch 652/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4853 - accuracy:
```

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0.7607 - val_loss: 0.7210 - val_accuracy: 0.5813
Epoch 653/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4933 - accuracy:
0.7561 - val_loss: 0.7243 - val_accuracy: 0.5798
Epoch 654/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4989 - accuracy:
0.7604 - val_loss: 0.7309 - val_accuracy: 0.5767
Epoch 655/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4971 - accuracy:
0.7535 - val_loss: 0.7352 - val_accuracy: 0.5706
Epoch 656/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4968 - accuracy:
0.7527 - val_loss: 0.7383 - val_accuracy: 0.5690
Epoch 657/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4876 - accuracy:
0.7638 - val_loss: 0.7380 - val_accuracy: 0.5690
Epoch 658/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4944 - accuracy:
0.7573 - val_loss: 0.7399 - val_accuracy: 0.5660
Epoch 659/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4926 - accuracy:
0.7607 - val_loss: 0.7421 - val_accuracy: 0.5644
Epoch 660/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4910 - accuracy:
0.7646 - val_loss: 0.7448 - val_accuracy: 0.5583
Epoch 661/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4957 - accuracy:
0.7573 - val_loss: 0.7500 - val_accuracy: 0.5567
Epoch 662/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4923 - accuracy:
0.7592 - val_loss: 0.7551 - val_accuracy: 0.5537
Epoch 663/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4936 - accuracy:
0.7607 - val_loss: 0.7568 - val_accuracy: 0.5537
Epoch 664/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4890 - accuracy:
0.7657 - val_loss: 0.7545 - val_accuracy: 0.5567
Epoch 665/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4944 - accuracy:
0.7600 - val_loss: 0.7488 - val_accuracy: 0.5598
Epoch 666/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4958 - accuracy:
0.7558 - val_loss: 0.7366 - val_accuracy: 0.5690
Epoch 667/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4946 - accuracy:
0.7623 - val_loss: 0.7327 - val_accuracy: 0.5706
Epoch 668/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4866 - accuracy:
0.7584 - val_loss: 0.7303 - val_accuracy: 0.5706
Epoch 669/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4925 - accuracy:
0.7569 - val_loss: 0.7302 - val_accuracy: 0.5706
Epoch 670/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4834 - accuracy:
0.7757 - val_loss: 0.7276 - val_accuracy: 0.5736
Epoch 671/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5003 - accuracy:
0.7535 - val_loss: 0.7207 - val_accuracy: 0.5798
Epoch 672/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4891 - accuracy:
0.7627 - val_loss: 0.7228 - val_accuracy: 0.5782
Epoch 673/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4931 - accuracy:
0.7577 - val_loss: 0.7302 - val_accuracy: 0.5752
Epoch 674/1000
```

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3/3 [==============================] - 0s 11ms/step - loss: 0.4962 - accuracy:
0.7535 - val_loss: 0.7375 - val_accuracy: 0.5690
Epoch 675/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5001 - accuracy:
0.7581 - val_loss: 0.7392 - val_accuracy: 0.5675
Epoch 676/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4985 - accuracy:
0.7527 - val_loss: 0.7377 - val_accuracy: 0.5675
Epoch 677/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4945 - accuracy:
0.7653 - val_loss: 0.7348 - val_accuracy: 0.5660
Epoch 678/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4948 - accuracy:
0.7596 - val_loss: 0.7339 - val_accuracy: 0.5629
Epoch 679/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4874 - accuracy:
0.7646 - val_loss: 0.7349 - val_accuracy: 0.5613
Epoch 680/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4862 - accuracy:
0.7630 - val_loss: 0.7334 - val_accuracy: 0.5629
Epoch 681/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4985 - accuracy:
0.7527 - val_loss: 0.7348 - val_accuracy: 0.5613
Epoch 682/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4917 - accuracy:
0.7546 - val_loss: 0.7306 - val_accuracy: 0.5629
Epoch 683/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4986 - accuracy:
0.7561 - val_loss: 0.7241 - val_accuracy: 0.5675
Epoch 684/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4886 - accuracy:
0.7592 - val_loss: 0.7213 - val_accuracy: 0.5690
Epoch 685/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4966 - accuracy:
0.7600 - val_loss: 0.7180 - val_accuracy: 0.5706
Epoch 686/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4869 - accuracy:
0.7669 - val_loss: 0.7217 - val_accuracy: 0.5706
Epoch 687/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4887 - accuracy:
0.7561 - val_loss: 0.7297 - val_accuracy: 0.5675
Epoch 688/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.5008 - accuracy:
0.7554 - val_loss: 0.7395 - val_accuracy: 0.5598
Epoch 689/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4879 - accuracy:
0.7600 - val_loss: 0.7433 - val_accuracy: 0.5598
Epoch 690/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4944 - accuracy:
0.7646 - val_loss: 0.7426 - val_accuracy: 0.5629
Epoch 691/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4958 - accuracy:
0.7561 - val_loss: 0.7392 - val_accuracy: 0.5629
Epoch 692/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4900 - accuracy:
0.7588 - val_loss: 0.7387 - val_accuracy: 0.5629
Epoch 693/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4940 - accuracy:
0.7581 - val_loss: 0.7384 - val_accuracy: 0.5598
Epoch 694/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4959 - accuracy:
0.7581 - val_loss: 0.7346 - val_accuracy: 0.5598
Epoch 695/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4778 - accuracy:
0.7653 - val_loss: 0.7317 - val_accuracy: 0.5644
```

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Epoch 696/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4935 - accuracy:
0.7657 - val_loss: 0.7305 - val_accuracy: 0.5644
Epoch 697/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4882 - accuracy:
0.7630 - val_loss: 0.7273 - val_accuracy: 0.5675
Epoch 698/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4824 - accuracy:
0.7699 - val_loss: 0.7301 - val_accuracy: 0.5660
Epoch 699/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4782 - accuracy:
0.7600 - val_loss: 0.7310 - val_accuracy: 0.5675
Epoch 700/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4867 - accuracy:
0.7653 - val_loss: 0.7303 - val_accuracy: 0.5690
Epoch 701/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4909 - accuracy:
0.7634 - val_loss: 0.7312 - val_accuracy: 0.5736
Epoch 702/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4879 - accuracy:
0.7515 - val_loss: 0.7365 - val_accuracy: 0.5706
Epoch 703/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4892 - accuracy:
0.7577 - val_loss: 0.7385 - val_accuracy: 0.5675
Epoch 704/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4935 - accuracy:
0.7554 - val_loss: 0.7376 - val_accuracy: 0.5660
Epoch 705/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4947 - accuracy:
0.7634 - val_loss: 0.7283 - val_accuracy: 0.5721
Epoch 706/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4908 - accuracy:
0.7627 - val_loss: 0.7240 - val_accuracy: 0.5721
Epoch 707/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4913 - accuracy:
0.7573 - val_loss: 0.7218 - val_accuracy: 0.5736
Epoch 708/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4887 - accuracy:
0.7680 - val_loss: 0.7256 - val_accuracy: 0.5706
Epoch 709/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4856 - accuracy:
0.7611 - val_loss: 0.7286 - val_accuracy: 0.5644
Epoch 710/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4903 - accuracy:
0.7703 - val_loss: 0.7299 - val_accuracy: 0.5660
Epoch 711/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4853 - accuracy:
0.7611 - val_loss: 0.7244 - val_accuracy: 0.5706
Epoch 712/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4859 - accuracy:
0.7638 - val_loss: 0.7223 - val_accuracy: 0.5736
Epoch 713/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4926 - accuracy:
0.7615 - val_loss: 0.7223 - val_accuracy: 0.5752
Epoch 714/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4930 - accuracy:
0.7592 - val_loss: 0.7240 - val_accuracy: 0.5736
Epoch 715/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4862 - accuracy:
0.7630 - val_loss: 0.7276 - val_accuracy: 0.5736
Epoch 716/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4843 - accuracy:
0.7661 - val_loss: 0.7341 - val_accuracy: 0.5660
Epoch 717/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4796 - accuracy:
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0.7638 - val_loss: 0.7363 - val_accuracy: 0.5660
Epoch 718/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4786 - accuracy:
0.7596 - val_loss: 0.7380 - val_accuracy: 0.5675
Epoch 719/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4873 - accuracy:
0.7558 - val_loss: 0.7433 - val_accuracy: 0.5660
Epoch 720/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4940 - accuracy:
0.7615 - val_loss: 0.7488 - val_accuracy: 0.5629
Epoch 721/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4815 - accuracy:
0.7738 - val_loss: 0.7462 - val_accuracy: 0.5629
Epoch 722/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4928 - accuracy:
0.7676 - val_loss: 0.7403 - val_accuracy: 0.5644
Epoch 723/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4803 - accuracy:
0.7738 - val_loss: 0.7273 - val_accuracy: 0.5706
Epoch 724/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4861 - accuracy:
0.7523 - val_loss: 0.7201 - val_accuracy: 0.5736
Epoch 725/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4860 - accuracy:
0.7696 - val_loss: 0.7158 - val_accuracy: 0.5767
Epoch 726/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4818 - accuracy:
0.7703 - val_loss: 0.7126 - val_accuracy: 0.5813
Epoch 727/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4833 - accuracy:
0.7684 - val_loss: 0.7180 - val_accuracy: 0.5752
Epoch 728/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4791 - accuracy:
0.7680 - val_loss: 0.7213 - val_accuracy: 0.5736
Epoch 729/1000
3/3 [==============================] - 0s 13ms/step - loss: 0.4909 - accuracy:
0.7634 - val_loss: 0.7302 - val_accuracy: 0.5690
Epoch 730/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4891 - accuracy:
0.7699 - val_loss: 0.7364 - val_accuracy: 0.5690
Epoch 731/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4813 - accuracy:
0.7722 - val_loss: 0.7389 - val_accuracy: 0.5675
Epoch 732/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4802 - accuracy:
0.7734 - val_loss: 0.7385 - val_accuracy: 0.5690
Epoch 733/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4711 - accuracy:
0.7757 - val_loss: 0.7394 - val_accuracy: 0.5690
Epoch 734/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4881 - accuracy:
0.7615 - val_loss: 0.7406 - val_accuracy: 0.5706
Epoch 735/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4895 - accuracy:
0.7703 - val_loss: 0.7385 - val_accuracy: 0.5721
Epoch 736/1000
3/3 [==============================] - 0s 14ms/step - loss: 0.4863 - accuracy:
0.7657 - val_loss: 0.7363 - val_accuracy: 0.5706
Epoch 737/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4974 - accuracy:
0.7504 - val_loss: 0.7348 - val_accuracy: 0.5706
Epoch 738/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4856 - accuracy:
0.7577 - val_loss: 0.7331 - val_accuracy: 0.5690
Epoch 739/1000
```

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3/3 [==============================] - 0s 12ms/step - loss: 0.4842 - accuracy:
0.7650 - val_loss: 0.7358 - val_accuracy: 0.5706
Epoch 740/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4840 - accuracy:
0.7638 - val_loss: 0.7389 - val_accuracy: 0.5690
Epoch 741/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4823 - accuracy:
0.7630 - val_loss: 0.7403 - val_accuracy: 0.5690
Epoch 742/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4813 - accuracy:
0.7638 - val_loss: 0.7391 - val_accuracy: 0.5675
Epoch 743/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4890 - accuracy:
0.7611 - val_loss: 0.7352 - val_accuracy: 0.5675
Epoch 744/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4748 - accuracy:
0.7784 - val_loss: 0.7306 - val_accuracy: 0.5690
Epoch 745/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4849 - accuracy:
0.7634 - val_loss: 0.7264 - val_accuracy: 0.5690
Epoch 746/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4764 - accuracy:
0.7803 - val_loss: 0.7257 - val_accuracy: 0.5690
Epoch 747/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4898 - accuracy:
0.7611 - val_loss: 0.7301 - val_accuracy: 0.5690
Epoch 748/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4807 - accuracy:
0.7684 - val_loss: 0.7376 - val_accuracy: 0.5644
Epoch 749/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4837 - accuracy:
0.7638 - val_loss: 0.7401 - val_accuracy: 0.5613
Epoch 750/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4850 - accuracy:
0.7673 - val_loss: 0.7382 - val_accuracy: 0.5613
Epoch 751/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4814 - accuracy:
0.7684 - val_loss: 0.7353 - val_accuracy: 0.5644
Epoch 752/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4777 - accuracy:
0.7703 - val_loss: 0.7385 - val_accuracy: 0.5598
Epoch 753/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4901 - accuracy:
0.7634 - val_loss: 0.7434 - val_accuracy: 0.5552
Epoch 754/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4788 - accuracy:
0.7761 - val_loss: 0.7471 - val_accuracy: 0.5567
Epoch 755/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4815 - accuracy:
0.7630 - val_loss: 0.7463 - val_accuracy: 0.5613
Epoch 756/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4855 - accuracy:
0.7696 - val_loss: 0.7421 - val_accuracy: 0.5660
Epoch 757/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4762 - accuracy:
0.7665 - val_loss: 0.7357 - val_accuracy: 0.5660
Epoch 758/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4900 - accuracy:
0.7584 - val_loss: 0.7287 - val_accuracy: 0.5736
Epoch 759/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4827 - accuracy:
0.7699 - val_loss: 0.7231 - val_accuracy: 0.5736
Epoch 760/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4819 - accuracy:
0.7711 - val_loss: 0.7239 - val_accuracy: 0.5736
```

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Epoch 761/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4832 - accuracy:
0.7715 - val_loss: 0.7281 - val_accuracy: 0.5721
Epoch 762/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4760 - accuracy:
0.7757 - val_loss: 0.7370 - val_accuracy: 0.5690
Epoch 763/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4821 - accuracy:
0.7715 - val_loss: 0.7433 - val_accuracy: 0.5644
Epoch 764/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4773 - accuracy:
0.7772 - val_loss: 0.7451 - val_accuracy: 0.5644
Epoch 765/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4871 - accuracy:
0.7615 - val_loss: 0.7455 - val_accuracy: 0.5644
Epoch 766/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4801 - accuracy:
0.7627 - val_loss: 0.7463 - val_accuracy: 0.5629
Epoch 767/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4850 - accuracy:
0.7565 - val_loss: 0.7409 - val_accuracy: 0.5644
Epoch 768/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4866 - accuracy:
0.7646 - val_loss: 0.7389 - val_accuracy: 0.5675
Epoch 769/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4799 - accuracy:
0.7657 - val_loss: 0.7374 - val_accuracy: 0.5706
Epoch 770/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4891 - accuracy:
0.7696 - val_loss: 0.7398 - val_accuracy: 0.5690
Epoch 771/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4784 - accuracy:
0.7615 - val_loss: 0.7406 - val_accuracy: 0.5675
Epoch 772/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4888 - accuracy:
0.7600 - val_loss: 0.7409 - val_accuracy: 0.5660
Epoch 773/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4841 - accuracy:
0.7657 - val_loss: 0.7430 - val_accuracy: 0.5613
Epoch 774/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4753 - accuracy:
0.7719 - val_loss: 0.7392 - val_accuracy: 0.5660
Epoch 775/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4740 - accuracy:
0.7699 - val_loss: 0.7353 - val_accuracy: 0.5706
Epoch 776/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4790 - accuracy:
0.7722 - val_loss: 0.7306 - val_accuracy: 0.5736
Epoch 777/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4762 - accuracy:
0.7688 - val_loss: 0.7233 - val_accuracy: 0.5782
Epoch 778/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4840 - accuracy:
0.7742 - val_loss: 0.7223 - val_accuracy: 0.5798
Epoch 779/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4840 - accuracy:
0.7692 - val_loss: 0.7258 - val_accuracy: 0.5782
Epoch 780/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4811 - accuracy:
0.7676 - val_loss: 0.7309 - val_accuracy: 0.5782
Epoch 781/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4806 - accuracy:
0.7661 - val_loss: 0.7352 - val_accuracy: 0.5736
Epoch 782/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4895 - accuracy:
```

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0.7577 - val_loss: 0.7421 - val_accuracy: 0.5690
Epoch 783/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4759 - accuracy:
0.7688 - val_loss: 0.7447 - val_accuracy: 0.5660
Epoch 784/1000
3/3 [==============================] - ETA: 0s - loss: 0.4790 - accuracy: 0.76 -
0s 12ms/step - loss: 0.4784 - accuracy: 0.7630 - val_loss: 0.7434 - val_accurac
y: 0.5660
Epoch 785/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4748 - accuracy:
0.7703 - val_loss: 0.7427 - val_accuracy: 0.5644
Epoch 786/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4796 - accuracy:
0.7619 - val_loss: 0.7369 - val_accuracy: 0.5644
Epoch 787/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4703 - accuracy:
0.7719 - val_loss: 0.7339 - val_accuracy: 0.5690
Epoch 788/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4898 - accuracy:
0.7646 - val_loss: 0.7296 - val_accuracy: 0.5706
Epoch 789/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4761 - accuracy:
0.7730 - val_loss: 0.7263 - val_accuracy: 0.5767
Epoch 790/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4795 - accuracy:
0.7742 - val_loss: 0.7280 - val_accuracy: 0.5767
Epoch 791/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4755 - accuracy:
0.7665 - val_loss: 0.7296 - val_accuracy: 0.5736
Epoch 792/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4716 - accuracy:
0.7765 - val_loss: 0.7285 - val_accuracy: 0.5752
Epoch 793/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4786 - accuracy:
0.7646 - val_loss: 0.7287 - val_accuracy: 0.5767
Epoch 794/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4799 - accuracy:
0.7680 - val_loss: 0.7319 - val_accuracy: 0.5767
Epoch 795/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4777 - accuracy:
0.7615 - val_loss: 0.7339 - val_accuracy: 0.5736
Epoch 796/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4830 - accuracy:
0.7642 - val_loss: 0.7348 - val_accuracy: 0.5690
Epoch 797/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4707 - accuracy:
0.7726 - val_loss: 0.7346 - val_accuracy: 0.5675
Epoch 798/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4720 - accuracy:
0.7757 - val_loss: 0.7358 - val_accuracy: 0.5706
Epoch 799/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4880 - accuracy:
0.7588 - val_loss: 0.7350 - val_accuracy: 0.5721
Epoch 800/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4872 - accuracy:
0.7619 - val_loss: 0.7347 - val_accuracy: 0.5752
Epoch 801/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4725 - accuracy:
0.7703 - val_loss: 0.7351 - val_accuracy: 0.5721
Epoch 802/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4761 - accuracy:
0.7676 - val_loss: 0.7314 - val_accuracy: 0.5767
Epoch 803/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4763 - accuracy:
0.7696 - val_loss: 0.7324 - val_accuracy: 0.5752
```

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Epoch 804/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4754 - accuracy:
0.7688 - val_loss: 0.7307 - val_accuracy: 0.5752
Epoch 805/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4826 - accuracy:
0.7634 - val_loss: 0.7339 - val_accuracy: 0.5736
Epoch 806/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4795 - accuracy:
0.7596 - val_loss: 0.7378 - val_accuracy: 0.5706
Epoch 807/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4824 - accuracy:
0.7642 - val_loss: 0.7372 - val_accuracy: 0.5690
Epoch 808/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4763 - accuracy:
0.7661 - val_loss: 0.7372 - val_accuracy: 0.5675
Epoch 809/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4722 - accuracy:
0.7768 - val_loss: 0.7315 - val_accuracy: 0.5706
Epoch 810/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4817 - accuracy:
0.7619 - val_loss: 0.7291 - val_accuracy: 0.5706
Epoch 811/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4837 - accuracy:
0.7634 - val_loss: 0.7301 - val_accuracy: 0.5706
Epoch 812/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4731 - accuracy:
0.7765 - val_loss: 0.7296 - val_accuracy: 0.5706
Epoch 813/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4790 - accuracy:
0.7749 - val_loss: 0.7331 - val_accuracy: 0.5690
Epoch 814/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4736 - accuracy:
0.7742 - val_loss: 0.7356 - val_accuracy: 0.5675
Epoch 815/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4804 - accuracy:
0.7722 - val_loss: 0.7380 - val_accuracy: 0.5690
Epoch 816/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4886 - accuracy:
0.7673 - val_loss: 0.7378 - val_accuracy: 0.5675
Epoch 817/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4805 - accuracy:
0.7623 - val_loss: 0.7404 - val_accuracy: 0.5675
Epoch 818/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4794 - accuracy:
0.7791 - val_loss: 0.7404 - val_accuracy: 0.5706
Epoch 819/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4849 - accuracy:
0.7592 - val_loss: 0.7374 - val_accuracy: 0.5752
Epoch 820/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4776 - accuracy:
0.7673 - val_loss: 0.7361 - val_accuracy: 0.5752
Epoch 821/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4853 - accuracy:
0.7665 - val_loss: 0.7349 - val_accuracy: 0.5767
Epoch 822/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4762 - accuracy:
0.7738 - val_loss: 0.7372 - val_accuracy: 0.5767
Epoch 823/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4648 - accuracy:
0.7807 - val_loss: 0.7359 - val_accuracy: 0.5736
Epoch 824/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4851 - accuracy:
0.7592 - val_loss: 0.7331 - val_accuracy: 0.5736
Epoch 825/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4772 - accuracy:
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0.7715 - val_loss: 0.7312 - val_accuracy: 0.5752
Epoch 826/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4677 - accuracy:
0.7780 - val_loss: 0.7278 - val_accuracy: 0.5782
Epoch 827/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4763 - accuracy:
0.7719 - val_loss: 0.7295 - val_accuracy: 0.5736
Epoch 828/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4839 - accuracy:
0.7627 - val_loss: 0.7348 - val_accuracy: 0.5721
Epoch 829/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4793 - accuracy:
0.7734 - val_loss: 0.7386 - val_accuracy: 0.5675
Epoch 830/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4742 - accuracy:
0.7745 - val_loss: 0.7398 - val_accuracy: 0.5660
Epoch 831/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4697 - accuracy:
0.7768 - val_loss: 0.7422 - val_accuracy: 0.5675
Epoch 832/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4767 - accuracy:
0.7745 - val_loss: 0.7442 - val_accuracy: 0.5675
Epoch 833/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4798 - accuracy:
0.7696 - val_loss: 0.7463 - val_accuracy: 0.5629
Epoch 834/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4749 - accuracy:
0.7742 - val_loss: 0.7445 - val_accuracy: 0.5690
Epoch 835/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4759 - accuracy:
0.7665 - val_loss: 0.7354 - val_accuracy: 0.5767
Epoch 836/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4675 - accuracy:
0.7791 - val_loss: 0.7285 - val_accuracy: 0.5859
Epoch 837/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4655 - accuracy:
0.7776 - val_loss: 0.7217 - val_accuracy: 0.5874
Epoch 838/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4775 - accuracy:
0.7596 - val_loss: 0.7191 - val_accuracy: 0.5890
Epoch 839/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4749 - accuracy:
0.7646 - val_loss: 0.7244 - val_accuracy: 0.5874
Epoch 840/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4748 - accuracy:
0.7768 - val_loss: 0.7345 - val_accuracy: 0.5798
Epoch 841/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4680 - accuracy:
0.7791 - val_loss: 0.7420 - val_accuracy: 0.5752
Epoch 842/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4749 - accuracy:
0.7765 - val_loss: 0.7532 - val_accuracy: 0.5660
Epoch 843/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4765 - accuracy:
0.7680 - val_loss: 0.7587 - val_accuracy: 0.5629
Epoch 844/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4725 - accuracy:
0.7676 - val_loss: 0.7569 - val_accuracy: 0.5644
Epoch 845/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4836 - accuracy:
0.7588 - val_loss: 0.7467 - val_accuracy: 0.5690
Epoch 846/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4691 - accuracy:
0.7745 - val_loss: 0.7366 - val_accuracy: 0.5721
Epoch 847/1000
```

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3/3 [==============================] - 0s 12ms/step - loss: 0.4778 - accuracy:
0.7730 - val_loss: 0.7264 - val_accuracy: 0.5782
Epoch 848/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4664 - accuracy:
0.7780 - val_loss: 0.7257 - val_accuracy: 0.5767
Epoch 849/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4704 - accuracy:
0.7711 - val_loss: 0.7284 - val_accuracy: 0.5752
Epoch 850/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4723 - accuracy:
0.7807 - val_loss: 0.7334 - val_accuracy: 0.5752
Epoch 851/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4745 - accuracy:
0.7711 - val_loss: 0.7383 - val_accuracy: 0.5736
Epoch 852/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4751 - accuracy:
0.7669 - val_loss: 0.7428 - val_accuracy: 0.5721
Epoch 853/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4677 - accuracy:
0.7719 - val_loss: 0.7442 - val_accuracy: 0.5721
Epoch 854/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4732 - accuracy:
0.7722 - val_loss: 0.7433 - val_accuracy: 0.5690
Epoch 855/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4706 - accuracy:
0.7772 - val_loss: 0.7398 - val_accuracy: 0.5721
Epoch 856/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4752 - accuracy:
0.7646 - val_loss: 0.7370 - val_accuracy: 0.5721
Epoch 857/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4770 - accuracy:
0.7669 - val_loss: 0.7364 - val_accuracy: 0.5721
Epoch 858/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4809 - accuracy:
0.7665 - val_loss: 0.7358 - val_accuracy: 0.5706
Epoch 859/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4689 - accuracy:
0.7780 - val_loss: 0.7325 - val_accuracy: 0.5736
Epoch 860/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4759 - accuracy:
0.7784 - val_loss: 0.7285 - val_accuracy: 0.5736
Epoch 861/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4702 - accuracy:
0.7726 - val_loss: 0.7290 - val_accuracy: 0.5736
Epoch 862/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4698 - accuracy:
0.7772 - val_loss: 0.7340 - val_accuracy: 0.5706
Epoch 863/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4788 - accuracy:
0.7665 - val_loss: 0.7396 - val_accuracy: 0.5675
Epoch 864/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4715 - accuracy:
0.7761 - val_loss: 0.7497 - val_accuracy: 0.5660
Epoch 865/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4701 - accuracy:
0.7703 - val_loss: 0.7558 - val_accuracy: 0.5629
Epoch 866/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4726 - accuracy:
0.7657 - val_loss: 0.7590 - val_accuracy: 0.5613
Epoch 867/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4758 - accuracy:
0.7688 - val_loss: 0.7622 - val_accuracy: 0.5598
Epoch 868/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4695 - accuracy:
0.7730 - val_loss: 0.7627 - val_accuracy: 0.5613
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Epoch 869/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4736 - accuracy:
0.7768 - val_loss: 0.7597 - val_accuracy: 0.5629
Epoch 870/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4795 - accuracy:
0.7657 - val_loss: 0.7534 - val_accuracy: 0.5660
Epoch 871/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4670 - accuracy:
0.7726 - val_loss: 0.7446 - val_accuracy: 0.5675
Epoch 872/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4831 - accuracy:
0.7680 - val_loss: 0.7367 - val_accuracy: 0.5706
Epoch 873/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4723 - accuracy:
0.7772 - val_loss: 0.7292 - val_accuracy: 0.5767
Epoch 874/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4731 - accuracy:
0.7745 - val_loss: 0.7255 - val_accuracy: 0.5813
Epoch 875/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4645 - accuracy:
0.7742 - val_loss: 0.7242 - val_accuracy: 0.5828
Epoch 876/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4743 - accuracy:
0.7791 - val_loss: 0.7302 - val_accuracy: 0.5767
Epoch 877/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4699 - accuracy:
0.7738 - val_loss: 0.7404 - val_accuracy: 0.5706
Epoch 878/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4769 - accuracy:
0.7684 - val_loss: 0.7446 - val_accuracy: 0.5721
Epoch 879/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4756 - accuracy:
0.7803 - val_loss: 0.7421 - val_accuracy: 0.5721
Epoch 880/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4710 - accuracy:
0.7742 - val_loss: 0.7370 - val_accuracy: 0.5798
Epoch 881/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4678 - accuracy:
0.7799 - val_loss: 0.7345 - val_accuracy: 0.5798
Epoch 882/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4740 - accuracy:
0.7699 - val_loss: 0.7325 - val_accuracy: 0.5782
Epoch 883/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4648 - accuracy:
0.7749 - val_loss: 0.7306 - val_accuracy: 0.5782
Epoch 884/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4663 - accuracy:
0.7765 - val_loss: 0.7350 - val_accuracy: 0.5767
Epoch 885/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4598 - accuracy:
0.7860 - val_loss: 0.7326 - val_accuracy: 0.5782
Epoch 886/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4733 - accuracy:
0.7657 - val_loss: 0.7310 - val_accuracy: 0.5798
Epoch 887/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4740 - accuracy:
0.7749 - val_loss: 0.7319 - val_accuracy: 0.5798
Epoch 888/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4721 - accuracy:
0.7699 - val_loss: 0.7338 - val_accuracy: 0.5782
Epoch 889/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4716 - accuracy:
0.7791 - val_loss: 0.7403 - val_accuracy: 0.5767
Epoch 890/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4662 - accuracy:
```

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0.7738 - val_loss: 0.7416 - val_accuracy: 0.5736
Epoch 891/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4657 - accuracy:
0.7803 - val_loss: 0.7419 - val_accuracy: 0.5736
Epoch 892/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4695 - accuracy:
0.7834 - val_loss: 0.7382 - val_accuracy: 0.5752
Epoch 893/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4754 - accuracy:
0.7696 - val_loss: 0.7343 - val_accuracy: 0.5782
Epoch 894/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4703 - accuracy:
0.7742 - val_loss: 0.7340 - val_accuracy: 0.5767
Epoch 895/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4691 - accuracy:
0.7684 - val_loss: 0.7374 - val_accuracy: 0.5721
Epoch 896/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4750 - accuracy:
0.7692 - val_loss: 0.7362 - val_accuracy: 0.5721
Epoch 897/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4688 - accuracy:
0.7722 - val_loss: 0.7348 - val_accuracy: 0.5752
Epoch 898/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4707 - accuracy:
0.7703 - val_loss: 0.7369 - val_accuracy: 0.5721
Epoch 899/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4742 - accuracy:
0.7715 - val_loss: 0.7414 - val_accuracy: 0.5721
Epoch 900/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4656 - accuracy:
0.7738 - val_loss: 0.7434 - val_accuracy: 0.5706
Epoch 901/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4678 - accuracy:
0.7745 - val_loss: 0.7479 - val_accuracy: 0.5706
Epoch 902/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4747 - accuracy:
0.7642 - val_loss: 0.7501 - val_accuracy: 0.5706
Epoch 903/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4791 - accuracy:
0.7726 - val_loss: 0.7483 - val_accuracy: 0.5706
Epoch 904/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4649 - accuracy:
0.7722 - val_loss: 0.7423 - val_accuracy: 0.5721
Epoch 905/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4673 - accuracy:
0.7765 - val_loss: 0.7359 - val_accuracy: 0.5767
Epoch 906/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4672 - accuracy:
0.7803 - val_loss: 0.7368 - val_accuracy: 0.5767
Epoch 907/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4675 - accuracy:
0.7788 - val_loss: 0.7321 - val_accuracy: 0.5782
Epoch 908/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4708 - accuracy:
0.7780 - val_loss: 0.7296 - val_accuracy: 0.5844
Epoch 909/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4712 - accuracy:
0.7807 - val_loss: 0.7332 - val_accuracy: 0.5813
Epoch 910/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4672 - accuracy:
0.7745 - val_loss: 0.7403 - val_accuracy: 0.5752
Epoch 911/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4670 - accuracy:
0.7765 - val_loss: 0.7449 - val_accuracy: 0.5721
Epoch 912/1000
```

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3/3 [==============================] - 0s 11ms/step - loss: 0.4840 - accuracy:
0.7657 - val_loss: 0.7491 - val_accuracy: 0.5675
Epoch 913/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4657 - accuracy:
0.7814 - val_loss: 0.7470 - val_accuracy: 0.5675
Epoch 914/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4715 - accuracy:
0.7711 - val_loss: 0.7449 - val_accuracy: 0.5690
Epoch 915/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4717 - accuracy:
0.7738 - val_loss: 0.7405 - val_accuracy: 0.5721
Epoch 916/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4713 - accuracy:
0.7788 - val_loss: 0.7354 - val_accuracy: 0.5767
Epoch 917/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4586 - accuracy:
0.7749 - val_loss: 0.7309 - val_accuracy: 0.5798
Epoch 918/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4664 - accuracy:
0.7607 - val_loss: 0.7305 - val_accuracy: 0.5798
Epoch 919/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4701 - accuracy:
0.7757 - val_loss: 0.7320 - val_accuracy: 0.5798
Epoch 920/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4719 - accuracy:
0.7788 - val_loss: 0.7366 - val_accuracy: 0.5782
Epoch 921/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4662 - accuracy:
0.7761 - val_loss: 0.7430 - val_accuracy: 0.5736
Epoch 922/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4750 - accuracy:
0.7734 - val_loss: 0.7490 - val_accuracy: 0.5660
Epoch 923/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4709 - accuracy:
0.7688 - val_loss: 0.7483 - val_accuracy: 0.5675
Epoch 924/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4648 - accuracy:
0.7753 - val_loss: 0.7474 - val_accuracy: 0.5660
Epoch 925/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4655 - accuracy:
0.7807 - val_loss: 0.7441 - val_accuracy: 0.5660
Epoch 926/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4626 - accuracy:
0.7772 - val_loss: 0.7411 - val_accuracy: 0.5721
Epoch 927/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4656 - accuracy:
0.7791 - val_loss: 0.7393 - val_accuracy: 0.5736
Epoch 928/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4735 - accuracy:
0.7757 - val_loss: 0.7415 - val_accuracy: 0.5752
Epoch 929/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4739 - accuracy:
0.7707 - val_loss: 0.7431 - val_accuracy: 0.5721
Epoch 930/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4679 - accuracy:
0.7745 - val_loss: 0.7458 - val_accuracy: 0.5721
Epoch 931/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4731 - accuracy:
0.7653 - val_loss: 0.7503 - val_accuracy: 0.5721
Epoch 932/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4717 - accuracy:
0.7757 - val_loss: 0.7539 - val_accuracy: 0.5690
Epoch 933/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4672 - accuracy:
0.7811 - val_loss: 0.7520 - val_accuracy: 0.5706
```

```
Epoch 934/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4652 - accuracy:
0.7811 - val_loss: 0.7422 - val_accuracy: 0.5752
Epoch 935/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4670 - accuracy:
0.7726 - val_loss: 0.7325 - val_accuracy: 0.5798
Epoch 936/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4688 - accuracy:
0.7742 - val_loss: 0.7266 - val_accuracy: 0.5813
Epoch 937/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4741 - accuracy:
0.7673 - val_loss: 0.7278 - val_accuracy: 0.5798
Epoch 938/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4689 - accuracy:
0.7834 - val_loss: 0.7313 - val_accuracy: 0.5813
Epoch 939/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4781 - accuracy:
0.7653 - val_loss: 0.7391 - val_accuracy: 0.5782
Epoch 940/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4679 - accuracy:
0.7761 - val_loss: 0.7440 - val_accuracy: 0.5721
Epoch 941/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4617 - accuracy:
0.7853 - val_loss: 0.7391 - val_accuracy: 0.5813
Epoch 942/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4628 - accuracy:
0.7910 - val_loss: 0.7326 - val_accuracy: 0.5828
Epoch 943/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4673 - accuracy:
0.7822 - val_loss: 0.7304 - val_accuracy: 0.5859
Epoch 944/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4655 - accuracy:
0.7811 - val_loss: 0.7318 - val_accuracy: 0.5844
Epoch 945/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4647 - accuracy:
0.7826 - val_loss: 0.7343 - val_accuracy: 0.5813
Epoch 946/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4648 - accuracy:
0.7715 - val_loss: 0.7347 - val_accuracy: 0.5798
Epoch 947/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4692 - accuracy:
0.7711 - val_loss: 0.7370 - val_accuracy: 0.5782
Epoch 948/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4696 - accuracy:
0.7688 - val_loss: 0.7355 - val_accuracy: 0.5782
Epoch 949/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4613 - accuracy:
0.7826 - val_loss: 0.7337 - val_accuracy: 0.5813
Epoch 950/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4631 - accuracy:
0.7753 - val_loss: 0.7381 - val_accuracy: 0.5798
Epoch 951/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4686 - accuracy:
0.7780 - val_loss: 0.7423 - val_accuracy: 0.5782
Epoch 952/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4664 - accuracy:
0.7784 - val_loss: 0.7444 - val_accuracy: 0.5782
Epoch 953/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4660 - accuracy:
0.7726 - val_loss: 0.7442 - val_accuracy: 0.5798
Epoch 954/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4675 - accuracy:
0.7830 - val_loss: 0.7417 - val_accuracy: 0.5798
Epoch 955/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4790 - accuracy:
```

```
0.7734 - val_loss: 0.7411 - val_accuracy: 0.5828
Epoch 956/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4664 - accuracy:
0.7837 - val_loss: 0.7434 - val_accuracy: 0.5828
Epoch 957/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4667 - accuracy:
0.7818 - val_loss: 0.7478 - val_accuracy: 0.5767
Epoch 958/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4717 - accuracy:
0.7703 - val_loss: 0.7486 - val_accuracy: 0.5752
Epoch 959/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4671 - accuracy:
0.7807 - val_loss: 0.7513 - val_accuracy: 0.5752
Epoch 960/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4681 - accuracy:
0.7722 - val_loss: 0.7530 - val_accuracy: 0.5736
Epoch 961/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4630 - accuracy:
0.7734 - val_loss: 0.7512 - val_accuracy: 0.5706
Epoch 962/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4683 - accuracy:
0.7738 - val_loss: 0.7460 - val_accuracy: 0.5736
Epoch 963/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4720 - accuracy:
0.7745 - val_loss: 0.7421 - val_accuracy: 0.5752
Epoch 964/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4747 - accuracy:
0.7761 - val_loss: 0.7411 - val_accuracy: 0.5736
Epoch 965/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4630 - accuracy:
0.7834 - val_loss: 0.7394 - val_accuracy: 0.5721
Epoch 966/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4748 - accuracy:
0.7784 - val_loss: 0.7419 - val_accuracy: 0.5736
Epoch 967/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4724 - accuracy:
0.7630 - val_loss: 0.7397 - val_accuracy: 0.5752
Epoch 968/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4737 - accuracy:
0.7734 - val_loss: 0.7410 - val_accuracy: 0.5767
Epoch 969/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4702 - accuracy:
0.7795 - val_loss: 0.7401 - val_accuracy: 0.5767
Epoch 970/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4669 - accuracy:
0.7745 - val_loss: 0.7351 - val_accuracy: 0.5813
Epoch 971/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4664 - accuracy:
0.7837 - val_loss: 0.7359 - val_accuracy: 0.5813
Epoch 972/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4619 - accuracy:
0.7811 - val_loss: 0.7394 - val_accuracy: 0.5828
Epoch 973/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4623 - accuracy:
0.7799 - val_loss: 0.7387 - val_accuracy: 0.5844
Epoch 974/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4701 - accuracy:
0.7772 - val_loss: 0.7418 - val_accuracy: 0.5828
Epoch 975/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4622 - accuracy:
0.7814 - val_loss: 0.7462 - val_accuracy: 0.5782
Epoch 976/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4665 - accuracy:
0.7734 - val_loss: 0.7471 - val_accuracy: 0.5798
Epoch 977/1000
```

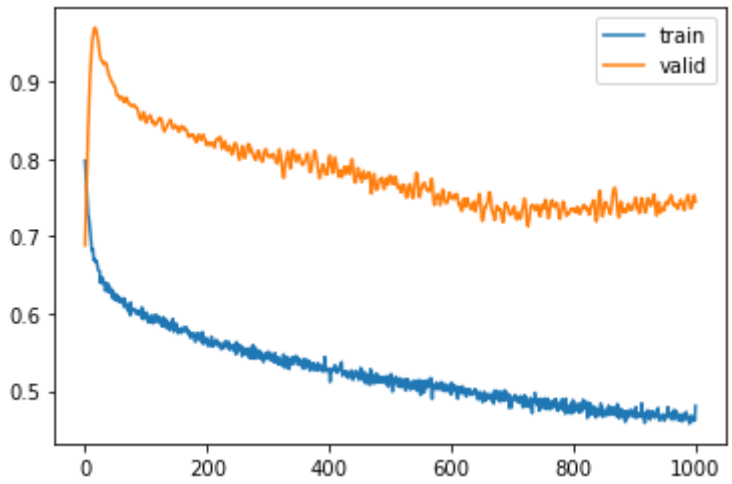
```
3/3 [==============================] - 0s 11ms/step - loss: 0.4613 - accuracy:
0.7780 - val_loss: 0.7441 - val_accuracy: 0.5828
Epoch 978/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4605 - accuracy:
0.7868 - val_loss: 0.7434 - val_accuracy: 0.5844
Epoch 979/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4677 - accuracy:
0.7753 - val_loss: 0.7411 - val_accuracy: 0.5874
Epoch 980/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4640 - accuracy:
0.7834 - val_loss: 0.7387 - val_accuracy: 0.5874
Epoch 981/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4694 - accuracy:
0.7722 - val_loss: 0.7356 - val_accuracy: 0.5874
Epoch 982/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4708 - accuracy:
0.7788 - val_loss: 0.7336 - val_accuracy: 0.5874
Epoch 983/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4627 - accuracy:
0.7830 - val_loss: 0.7371 - val_accuracy: 0.5874
Epoch 984/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4700 - accuracy:
0.7761 - val_loss: 0.7454 - val_accuracy: 0.5828
Epoch 985/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4728 - accuracy:
0.7715 - val_loss: 0.7458 - val_accuracy: 0.5813
Epoch 986/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4660 - accuracy:
0.7711 - val_loss: 0.7491 - val_accuracy: 0.5752
Epoch 987/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4633 - accuracy:
0.7730 - val_loss: 0.7529 - val_accuracy: 0.5690
Epoch 988/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4654 - accuracy:
0.7822 - val_loss: 0.7527 - val_accuracy: 0.5660
Epoch 989/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4663 - accuracy:
0.7807 - val_loss: 0.7518 - val_accuracy: 0.5660
Epoch 990/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4575 - accuracy:
0.7814 - val_loss: 0.7477 - val_accuracy: 0.5736
Epoch 991/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4647 - accuracy:
0.7772 - val_loss: 0.7400 - val_accuracy: 0.5828
Epoch 992/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4678 - accuracy:
0.7784 - val_loss: 0.7364 - val_accuracy: 0.5859
Epoch 993/1000
3/3 [==============================] - 0s 14ms/step - loss: 0.4667 - accuracy:
0.7807 - val_loss: 0.7359 - val_accuracy: 0.5828
Epoch 994/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4635 - accuracy:
0.7772 - val_loss: 0.7377 - val_accuracy: 0.5782
Epoch 995/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4617 - accuracy:
0.7837 - val_loss: 0.7411 - val_accuracy: 0.5767
Epoch 996/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4618 - accuracy:
0.7830 - val_loss: 0.7446 - val_accuracy: 0.5721
Epoch 997/1000
3/3 [==============================] - 0s 11ms/step - loss: 0.4609 - accuracy:
0.7826 - val_loss: 0.7501 - val_accuracy: 0.5706
Epoch 998/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4679 - accuracy:
0.7765 - val_loss: 0.7531 - val_accuracy: 0.5706
```

```
Epoch 999/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4618 - accuracy:
0.7814 - val_loss: 0.7500 - val_accuracy: 0.5706
Epoch 1000/1000
3/3 [==============================] - 0s 12ms/step - loss: 0.4804 - accuracy:
0.7650 - val_loss: 0.7448 - val_accuracy: 0.5736
```

In [66]:
```
# Capturing learning history per epoch
hist3 = pd.DataFrame(hist_mod3.history)
hist3["epoch"] = hist_mod3.epoch

# Plotting accuracy at different epochs
plt.plot(hist3["loss"])
plt.plot(hist3["val_loss"])
plt.legend(("train", "valid"), loc=0)
```

Out[66]:
```
<matplotlib.legend.Legend at 0x185916cae80>
```



In [67]:
```
model3_score = model3.evaluate(scaled_test_X, scaled_test_y)
```

```
63/63 [==============================] - 0s 629us/step - loss: 0.3681 - accurac
y: 0.8520
```

In [68]:
```
model4 = Sequential()

model4.add(
    Dense(units=9, input_dim=12, kernel_initializer="HeNormal", activation="leak
)

model4.add(Dropout(0.1))

model4.add(Dense(units=7, kernel_initializer="HeNormal", activation="leaky_relu"

model4.add(Dense(units=5, kernel_initializer="HeNormal", activation="leaky_relu"

model4.add(Dense(units=2, activation="relu"))

model4.add(Dense(1, kernel_initializer="HeNormal", activation="sigmoid"))

model4.compile(Nadam(lr=0.01), loss="binary_crossentropy", metrics=["accuracy"])

model4.summary()
```

```
Model: "sequential_3"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 dense_9 (Dense)             (None, 9)                 117

 dropout_2 (Dropout)         (None, 9)                 0

 dense_10 (Dense)            (None, 7)                 70

 dense_11 (Dense)            (None, 5)                 40

 dense_12 (Dense)            (None, 2)                 12

 dense_13 (Dense)            (None, 1)                 3

=================================================================
Total params: 242
Trainable params: 242
Non-trainable params: 0
_________________________________________________________________
```

In [69]:
```
es2 = tf.keras.callbacks.EarlyStopping(
    monitor="loss",
    min_delta=0,
    patience=25,
    verbose=0,
    mode="min",
    baseline=None,
    restore_best_weights=True,
)
```

In [70]:
```
initial_learning_rate = 0.01
epochs = 2000
decay = initial_learning_rate / epochs


def lr_time_based_decay(epoch, lr):
    return lr * 1 / (1 + decay * epoch)
```

In [71]:
```
hist_mod4 = model4.fit(
    scaled_train_over_X,
    scaled_train_over_y,
    batch_size=1000,
    epochs=2000,
    validation_split=0.2,
    callbacks=[LearningRateScheduler(lr_time_based_decay), (es2)],
)
```

```
Epoch 1/2000
11/11 [==============================] - 1s 15ms/step - loss: 0.7126 - accuracy:
0.5756 - val_loss: 0.7780 - val_accuracy: 0.2461 - lr: 0.0100
Epoch 2/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.6196 - accuracy:
0.6726 - val_loss: 0.6633 - val_accuracy: 0.5035 - lr: 0.0100
Epoch 3/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.5784 - accuracy:
0.7022 - val_loss: 0.5397 - val_accuracy: 0.6907 - lr: 0.0100
Epoch 4/2000
```

```
11/11 [==============================] - 0s 4ms/step - loss: 0.5436 - accuracy:
0.7375 - val_loss: 0.4878 - val_accuracy: 0.7476 - lr: 0.0100
Epoch 5/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.5098 - accuracy:
0.7668 - val_loss: 0.5645 - val_accuracy: 0.6864 - lr: 0.0100
Epoch 6/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.4937 - accuracy:
0.7731 - val_loss: 0.3061 - val_accuracy: 0.8622 - lr: 0.0100
Epoch 7/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.4672 - accuracy:
0.7868 - val_loss: 0.2204 - val_accuracy: 0.9042 - lr: 0.0100
Epoch 8/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.4470 - accuracy:
0.7985 - val_loss: 0.2896 - val_accuracy: 0.8462 - lr: 0.0100
Epoch 9/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.4362 - accuracy:
0.8046 - val_loss: 0.2794 - val_accuracy: 0.8442 - lr: 0.0100
Epoch 10/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.4211 - accuracy:
0.8145 - val_loss: 0.2619 - val_accuracy: 0.8536 - lr: 0.0100
Epoch 11/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.4191 - accuracy:
0.8129 - val_loss: 0.2931 - val_accuracy: 0.8301 - lr: 0.0100
Epoch 12/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.4094 - accuracy:
0.8203 - val_loss: 0.2683 - val_accuracy: 0.8399 - lr: 0.0100
Epoch 13/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.4101 - accuracy:
0.8207 - val_loss: 0.1664 - val_accuracy: 0.9105 - lr: 0.0100
Epoch 14/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.4086 - accuracy:
0.8184 - val_loss: 0.2233 - val_accuracy: 0.8689 - lr: 0.0100
Epoch 15/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3995 - accuracy:
0.8222 - val_loss: 0.2329 - val_accuracy: 0.8638 - lr: 0.0100
Epoch 16/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3987 - accuracy:
0.8238 - val_loss: 0.3114 - val_accuracy: 0.8069 - lr: 0.0100
Epoch 17/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3959 - accuracy:
0.8281 - val_loss: 0.2606 - val_accuracy: 0.8473 - lr: 0.0100
Epoch 18/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3925 - accuracy:
0.8306 - val_loss: 0.2673 - val_accuracy: 0.8442 - lr: 0.0100
Epoch 19/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3873 - accuracy:
0.8309 - val_loss: 0.2982 - val_accuracy: 0.8308 - lr: 0.0100
Epoch 20/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3876 - accuracy:
0.8315 - val_loss: 0.1573 - val_accuracy: 0.9195 - lr: 0.0100
Epoch 21/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3867 - accuracy:
0.8318 - val_loss: 0.2658 - val_accuracy: 0.8450 - lr: 0.0100
Epoch 22/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3799 - accuracy:
0.8338 - val_loss: 0.2313 - val_accuracy: 0.8685 - lr: 0.0100
Epoch 23/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3792 - accuracy:
0.8340 - val_loss: 0.1826 - val_accuracy: 0.9054 - lr: 0.0100
Epoch 24/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3736 - accuracy:
0.8412 - val_loss: 0.1731 - val_accuracy: 0.9078 - lr: 0.0100
Epoch 25/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3721 - accuracy:
0.8374 - val_loss: 0.1870 - val_accuracy: 0.8976 - lr: 0.0100
```

```
Epoch 26/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3691 - accuracy:
0.8417 - val_loss: 0.2207 - val_accuracy: 0.8807 - lr: 0.0100
Epoch 27/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3635 - accuracy:
0.8449 - val_loss: 0.1988 - val_accuracy: 0.8936 - lr: 0.0100
Epoch 28/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3668 - accuracy:
0.8409 - val_loss: 0.2642 - val_accuracy: 0.8540 - lr: 0.0100
Epoch 29/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3632 - accuracy:
0.8426 - val_loss: 0.2526 - val_accuracy: 0.8575 - lr: 0.0100
Epoch 30/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3558 - accuracy:
0.8445 - val_loss: 0.2114 - val_accuracy: 0.8854 - lr: 0.0100
Epoch 31/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3592 - accuracy:
0.8433 - val_loss: 0.1520 - val_accuracy: 0.9203 - lr: 0.0100
Epoch 32/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3541 - accuracy:
0.8477 - val_loss: 0.3082 - val_accuracy: 0.8273 - lr: 0.0100
Epoch 33/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3476 - accuracy:
0.8495 - val_loss: 0.1454 - val_accuracy: 0.9207 - lr: 0.0100
Epoch 34/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3465 - accuracy:
0.8498 - val_loss: 0.2901 - val_accuracy: 0.8387 - lr: 0.0100
Epoch 35/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3434 - accuracy:
0.8527 - val_loss: 0.1417 - val_accuracy: 0.9246 - lr: 0.0100
Epoch 36/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3416 - accuracy:
0.8505 - val_loss: 0.1731 - val_accuracy: 0.9035 - lr: 0.0100
Epoch 37/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3425 - accuracy:
0.8523 - val_loss: 0.1263 - val_accuracy: 0.9329 - lr: 0.0100
Epoch 38/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3435 - accuracy:
0.8543 - val_loss: 0.2096 - val_accuracy: 0.8870 - lr: 0.0100
Epoch 39/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3434 - accuracy:
0.8525 - val_loss: 0.1938 - val_accuracy: 0.8929 - lr: 0.0100
Epoch 40/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3376 - accuracy:
0.8574 - val_loss: 0.1393 - val_accuracy: 0.9235 - lr: 0.0100
Epoch 41/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3418 - accuracy:
0.8525 - val_loss: 0.1911 - val_accuracy: 0.8944 - lr: 0.0100
Epoch 42/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3374 - accuracy:
0.8546 - val_loss: 0.1695 - val_accuracy: 0.9046 - lr: 0.0100
Epoch 43/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3382 - accuracy:
0.8540 - val_loss: 0.2448 - val_accuracy: 0.8732 - lr: 0.0100
Epoch 44/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3371 - accuracy:
0.8540 - val_loss: 0.2260 - val_accuracy: 0.8748 - lr: 0.0100
Epoch 45/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3304 - accuracy:
0.8606 - val_loss: 0.2928 - val_accuracy: 0.8356 - lr: 0.0100
Epoch 46/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3392 - accuracy:
0.8552 - val_loss: 0.1788 - val_accuracy: 0.9027 - lr: 0.0099
Epoch 47/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3324 - accuracy:
```

```
0.8570 - val_loss: 0.1789 - val_accuracy: 0.9027 - lr: 0.0099
Epoch 48/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3325 - accuracy:
0.8556 - val_loss: 0.2247 - val_accuracy: 0.8764 - lr: 0.0099
Epoch 49/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3325 - accuracy:
0.8547 - val_loss: 0.1715 - val_accuracy: 0.9046 - lr: 0.0099
Epoch 50/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3313 - accuracy:
0.8552 - val_loss: 0.1982 - val_accuracy: 0.8889 - lr: 0.0099
Epoch 51/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3339 - accuracy:
0.8568 - val_loss: 0.2007 - val_accuracy: 0.8913 - lr: 0.0099
Epoch 52/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3298 - accuracy:
0.8576 - val_loss: 0.2461 - val_accuracy: 0.8673 - lr: 0.0099
Epoch 53/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3367 - accuracy:
0.8534 - val_loss: 0.1456 - val_accuracy: 0.9195 - lr: 0.0099
Epoch 54/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3304 - accuracy:
0.8560 - val_loss: 0.1785 - val_accuracy: 0.8972 - lr: 0.0099
Epoch 55/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3276 - accuracy:
0.8571 - val_loss: 0.2057 - val_accuracy: 0.8905 - lr: 0.0099
Epoch 56/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3283 - accuracy:
0.8574 - val_loss: 0.1990 - val_accuracy: 0.8936 - lr: 0.0099
Epoch 57/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3283 - accuracy:
0.8587 - val_loss: 0.1580 - val_accuracy: 0.9113 - lr: 0.0099
Epoch 58/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3287 - accuracy:
0.8571 - val_loss: 0.1383 - val_accuracy: 0.9223 - lr: 0.0099
Epoch 59/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3291 - accuracy:
0.8573 - val_loss: 0.1441 - val_accuracy: 0.9207 - lr: 0.0099
Epoch 60/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3262 - accuracy:
0.8585 - val_loss: 0.2067 - val_accuracy: 0.8917 - lr: 0.0099
Epoch 61/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3277 - accuracy:
0.8585 - val_loss: 0.2108 - val_accuracy: 0.8830 - lr: 0.0099
Epoch 62/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3277 - accuracy:
0.8579 - val_loss: 0.1325 - val_accuracy: 0.9317 - lr: 0.0099
Epoch 63/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3275 - accuracy:
0.8577 - val_loss: 0.1296 - val_accuracy: 0.9254 - lr: 0.0099
Epoch 64/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3278 - accuracy:
0.8587 - val_loss: 0.1618 - val_accuracy: 0.9117 - lr: 0.0099
Epoch 65/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3293 - accuracy:
0.8576 - val_loss: 0.1032 - val_accuracy: 0.9462 - lr: 0.0099
Epoch 66/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3413 - accuracy:
0.8531 - val_loss: 0.1785 - val_accuracy: 0.9062 - lr: 0.0099
Epoch 67/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3239 - accuracy:
0.8598 - val_loss: 0.1925 - val_accuracy: 0.8936 - lr: 0.0099
Epoch 68/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3259 - accuracy:
0.8562 - val_loss: 0.1490 - val_accuracy: 0.9180 - lr: 0.0099
Epoch 69/2000
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11/11 [==============================] - 0s 4ms/step - loss: 0.3232 - accuracy:
0.8600 - val_loss: 0.1078 - val_accuracy: 0.9462 - lr: 0.0099
Epoch 70/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3263 - accuracy:
0.8586 - val_loss: 0.2022 - val_accuracy: 0.8917 - lr: 0.0099
Epoch 71/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3250 - accuracy:
0.8588 - val_loss: 0.2644 - val_accuracy: 0.8462 - lr: 0.0099
Epoch 72/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3271 - accuracy:
0.8588 - val_loss: 0.2234 - val_accuracy: 0.8799 - lr: 0.0099
Epoch 73/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3259 - accuracy:
0.8571 - val_loss: 0.2000 - val_accuracy: 0.8905 - lr: 0.0099
Epoch 74/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3246 - accuracy:
0.8592 - val_loss: 0.2317 - val_accuracy: 0.8717 - lr: 0.0099
Epoch 75/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3270 - accuracy:
0.8579 - val_loss: 0.1589 - val_accuracy: 0.9168 - lr: 0.0099
Epoch 76/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3243 - accuracy:
0.8541 - val_loss: 0.1376 - val_accuracy: 0.9270 - lr: 0.0099
Epoch 77/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3227 - accuracy:
0.8592 - val_loss: 0.1940 - val_accuracy: 0.8952 - lr: 0.0099
Epoch 78/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3227 - accuracy:
0.8603 - val_loss: 0.1781 - val_accuracy: 0.9038 - lr: 0.0099
Epoch 79/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3230 - accuracy:
0.8574 - val_loss: 0.1819 - val_accuracy: 0.8995 - lr: 0.0098
Epoch 80/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3208 - accuracy:
0.8572 - val_loss: 0.1800 - val_accuracy: 0.9007 - lr: 0.0098
Epoch 81/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3244 - accuracy:
0.8568 - val_loss: 0.1950 - val_accuracy: 0.8936 - lr: 0.0098
Epoch 82/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3224 - accuracy:
0.8604 - val_loss: 0.1569 - val_accuracy: 0.9160 - lr: 0.0098
Epoch 83/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3219 - accuracy:
0.8602 - val_loss: 0.1970 - val_accuracy: 0.8948 - lr: 0.0098
Epoch 84/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3198 - accuracy:
0.8593 - val_loss: 0.1637 - val_accuracy: 0.9160 - lr: 0.0098
Epoch 85/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3275 - accuracy:
0.8570 - val_loss: 0.1381 - val_accuracy: 0.9274 - lr: 0.0098
Epoch 86/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3190 - accuracy:
0.8616 - val_loss: 0.1836 - val_accuracy: 0.9019 - lr: 0.0098
Epoch 87/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3194 - accuracy:
0.8626 - val_loss: 0.1638 - val_accuracy: 0.9125 - lr: 0.0098
Epoch 88/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3211 - accuracy:
0.8599 - val_loss: 0.1713 - val_accuracy: 0.9121 - lr: 0.0098
Epoch 89/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3204 - accuracy:
0.8603 - val_loss: 0.1714 - val_accuracy: 0.9089 - lr: 0.0098
Epoch 90/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3178 - accuracy:
0.8606 - val_loss: 0.1837 - val_accuracy: 0.9038 - lr: 0.0098
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Epoch 91/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3178 - accuracy:
0.8634 - val_loss: 0.2154 - val_accuracy: 0.8838 - lr: 0.0098
Epoch 92/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3193 - accuracy:
0.8611 - val_loss: 0.1415 - val_accuracy: 0.9297 - lr: 0.0098
Epoch 93/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3224 - accuracy:
0.8617 - val_loss: 0.1764 - val_accuracy: 0.9078 - lr: 0.0098
Epoch 94/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3235 - accuracy:
0.8596 - val_loss: 0.1426 - val_accuracy: 0.9282 - lr: 0.0098
Epoch 95/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3181 - accuracy:
0.8626 - val_loss: 0.2076 - val_accuracy: 0.8881 - lr: 0.0098
Epoch 96/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3174 - accuracy:
0.8621 - val_loss: 0.1494 - val_accuracy: 0.9246 - lr: 0.0098
Epoch 97/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3210 - accuracy:
0.8590 - val_loss: 0.1524 - val_accuracy: 0.9243 - lr: 0.0098
Epoch 98/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3172 - accuracy:
0.8605 - val_loss: 0.1719 - val_accuracy: 0.9097 - lr: 0.0098
Epoch 99/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3186 - accuracy:
0.8619 - val_loss: 0.1625 - val_accuracy: 0.9141 - lr: 0.0098
Epoch 100/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3193 - accuracy:
0.8602 - val_loss: 0.1821 - val_accuracy: 0.9035 - lr: 0.0098
Epoch 101/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3162 - accuracy:
0.8620 - val_loss: 0.2048 - val_accuracy: 0.8885 - lr: 0.0098
Epoch 102/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3233 - accuracy:
0.8567 - val_loss: 0.1428 - val_accuracy: 0.9278 - lr: 0.0097
Epoch 103/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3171 - accuracy:
0.8614 - val_loss: 0.1481 - val_accuracy: 0.9254 - lr: 0.0097
Epoch 104/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3177 - accuracy:
0.8594 - val_loss: 0.2136 - val_accuracy: 0.8834 - lr: 0.0097
Epoch 105/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3222 - accuracy:
0.8575 - val_loss: 0.1559 - val_accuracy: 0.9227 - lr: 0.0097
Epoch 106/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3169 - accuracy:
0.8597 - val_loss: 0.1604 - val_accuracy: 0.9172 - lr: 0.0097
Epoch 107/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3192 - accuracy:
0.8606 - val_loss: 0.1941 - val_accuracy: 0.8881 - lr: 0.0097
Epoch 108/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3192 - accuracy:
0.8595 - val_loss: 0.1239 - val_accuracy: 0.9407 - lr: 0.0097
Epoch 109/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3150 - accuracy:
0.8598 - val_loss: 0.1599 - val_accuracy: 0.9211 - lr: 0.0097
Epoch 110/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3165 - accuracy:
0.8610 - val_loss: 0.1642 - val_accuracy: 0.9172 - lr: 0.0097
Epoch 111/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3179 - accuracy:
0.8613 - val_loss: 0.1362 - val_accuracy: 0.9349 - lr: 0.0097
Epoch 112/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3153 - accuracy:
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0.8611 - val_loss: 0.1467 - val_accuracy: 0.9297 - lr: 0.0097
Epoch 113/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3154 - accuracy:
0.8596 - val_loss: 0.1893 - val_accuracy: 0.9003 - lr: 0.0097
Epoch 114/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3149 - accuracy:
0.8636 - val_loss: 0.1482 - val_accuracy: 0.9258 - lr: 0.0097
Epoch 115/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3175 - accuracy:
0.8623 - val_loss: 0.1422 - val_accuracy: 0.9337 - lr: 0.0097
Epoch 116/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3147 - accuracy:
0.8635 - val_loss: 0.1313 - val_accuracy: 0.9368 - lr: 0.0097
Epoch 117/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3169 - accuracy:
0.8610 - val_loss: 0.1654 - val_accuracy: 0.9192 - lr: 0.0097
Epoch 118/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3152 - accuracy:
0.8594 - val_loss: 0.1920 - val_accuracy: 0.8976 - lr: 0.0097
Epoch 119/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3177 - accuracy:
0.8614 - val_loss: 0.1212 - val_accuracy: 0.9454 - lr: 0.0097
Epoch 120/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3159 - accuracy:
0.8620 - val_loss: 0.1835 - val_accuracy: 0.9042 - lr: 0.0096
Epoch 121/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3148 - accuracy:
0.8618 - val_loss: 0.1958 - val_accuracy: 0.8984 - lr: 0.0096
Epoch 122/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3144 - accuracy:
0.8632 - val_loss: 0.1712 - val_accuracy: 0.9117 - lr: 0.0096
Epoch 123/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3123 - accuracy:
0.8628 - val_loss: 0.1646 - val_accuracy: 0.9172 - lr: 0.0096
Epoch 124/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3093 - accuracy:
0.8662 - val_loss: 0.1598 - val_accuracy: 0.9211 - lr: 0.0096
Epoch 125/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3128 - accuracy:
0.8650 - val_loss: 0.1474 - val_accuracy: 0.9274 - lr: 0.0096
Epoch 126/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3120 - accuracy:
0.8637 - val_loss: 0.2072 - val_accuracy: 0.8948 - lr: 0.0096
Epoch 127/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3130 - accuracy:
0.8624 - val_loss: 0.1492 - val_accuracy: 0.9243 - lr: 0.0096
Epoch 128/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3101 - accuracy:
0.8639 - val_loss: 0.1776 - val_accuracy: 0.9046 - lr: 0.0096
Epoch 129/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3104 - accuracy:
0.8623 - val_loss: 0.1875 - val_accuracy: 0.9035 - lr: 0.0096
Epoch 130/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3138 - accuracy:
0.8629 - val_loss: 0.1564 - val_accuracy: 0.9195 - lr: 0.0096
Epoch 131/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3107 - accuracy:
0.8643 - val_loss: 0.1958 - val_accuracy: 0.9023 - lr: 0.0096
Epoch 132/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3132 - accuracy:
0.8623 - val_loss: 0.1687 - val_accuracy: 0.9172 - lr: 0.0096
Epoch 133/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3122 - accuracy:
0.8631 - val_loss: 0.1175 - val_accuracy: 0.9431 - lr: 0.0096
Epoch 134/2000
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11/11 [==============================] - 0s 4ms/step - loss: 0.3181 - accuracy:
0.8612 - val_loss: 0.1458 - val_accuracy: 0.9290 - lr: 0.0096
Epoch 135/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3134 - accuracy:
0.8625 - val_loss: 0.2057 - val_accuracy: 0.8984 - lr: 0.0096
Epoch 136/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3137 - accuracy:
0.8628 - val_loss: 0.1169 - val_accuracy: 0.9427 - lr: 0.0096
Epoch 137/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3091 - accuracy:
0.8644 - val_loss: 0.1309 - val_accuracy: 0.9380 - lr: 0.0095
Epoch 138/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3104 - accuracy:
0.8634 - val_loss: 0.1826 - val_accuracy: 0.9082 - lr: 0.0095
Epoch 139/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3064 - accuracy:
0.8681 - val_loss: 0.1320 - val_accuracy: 0.9384 - lr: 0.0095
Epoch 140/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3088 - accuracy:
0.8638 - val_loss: 0.1453 - val_accuracy: 0.9286 - lr: 0.0095
Epoch 141/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3122 - accuracy:
0.8638 - val_loss: 0.1723 - val_accuracy: 0.9148 - lr: 0.0095
Epoch 142/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3161 - accuracy:
0.8620 - val_loss: 0.2039 - val_accuracy: 0.8885 - lr: 0.0095
Epoch 143/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3079 - accuracy:
0.8650 - val_loss: 0.1892 - val_accuracy: 0.9038 - lr: 0.0095
Epoch 144/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3060 - accuracy:
0.8672 - val_loss: 0.1421 - val_accuracy: 0.9321 - lr: 0.0095
Epoch 145/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3109 - accuracy:
0.8646 - val_loss: 0.1131 - val_accuracy: 0.9474 - lr: 0.0095
Epoch 146/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3085 - accuracy:
0.8645 - val_loss: 0.1901 - val_accuracy: 0.8999 - lr: 0.0095
Epoch 147/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3073 - accuracy:
0.8662 - val_loss: 0.1989 - val_accuracy: 0.9003 - lr: 0.0095
Epoch 148/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3092 - accuracy:
0.8628 - val_loss: 0.1689 - val_accuracy: 0.9215 - lr: 0.0095
Epoch 149/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3065 - accuracy:
0.8676 - val_loss: 0.1755 - val_accuracy: 0.9066 - lr: 0.0095
Epoch 150/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3109 - accuracy:
0.8631 - val_loss: 0.2714 - val_accuracy: 0.8359 - lr: 0.0095
Epoch 151/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3101 - accuracy:
0.8641 - val_loss: 0.1569 - val_accuracy: 0.9246 - lr: 0.0094
Epoch 152/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3072 - accuracy:
0.8640 - val_loss: 0.2258 - val_accuracy: 0.8862 - lr: 0.0094
Epoch 153/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3076 - accuracy:
0.8664 - val_loss: 0.1323 - val_accuracy: 0.9376 - lr: 0.0094
Epoch 154/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3113 - accuracy:
0.8627 - val_loss: 0.1567 - val_accuracy: 0.9227 - lr: 0.0094
Epoch 155/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3051 - accuracy:
0.8668 - val_loss: 0.2026 - val_accuracy: 0.8995 - lr: 0.0094
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Epoch 156/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3089 - accuracy:
0.8667 - val_loss: 0.1552 - val_accuracy: 0.9203 - lr: 0.0094
Epoch 157/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3114 - accuracy:
0.8630 - val_loss: 0.1013 - val_accuracy: 0.9541 - lr: 0.0094
Epoch 158/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3112 - accuracy:
0.8620 - val_loss: 0.1542 - val_accuracy: 0.9215 - lr: 0.0094
Epoch 159/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3056 - accuracy:
0.8672 - val_loss: 0.1924 - val_accuracy: 0.8964 - lr: 0.0094
Epoch 160/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3104 - accuracy:
0.8635 - val_loss: 0.1338 - val_accuracy: 0.9384 - lr: 0.0094
Epoch 161/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3072 - accuracy:
0.8641 - val_loss: 0.1182 - val_accuracy: 0.9447 - lr: 0.0094
Epoch 162/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3081 - accuracy:
0.8640 - val_loss: 0.1793 - val_accuracy: 0.9046 - lr: 0.0094
Epoch 163/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3069 - accuracy:
0.8654 - val_loss: 0.1467 - val_accuracy: 0.9297 - lr: 0.0094
Epoch 164/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3076 - accuracy:
0.8665 - val_loss: 0.2238 - val_accuracy: 0.8787 - lr: 0.0094
Epoch 165/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3051 - accuracy:
0.8673 - val_loss: 0.1793 - val_accuracy: 0.9062 - lr: 0.0093
Epoch 166/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3108 - accuracy:
0.8644 - val_loss: 0.1511 - val_accuracy: 0.9227 - lr: 0.0093
Epoch 167/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3041 - accuracy:
0.8668 - val_loss: 0.1459 - val_accuracy: 0.9262 - lr: 0.0093
Epoch 168/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3077 - accuracy:
0.8655 - val_loss: 0.2114 - val_accuracy: 0.8878 - lr: 0.0093
Epoch 169/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3061 - accuracy:
0.8661 - val_loss: 0.1471 - val_accuracy: 0.9258 - lr: 0.0093
Epoch 170/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3057 - accuracy:
0.8676 - val_loss: 0.1677 - val_accuracy: 0.9117 - lr: 0.0093
Epoch 171/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3068 - accuracy:
0.8672 - val_loss: 0.1229 - val_accuracy: 0.9419 - lr: 0.0093
Epoch 172/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3073 - accuracy:
0.8676 - val_loss: 0.2041 - val_accuracy: 0.8921 - lr: 0.0093
Epoch 173/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3039 - accuracy:
0.8676 - val_loss: 0.1979 - val_accuracy: 0.8984 - lr: 0.0093
Epoch 174/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3072 - accuracy:
0.8664 - val_loss: 0.2147 - val_accuracy: 0.8795 - lr: 0.0093
Epoch 175/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3050 - accuracy:
0.8670 - val_loss: 0.1421 - val_accuracy: 0.9349 - lr: 0.0093
Epoch 176/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3071 - accuracy:
0.8662 - val_loss: 0.1501 - val_accuracy: 0.9250 - lr: 0.0093
Epoch 177/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3039 - accuracy:
```

```
0.8696 - val_loss: 0.2165 - val_accuracy: 0.8791 - lr: 0.0093
Epoch 178/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3073 - accuracy:
0.8638 - val_loss: 0.1454 - val_accuracy: 0.9282 - lr: 0.0092
Epoch 179/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3077 - accuracy:
0.8656 - val_loss: 0.1991 - val_accuracy: 0.8936 - lr: 0.0092
Epoch 180/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3075 - accuracy:
0.8647 - val_loss: 0.1829 - val_accuracy: 0.9011 - lr: 0.0092
Epoch 181/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3070 - accuracy:
0.8660 - val_loss: 0.2187 - val_accuracy: 0.8881 - lr: 0.0092
Epoch 182/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3065 - accuracy:
0.8635 - val_loss: 0.1749 - val_accuracy: 0.9101 - lr: 0.0092
Epoch 183/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3075 - accuracy:
0.8657 - val_loss: 0.0960 - val_accuracy: 0.9584 - lr: 0.0092
Epoch 184/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3097 - accuracy:
0.8617 - val_loss: 0.2040 - val_accuracy: 0.8936 - lr: 0.0092
Epoch 185/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3062 - accuracy:
0.8655 - val_loss: 0.1691 - val_accuracy: 0.9133 - lr: 0.0092
Epoch 186/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3063 - accuracy:
0.8676 - val_loss: 0.1800 - val_accuracy: 0.9031 - lr: 0.0092
Epoch 187/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3065 - accuracy:
0.8672 - val_loss: 0.1947 - val_accuracy: 0.8956 - lr: 0.0092
Epoch 188/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3043 - accuracy:
0.8668 - val_loss: 0.2389 - val_accuracy: 0.8728 - lr: 0.0092
Epoch 189/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3084 - accuracy:
0.8660 - val_loss: 0.1291 - val_accuracy: 0.9423 - lr: 0.0092
Epoch 190/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3080 - accuracy:
0.8656 - val_loss: 0.1520 - val_accuracy: 0.9278 - lr: 0.0091
Epoch 191/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3039 - accuracy:
0.8666 - val_loss: 0.1620 - val_accuracy: 0.9215 - lr: 0.0091
Epoch 192/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3017 - accuracy:
0.8693 - val_loss: 0.1658 - val_accuracy: 0.9172 - lr: 0.0091
Epoch 193/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3041 - accuracy:
0.8666 - val_loss: 0.1477 - val_accuracy: 0.9301 - lr: 0.0091
Epoch 194/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3041 - accuracy:
0.8657 - val_loss: 0.1867 - val_accuracy: 0.9046 - lr: 0.0091
Epoch 195/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3058 - accuracy:
0.8666 - val_loss: 0.1400 - val_accuracy: 0.9337 - lr: 0.0091
Epoch 196/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3014 - accuracy:
0.8700 - val_loss: 0.2249 - val_accuracy: 0.8787 - lr: 0.0091
Epoch 197/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3041 - accuracy:
0.8686 - val_loss: 0.2747 - val_accuracy: 0.8528 - lr: 0.0091
Epoch 198/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3041 - accuracy:
0.8667 - val_loss: 0.1353 - val_accuracy: 0.9396 - lr: 0.0091
Epoch 199/2000
```

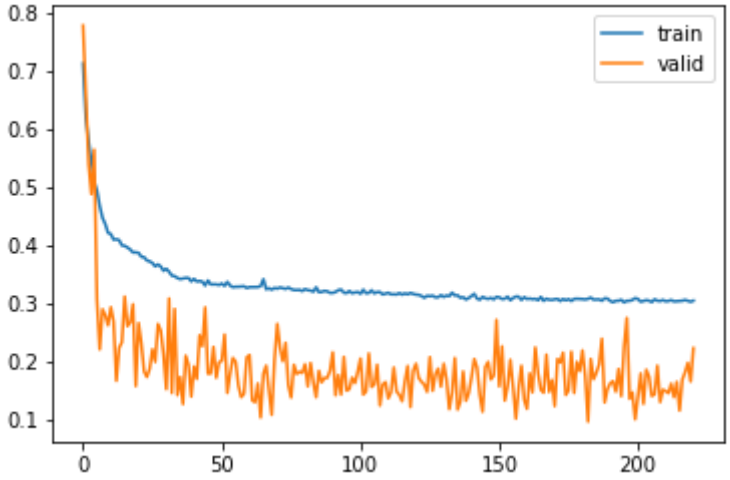
```
11/11 [==============================] - 0s 4ms/step - loss: 0.3055 - accuracy:
0.8645 - val_loss: 0.1464 - val_accuracy: 0.9278 - lr: 0.0091
Epoch 200/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3087 - accuracy:
0.8671 - val_loss: 0.1001 - val_accuracy: 0.9509 - lr: 0.0091
Epoch 201/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3072 - accuracy:
0.8665 - val_loss: 0.1389 - val_accuracy: 0.9333 - lr: 0.0090
Epoch 202/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3025 - accuracy:
0.8684 - val_loss: 0.1791 - val_accuracy: 0.9058 - lr: 0.0090
Epoch 203/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3040 - accuracy:
0.8680 - val_loss: 0.1266 - val_accuracy: 0.9451 - lr: 0.0090
Epoch 204/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3052 - accuracy:
0.8651 - val_loss: 0.1855 - val_accuracy: 0.9050 - lr: 0.0090
Epoch 205/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3043 - accuracy:
0.8664 - val_loss: 0.1737 - val_accuracy: 0.9062 - lr: 0.0090
Epoch 206/2000
11/11 [==============================] - 0s 5ms/step - loss: 0.3019 - accuracy:
0.8680 - val_loss: 0.1401 - val_accuracy: 0.9290 - lr: 0.0090
Epoch 207/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3067 - accuracy:
0.8649 - val_loss: 0.1433 - val_accuracy: 0.9274 - lr: 0.0090
Epoch 208/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3043 - accuracy:
0.8668 - val_loss: 0.1926 - val_accuracy: 0.8948 - lr: 0.0090
Epoch 209/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3037 - accuracy:
0.8674 - val_loss: 0.1297 - val_accuracy: 0.9360 - lr: 0.0090
Epoch 210/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3055 - accuracy:
0.8661 - val_loss: 0.1511 - val_accuracy: 0.9211 - lr: 0.0090
Epoch 211/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3033 - accuracy:
0.8688 - val_loss: 0.1487 - val_accuracy: 0.9258 - lr: 0.0090
Epoch 212/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3038 - accuracy:
0.8659 - val_loss: 0.1451 - val_accuracy: 0.9297 - lr: 0.0089
Epoch 213/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3054 - accuracy:
0.8670 - val_loss: 0.1615 - val_accuracy: 0.9192 - lr: 0.0089
Epoch 214/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3031 - accuracy:
0.8672 - val_loss: 0.1381 - val_accuracy: 0.9321 - lr: 0.0089
Epoch 215/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3035 - accuracy:
0.8673 - val_loss: 0.1646 - val_accuracy: 0.9105 - lr: 0.0089
Epoch 216/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3036 - accuracy:
0.8683 - val_loss: 0.1152 - val_accuracy: 0.9431 - lr: 0.0089
Epoch 217/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3042 - accuracy:
0.8655 - val_loss: 0.1685 - val_accuracy: 0.9117 - lr: 0.0089
Epoch 218/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3056 - accuracy:
0.8665 - val_loss: 0.1811 - val_accuracy: 0.9097 - lr: 0.0089
Epoch 219/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3038 - accuracy:
0.8686 - val_loss: 0.1974 - val_accuracy: 0.8984 - lr: 0.0089
Epoch 220/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3025 - accuracy:
0.8682 - val_loss: 0.1652 - val_accuracy: 0.9160 - lr: 0.0089
```

```
Epoch 221/2000
11/11 [==============================] - 0s 4ms/step - loss: 0.3043 - accuracy:
0.8669 - val_loss: 0.2225 - val_accuracy: 0.8799 - lr: 0.0089
```

In [72]:
```
# Capturing learning history per epoch
hist4 = pd.DataFrame(hist_mod4.history)
hist4["epoch"] = hist_mod4.epoch

# Plotting accuracy at different epochs
plt.plot(hist4["loss"])
plt.plot(hist4["val_loss"])
plt.legend(("train", "valid"), loc=0)
```

Out[72]:
```
<matplotlib.legend.Legend at 0x1858f6d82b0>
```



In [73]:
```
model4_score = model4.evaluate(scaled_test_X, scaled_test_y)
```

```
63/63 [==============================] - 0s 646us/step - loss: 0.3519 - accurac
y: 0.8535
```

In [74]:
```
model5 = Sequential()

model5.add(
    Dense(units=9, input_dim=12, kernel_initializer="HeNormal", activation="leak
)

model5.add(Dropout(0.1))

model5.add(Dense(units=7, kernel_initializer="HeNormal", activation="leaky_relu"

model5.add(Dense(units=5, kernel_initializer="HeNormal", activation="leaky_relu"

model5.add(Dense(units=2, activation="relu"))

model5.add(Dense(1, kernel_initializer="HeNormal", activation="sigmoid"))

model5.compile(Nadam(lr=0.01), loss="binary_crossentropy", metrics=["accuracy"])

model5.summary()
```

```
Model: "sequential_4"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
```

```
=================================================================
 dense_14 (Dense)            (None, 9)                 117

 dropout_3 (Dropout)         (None, 9)                 0

 dense_15 (Dense)            (None, 7)                 70

 dense_16 (Dense)            (None, 5)                 40

 dense_17 (Dense)            (None, 2)                 12

 dense_18 (Dense)            (None, 1)                 3

=================================================================
Total params: 242
Trainable params: 242
Non-trainable params: 0
_________________________________________________________________
```

In [75]:
```
initial_learning_rate = 0.01
epochs = 2000
decay = initial_learning_rate / epochs


def lr_time_based_decay(epoch, lr):
    return lr * 1 / (1 + decay * epoch)
```

In [76]:
```
hist_mod5 = model5.fit(
    scaled_train_X,
    scaled_train_y,
    batch_size=1000,
    epochs=2000,
    validation_split=0.2,
    callbacks=[LearningRateScheduler(lr_time_based_decay), (es2)],
)
```

```
Epoch 1/2000
7/7 [==============================] - 1s 23ms/step - loss: 0.6907 - accuracy:
0.6495 - val_loss: 0.6775 - val_accuracy: 0.7906 - lr: 0.0100
Epoch 2/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.6711 - accuracy: 0.
7966 - val_loss: 0.6620 - val_accuracy: 0.7906 - lr: 0.0100
Epoch 3/2000
7/7 [==============================] - 0s 6ms/step - loss: 0.6549 - accuracy: 0.
7977 - val_loss: 0.6462 - val_accuracy: 0.7906 - lr: 0.0100
Epoch 4/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.6389 - accuracy: 0.
7977 - val_loss: 0.6313 - val_accuracy: 0.7906 - lr: 0.0100
Epoch 5/2000
7/7 [==============================] - 0s 6ms/step - loss: 0.6240 - accuracy: 0.
7977 - val_loss: 0.6175 - val_accuracy: 0.7906 - lr: 0.0100
Epoch 6/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.6102 - accuracy: 0.
7977 - val_loss: 0.6050 - val_accuracy: 0.7906 - lr: 0.0100
Epoch 7/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.5977 - accuracy: 0.
7977 - val_loss: 0.5935 - val_accuracy: 0.7906 - lr: 0.0100
Epoch 8/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.5864 - accuracy: 0.
7977 - val_loss: 0.5834 - val_accuracy: 0.7906 - lr: 0.0100
Epoch 9/2000
```

```
7/7 [==============================] - 0s 5ms/step - loss: 0.5763 - accuracy: 0.
7977 - val_loss: 0.5742 - val_accuracy: 0.7906 - lr: 0.0100
Epoch 10/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.5671 - accuracy: 0.
7977 - val_loss: 0.5660 - val_accuracy: 0.7906 - lr: 0.0100
Epoch 11/2000
7/7 [==============================] - 0s 6ms/step - loss: 0.5589 - accuracy: 0.
7977 - val_loss: 0.5586 - val_accuracy: 0.7906 - lr: 0.0100
Epoch 12/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.5515 - accuracy: 0.
7977 - val_loss: 0.5516 - val_accuracy: 0.7906 - lr: 0.0100
Epoch 13/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.5443 - accuracy: 0.
7977 - val_loss: 0.5444 - val_accuracy: 0.7906 - lr: 0.0100
Epoch 14/2000
7/7 [==============================] - 0s 6ms/step - loss: 0.5370 - accuracy: 0.
7977 - val_loss: 0.5363 - val_accuracy: 0.7919 - lr: 0.0100
Epoch 15/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.5294 - accuracy: 0.
8011 - val_loss: 0.5287 - val_accuracy: 0.7981 - lr: 0.0100
Epoch 16/2000
7/7 [==============================] - 0s 6ms/step - loss: 0.5222 - accuracy: 0.
8033 - val_loss: 0.5205 - val_accuracy: 0.7987 - lr: 0.0100
Epoch 17/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.5162 - accuracy: 0.
8045 - val_loss: 0.5154 - val_accuracy: 0.7987 - lr: 0.0100
Epoch 18/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.5096 - accuracy: 0.
8081 - val_loss: 0.5138 - val_accuracy: 0.7994 - lr: 0.0100
Epoch 19/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.5052 - accuracy: 0.
8075 - val_loss: 0.5086 - val_accuracy: 0.8012 - lr: 0.0100
Epoch 20/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.5007 - accuracy: 0.
8086 - val_loss: 0.5001 - val_accuracy: 0.8050 - lr: 0.0100
Epoch 21/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4948 - accuracy: 0.
8112 - val_loss: 0.4958 - val_accuracy: 0.8056 - lr: 0.0100
Epoch 22/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4904 - accuracy: 0.
8128 - val_loss: 0.4931 - val_accuracy: 0.8025 - lr: 0.0100
Epoch 23/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4905 - accuracy: 0.
8105 - val_loss: 0.4954 - val_accuracy: 0.8056 - lr: 0.0100
Epoch 24/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4861 - accuracy: 0.
8105 - val_loss: 0.4849 - val_accuracy: 0.8037 - lr: 0.0100
Epoch 25/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4822 - accuracy: 0.
8138 - val_loss: 0.4791 - val_accuracy: 0.8075 - lr: 0.0100
Epoch 26/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4767 - accuracy: 0.
8158 - val_loss: 0.4736 - val_accuracy: 0.8094 - lr: 0.0100
Epoch 27/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4755 - accuracy: 0.
8150 - val_loss: 0.4930 - val_accuracy: 0.8019 - lr: 0.0100
Epoch 28/2000
7/7 [==============================] - 0s 6ms/step - loss: 0.4729 - accuracy: 0.
8186 - val_loss: 0.4679 - val_accuracy: 0.8181 - lr: 0.0100
Epoch 29/2000
7/7 [==============================] - 0s 6ms/step - loss: 0.4683 - accuracy: 0.
8175 - val_loss: 0.4778 - val_accuracy: 0.8050 - lr: 0.0100
Epoch 30/2000
7/7 [==============================] - 0s 7ms/step - loss: 0.4634 - accuracy: 0.
8206 - val_loss: 0.4530 - val_accuracy: 0.8306 - lr: 0.0100
```

```
Epoch 31/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4636 - accuracy: 0.
8227 - val_loss: 0.4490 - val_accuracy: 0.8300 - lr: 0.0100
Epoch 32/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4573 - accuracy: 0.
8253 - val_loss: 0.4559 - val_accuracy: 0.8250 - lr: 0.0100
Epoch 33/2000
7/7 [==============================] - 0s 6ms/step - loss: 0.4628 - accuracy: 0.
8211 - val_loss: 0.4427 - val_accuracy: 0.8313 - lr: 0.0100
Epoch 34/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4515 - accuracy: 0.
8277 - val_loss: 0.4395 - val_accuracy: 0.8306 - lr: 0.0100
Epoch 35/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4487 - accuracy: 0.
8286 - val_loss: 0.4378 - val_accuracy: 0.8338 - lr: 0.0100
Epoch 36/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4461 - accuracy: 0.
8297 - val_loss: 0.4370 - val_accuracy: 0.8413 - lr: 0.0100
Epoch 37/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4529 - accuracy: 0.
8253 - val_loss: 0.4321 - val_accuracy: 0.8363 - lr: 0.0100
Epoch 38/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4483 - accuracy: 0.
8273 - val_loss: 0.4328 - val_accuracy: 0.8344 - lr: 0.0100
Epoch 39/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4393 - accuracy: 0.
8327 - val_loss: 0.4476 - val_accuracy: 0.8275 - lr: 0.0100
Epoch 40/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4471 - accuracy: 0.
8252 - val_loss: 0.4326 - val_accuracy: 0.8369 - lr: 0.0100
Epoch 41/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4385 - accuracy: 0.
8331 - val_loss: 0.4303 - val_accuracy: 0.8381 - lr: 0.0100
Epoch 42/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4340 - accuracy: 0.
8355 - val_loss: 0.4218 - val_accuracy: 0.8419 - lr: 0.0100
Epoch 43/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4351 - accuracy: 0.
8356 - val_loss: 0.4232 - val_accuracy: 0.8450 - lr: 0.0100
Epoch 44/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4373 - accuracy: 0.
8325 - val_loss: 0.4180 - val_accuracy: 0.8425 - lr: 0.0100
Epoch 45/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4322 - accuracy: 0.
8377 - val_loss: 0.4162 - val_accuracy: 0.8462 - lr: 0.0100
Epoch 46/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4244 - accuracy: 0.
8381 - val_loss: 0.4134 - val_accuracy: 0.8438 - lr: 0.0099
Epoch 47/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4226 - accuracy: 0.
8406 - val_loss: 0.4108 - val_accuracy: 0.8487 - lr: 0.0099
Epoch 48/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4214 - accuracy: 0.
8414 - val_loss: 0.4007 - val_accuracy: 0.8475 - lr: 0.0099
Epoch 49/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4151 - accuracy: 0.
8442 - val_loss: 0.4078 - val_accuracy: 0.8444 - lr: 0.0099
Epoch 50/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4121 - accuracy: 0.
8422 - val_loss: 0.3946 - val_accuracy: 0.8569 - lr: 0.0099
Epoch 51/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4058 - accuracy: 0.
8483 - val_loss: 0.3890 - val_accuracy: 0.8494 - lr: 0.0099
Epoch 52/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4035 - accuracy: 0.
```

```
8484 - val_loss: 0.3904 - val_accuracy: 0.8494 - lr: 0.0099
Epoch 53/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4025 - accuracy: 0.
8505 - val_loss: 0.3905 - val_accuracy: 0.8519 - lr: 0.0099
Epoch 54/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4026 - accuracy: 0.
8484 - val_loss: 0.3821 - val_accuracy: 0.8625 - lr: 0.0099
Epoch 55/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4016 - accuracy: 0.
8487 - val_loss: 0.3864 - val_accuracy: 0.8512 - lr: 0.0099
Epoch 56/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3995 - accuracy: 0.
8495 - val_loss: 0.3893 - val_accuracy: 0.8519 - lr: 0.0099
Epoch 57/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4006 - accuracy: 0.
8478 - val_loss: 0.3803 - val_accuracy: 0.8644 - lr: 0.0099
Epoch 58/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3975 - accuracy: 0.
8505 - val_loss: 0.3810 - val_accuracy: 0.8581 - lr: 0.0099
Epoch 59/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.4017 - accuracy: 0.
8469 - val_loss: 0.3781 - val_accuracy: 0.8606 - lr: 0.0099
Epoch 60/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3954 - accuracy: 0.
8522 - val_loss: 0.3852 - val_accuracy: 0.8525 - lr: 0.0099
Epoch 61/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3937 - accuracy: 0.
8514 - val_loss: 0.3816 - val_accuracy: 0.8581 - lr: 0.0099
Epoch 62/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3939 - accuracy: 0.
8519 - val_loss: 0.3787 - val_accuracy: 0.8612 - lr: 0.0099
Epoch 63/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3946 - accuracy: 0.
8511 - val_loss: 0.3817 - val_accuracy: 0.8594 - lr: 0.0099
Epoch 64/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3940 - accuracy: 0.
8528 - val_loss: 0.3783 - val_accuracy: 0.8606 - lr: 0.0099
Epoch 65/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3937 - accuracy: 0.
8541 - val_loss: 0.3794 - val_accuracy: 0.8544 - lr: 0.0099
Epoch 66/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3928 - accuracy: 0.
8506 - val_loss: 0.3744 - val_accuracy: 0.8562 - lr: 0.0099
Epoch 67/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3919 - accuracy: 0.
8448 - val_loss: 0.3759 - val_accuracy: 0.8537 - lr: 0.0099
Epoch 68/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3860 - accuracy: 0.
8475 - val_loss: 0.3898 - val_accuracy: 0.8487 - lr: 0.0099
Epoch 69/2000
7/7 [==============================] - ETA: 0s - loss: 0.4027 - accuracy: 0.83 -
0s 5ms/step - loss: 0.3864 - accuracy: 0.8475 - val_loss: 0.3742 - val_accuracy:
0.8537 - lr: 0.0099
Epoch 70/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3815 - accuracy: 0.
8486 - val_loss: 0.3873 - val_accuracy: 0.8450 - lr: 0.0099
Epoch 71/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3827 - accuracy: 0.
8503 - val_loss: 0.3695 - val_accuracy: 0.8556 - lr: 0.0099
Epoch 72/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3780 - accuracy: 0.
8495 - val_loss: 0.3675 - val_accuracy: 0.8569 - lr: 0.0099
Epoch 73/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3780 - accuracy: 0.
8509 - val_loss: 0.3693 - val_accuracy: 0.8550 - lr: 0.0099
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Epoch 74/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3760 - accuracy: 0.
8506 - val_loss: 0.3633 - val_accuracy: 0.8575 - lr: 0.0099
Epoch 75/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3738 - accuracy: 0.
8522 - val_loss: 0.3646 - val_accuracy: 0.8575 - lr: 0.0099
Epoch 76/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3764 - accuracy: 0.
8505 - val_loss: 0.3684 - val_accuracy: 0.8525 - lr: 0.0099
Epoch 77/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3745 - accuracy: 0.
8523 - val_loss: 0.3673 - val_accuracy: 0.8544 - lr: 0.0099
Epoch 78/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3760 - accuracy: 0.
8477 - val_loss: 0.3603 - val_accuracy: 0.8619 - lr: 0.0099
Epoch 79/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3721 - accuracy: 0.
8500 - val_loss: 0.3581 - val_accuracy: 0.8619 - lr: 0.0098
Epoch 80/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3718 - accuracy: 0.
8523 - val_loss: 0.3665 - val_accuracy: 0.8537 - lr: 0.0098
Epoch 81/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3767 - accuracy: 0.
8505 - val_loss: 0.3620 - val_accuracy: 0.8581 - lr: 0.0098
Epoch 82/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3713 - accuracy: 0.
8519 - val_loss: 0.3596 - val_accuracy: 0.8619 - lr: 0.0098
Epoch 83/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3731 - accuracy: 0.
8478 - val_loss: 0.3622 - val_accuracy: 0.8575 - lr: 0.0098
Epoch 84/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3730 - accuracy: 0.
8494 - val_loss: 0.3849 - val_accuracy: 0.8419 - lr: 0.0098
Epoch 85/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3750 - accuracy: 0.
8500 - val_loss: 0.3612 - val_accuracy: 0.8594 - lr: 0.0098
Epoch 86/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3692 - accuracy: 0.
8502 - val_loss: 0.3653 - val_accuracy: 0.8531 - lr: 0.0098
Epoch 87/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3694 - accuracy: 0.
8523 - val_loss: 0.3575 - val_accuracy: 0.8594 - lr: 0.0098
Epoch 88/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3664 - accuracy: 0.
8520 - val_loss: 0.3558 - val_accuracy: 0.8619 - lr: 0.0098
Epoch 89/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3661 - accuracy: 0.
8522 - val_loss: 0.3601 - val_accuracy: 0.8569 - lr: 0.0098
Epoch 90/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3662 - accuracy: 0.
8502 - val_loss: 0.3745 - val_accuracy: 0.8450 - lr: 0.0098
Epoch 91/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3638 - accuracy: 0.
8516 - val_loss: 0.3739 - val_accuracy: 0.8487 - lr: 0.0098
Epoch 92/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3650 - accuracy: 0.
8553 - val_loss: 0.3607 - val_accuracy: 0.8562 - lr: 0.0098
Epoch 93/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3635 - accuracy: 0.
8505 - val_loss: 0.3561 - val_accuracy: 0.8619 - lr: 0.0098
Epoch 94/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3603 - accuracy: 0.
8525 - val_loss: 0.3630 - val_accuracy: 0.8525 - lr: 0.0098
Epoch 95/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3638 - accuracy: 0.
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8509 - val_loss: 0.3615 - val_accuracy: 0.8544 - lr: 0.0098
Epoch 96/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3615 - accuracy: 0.
8494 - val_loss: 0.3573 - val_accuracy: 0.8594 - lr: 0.0098
Epoch 97/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3641 - accuracy: 0.
8520 - val_loss: 0.3581 - val_accuracy: 0.8562 - lr: 0.0098
Epoch 98/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3621 - accuracy: 0.
8528 - val_loss: 0.3576 - val_accuracy: 0.8562 - lr: 0.0098
Epoch 99/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3622 - accuracy: 0.
8525 - val_loss: 0.3543 - val_accuracy: 0.8606 - lr: 0.0098
Epoch 100/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3569 - accuracy: 0.
8536 - val_loss: 0.3552 - val_accuracy: 0.8575 - lr: 0.0098
Epoch 101/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3605 - accuracy: 0.
8533 - val_loss: 0.3635 - val_accuracy: 0.8525 - lr: 0.0098
Epoch 102/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3620 - accuracy: 0.
8536 - val_loss: 0.3703 - val_accuracy: 0.8544 - lr: 0.0097
Epoch 103/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3613 - accuracy: 0.
8537 - val_loss: 0.3565 - val_accuracy: 0.8606 - lr: 0.0097
Epoch 104/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3632 - accuracy: 0.
8505 - val_loss: 0.3734 - val_accuracy: 0.8462 - lr: 0.0097
Epoch 105/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3639 - accuracy: 0.
8508 - val_loss: 0.3593 - val_accuracy: 0.8656 - lr: 0.0097
Epoch 106/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3589 - accuracy: 0.
8523 - val_loss: 0.3558 - val_accuracy: 0.8637 - lr: 0.0097
Epoch 107/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3620 - accuracy: 0.
8516 - val_loss: 0.3530 - val_accuracy: 0.8556 - lr: 0.0097
Epoch 108/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3584 - accuracy: 0.
8531 - val_loss: 0.3529 - val_accuracy: 0.8606 - lr: 0.0097
Epoch 109/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3563 - accuracy: 0.
8517 - val_loss: 0.3551 - val_accuracy: 0.8550 - lr: 0.0097
Epoch 110/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3559 - accuracy: 0.
8522 - val_loss: 0.3642 - val_accuracy: 0.8525 - lr: 0.0097
Epoch 111/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3608 - accuracy: 0.
8530 - val_loss: 0.3541 - val_accuracy: 0.8550 - lr: 0.0097
Epoch 112/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3568 - accuracy: 0.
8533 - val_loss: 0.3557 - val_accuracy: 0.8569 - lr: 0.0097
Epoch 113/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3551 - accuracy: 0.
8519 - val_loss: 0.3569 - val_accuracy: 0.8544 - lr: 0.0097
Epoch 114/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3572 - accuracy: 0.
8514 - val_loss: 0.3519 - val_accuracy: 0.8600 - lr: 0.0097
Epoch 115/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3564 - accuracy: 0.
8516 - val_loss: 0.3550 - val_accuracy: 0.8612 - lr: 0.0097
Epoch 116/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3563 - accuracy: 0.
8572 - val_loss: 0.3530 - val_accuracy: 0.8569 - lr: 0.0097
Epoch 117/2000
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7/7 [==============================] - 0s 5ms/step - loss: 0.3573 - accuracy: 0.
8548 - val_loss: 0.3532 - val_accuracy: 0.8606 - lr: 0.0097
Epoch 118/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3595 - accuracy: 0.
8523 - val_loss: 0.3596 - val_accuracy: 0.8544 - lr: 0.0097
Epoch 119/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3582 - accuracy: 0.
8572 - val_loss: 0.3540 - val_accuracy: 0.8537 - lr: 0.0097
Epoch 120/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3576 - accuracy: 0.
8534 - val_loss: 0.3559 - val_accuracy: 0.8562 - lr: 0.0096
Epoch 121/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3535 - accuracy: 0.
8556 - val_loss: 0.3523 - val_accuracy: 0.8594 - lr: 0.0096
Epoch 122/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3534 - accuracy: 0.
8553 - val_loss: 0.3567 - val_accuracy: 0.8531 - lr: 0.0096
Epoch 123/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3551 - accuracy: 0.
8531 - val_loss: 0.3562 - val_accuracy: 0.8562 - lr: 0.0096
Epoch 124/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3579 - accuracy: 0.
8541 - val_loss: 0.3591 - val_accuracy: 0.8525 - lr: 0.0096
Epoch 125/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3551 - accuracy: 0.
8550 - val_loss: 0.3577 - val_accuracy: 0.8550 - lr: 0.0096
Epoch 126/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3551 - accuracy: 0.
8536 - val_loss: 0.3566 - val_accuracy: 0.8512 - lr: 0.0096
Epoch 127/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3560 - accuracy: 0.
8534 - val_loss: 0.3529 - val_accuracy: 0.8569 - lr: 0.0096
Epoch 128/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3524 - accuracy: 0.
8552 - val_loss: 0.3534 - val_accuracy: 0.8587 - lr: 0.0096
Epoch 129/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3501 - accuracy: 0.
8542 - val_loss: 0.3595 - val_accuracy: 0.8519 - lr: 0.0096
Epoch 130/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3538 - accuracy: 0.
8520 - val_loss: 0.3514 - val_accuracy: 0.8631 - lr: 0.0096
Epoch 131/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3529 - accuracy: 0.
8528 - val_loss: 0.3553 - val_accuracy: 0.8544 - lr: 0.0096
Epoch 132/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3510 - accuracy: 0.
8584 - val_loss: 0.3489 - val_accuracy: 0.8606 - lr: 0.0096
Epoch 133/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3525 - accuracy: 0.
8562 - val_loss: 0.3636 - val_accuracy: 0.8431 - lr: 0.0096
Epoch 134/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3537 - accuracy: 0.
8559 - val_loss: 0.3499 - val_accuracy: 0.8612 - lr: 0.0096
Epoch 135/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3511 - accuracy: 0.
8548 - val_loss: 0.3533 - val_accuracy: 0.8550 - lr: 0.0096
Epoch 136/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3540 - accuracy: 0.
8523 - val_loss: 0.3545 - val_accuracy: 0.8519 - lr: 0.0096
Epoch 137/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3577 - accuracy: 0.
8536 - val_loss: 0.3675 - val_accuracy: 0.8456 - lr: 0.0095
Epoch 138/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3567 - accuracy: 0.
8545 - val_loss: 0.3481 - val_accuracy: 0.8650 - lr: 0.0095
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Epoch 139/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3544 - accuracy: 0.
8517 - val_loss: 0.3603 - val_accuracy: 0.8569 - lr: 0.0095
Epoch 140/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3537 - accuracy: 0.
8536 - val_loss: 0.3501 - val_accuracy: 0.8631 - lr: 0.0095
Epoch 141/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3493 - accuracy: 0.
8561 - val_loss: 0.3582 - val_accuracy: 0.8594 - lr: 0.0095
Epoch 142/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3515 - accuracy: 0.
8547 - val_loss: 0.3495 - val_accuracy: 0.8619 - lr: 0.0095
Epoch 143/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3509 - accuracy: 0.
8542 - val_loss: 0.3509 - val_accuracy: 0.8581 - lr: 0.0095
Epoch 144/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3503 - accuracy: 0.
8556 - val_loss: 0.3559 - val_accuracy: 0.8531 - lr: 0.0095
Epoch 145/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3480 - accuracy: 0.
8534 - val_loss: 0.3568 - val_accuracy: 0.8594 - lr: 0.0095
Epoch 146/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3530 - accuracy: 0.
8558 - val_loss: 0.3530 - val_accuracy: 0.8619 - lr: 0.0095
Epoch 147/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3479 - accuracy: 0.
8542 - val_loss: 0.3583 - val_accuracy: 0.8487 - lr: 0.0095
Epoch 148/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3486 - accuracy: 0.
8567 - val_loss: 0.3537 - val_accuracy: 0.8587 - lr: 0.0095
Epoch 149/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3527 - accuracy: 0.
8533 - val_loss: 0.3514 - val_accuracy: 0.8606 - lr: 0.0095
Epoch 150/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3492 - accuracy: 0.
8541 - val_loss: 0.3581 - val_accuracy: 0.8569 - lr: 0.0095
Epoch 151/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3512 - accuracy: 0.
8556 - val_loss: 0.3499 - val_accuracy: 0.8625 - lr: 0.0094
Epoch 152/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3502 - accuracy: 0.
8556 - val_loss: 0.3648 - val_accuracy: 0.8506 - lr: 0.0094
Epoch 153/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3516 - accuracy: 0.
8559 - val_loss: 0.3550 - val_accuracy: 0.8587 - lr: 0.0094
Epoch 154/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3485 - accuracy: 0.
8584 - val_loss: 0.3498 - val_accuracy: 0.8619 - lr: 0.0094
Epoch 155/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3494 - accuracy: 0.
8561 - val_loss: 0.3583 - val_accuracy: 0.8462 - lr: 0.0094
Epoch 156/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3520 - accuracy: 0.
8584 - val_loss: 0.3548 - val_accuracy: 0.8556 - lr: 0.0094
Epoch 157/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3510 - accuracy: 0.
8556 - val_loss: 0.3509 - val_accuracy: 0.8587 - lr: 0.0094
Epoch 158/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3502 - accuracy: 0.
8545 - val_loss: 0.3484 - val_accuracy: 0.8619 - lr: 0.0094
Epoch 159/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3471 - accuracy: 0.
8564 - val_loss: 0.3523 - val_accuracy: 0.8581 - lr: 0.0094
Epoch 160/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3460 - accuracy: 0.
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8564 - val_loss: 0.3512 - val_accuracy: 0.8562 - lr: 0.0094
Epoch 161/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3477 - accuracy: 0.
8583 - val_loss: 0.3488 - val_accuracy: 0.8619 - lr: 0.0094
Epoch 162/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3482 - accuracy: 0.
8562 - val_loss: 0.3501 - val_accuracy: 0.8606 - lr: 0.0094
Epoch 163/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3485 - accuracy: 0.
8534 - val_loss: 0.3482 - val_accuracy: 0.8631 - lr: 0.0094
Epoch 164/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3486 - accuracy: 0.
8545 - val_loss: 0.3497 - val_accuracy: 0.8644 - lr: 0.0094
Epoch 165/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3473 - accuracy: 0.
8572 - val_loss: 0.3594 - val_accuracy: 0.8550 - lr: 0.0093
Epoch 166/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3484 - accuracy: 0.
8553 - val_loss: 0.3589 - val_accuracy: 0.8519 - lr: 0.0093
Epoch 167/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3500 - accuracy: 0.
8570 - val_loss: 0.3495 - val_accuracy: 0.8612 - lr: 0.0093
Epoch 168/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3494 - accuracy: 0.
8573 - val_loss: 0.3511 - val_accuracy: 0.8587 - lr: 0.0093
Epoch 169/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3491 - accuracy: 0.
8591 - val_loss: 0.3496 - val_accuracy: 0.8644 - lr: 0.0093
Epoch 170/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3495 - accuracy: 0.
8522 - val_loss: 0.3647 - val_accuracy: 0.8531 - lr: 0.0093
Epoch 171/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3515 - accuracy: 0.
8567 - val_loss: 0.3537 - val_accuracy: 0.8556 - lr: 0.0093
Epoch 172/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3478 - accuracy: 0.
8584 - val_loss: 0.3488 - val_accuracy: 0.8625 - lr: 0.0093
Epoch 173/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3478 - accuracy: 0.
8561 - val_loss: 0.3509 - val_accuracy: 0.8569 - lr: 0.0093
Epoch 174/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3452 - accuracy: 0.
8608 - val_loss: 0.3484 - val_accuracy: 0.8619 - lr: 0.0093
Epoch 175/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3480 - accuracy: 0.
8553 - val_loss: 0.3546 - val_accuracy: 0.8562 - lr: 0.0093
Epoch 176/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3478 - accuracy: 0.
8566 - val_loss: 0.3489 - val_accuracy: 0.8569 - lr: 0.0093
Epoch 177/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3485 - accuracy: 0.
8581 - val_loss: 0.3509 - val_accuracy: 0.8581 - lr: 0.0093
Epoch 178/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3466 - accuracy: 0.
8558 - val_loss: 0.3534 - val_accuracy: 0.8537 - lr: 0.0092
Epoch 179/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3481 - accuracy: 0.
8567 - val_loss: 0.3479 - val_accuracy: 0.8625 - lr: 0.0092
Epoch 180/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3493 - accuracy: 0.
8528 - val_loss: 0.3545 - val_accuracy: 0.8550 - lr: 0.0092
Epoch 181/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3505 - accuracy: 0.
8530 - val_loss: 0.3579 - val_accuracy: 0.8550 - lr: 0.0092
Epoch 182/2000
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7/7 [==============================] - 0s 5ms/step - loss: 0.3446 - accuracy: 0.
8577 - val_loss: 0.3533 - val_accuracy: 0.8569 - lr: 0.0092
Epoch 183/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3457 - accuracy: 0.
8569 - val_loss: 0.3490 - val_accuracy: 0.8587 - lr: 0.0092
Epoch 184/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3440 - accuracy: 0.
8562 - val_loss: 0.3500 - val_accuracy: 0.8612 - lr: 0.0092
Epoch 185/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3471 - accuracy: 0.
8548 - val_loss: 0.3522 - val_accuracy: 0.8625 - lr: 0.0092
Epoch 186/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3467 - accuracy: 0.
8581 - val_loss: 0.3512 - val_accuracy: 0.8575 - lr: 0.0092
Epoch 187/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3464 - accuracy: 0.
8570 - val_loss: 0.3492 - val_accuracy: 0.8619 - lr: 0.0092
Epoch 188/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3452 - accuracy: 0.
8534 - val_loss: 0.3524 - val_accuracy: 0.8587 - lr: 0.0092
Epoch 189/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3460 - accuracy: 0.
8583 - val_loss: 0.3532 - val_accuracy: 0.8550 - lr: 0.0092
Epoch 190/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3462 - accuracy: 0.
8570 - val_loss: 0.3532 - val_accuracy: 0.8569 - lr: 0.0091
Epoch 191/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3459 - accuracy: 0.
8561 - val_loss: 0.3508 - val_accuracy: 0.8587 - lr: 0.0091
Epoch 192/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3450 - accuracy: 0.
8594 - val_loss: 0.3644 - val_accuracy: 0.8562 - lr: 0.0091
Epoch 193/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3478 - accuracy: 0.
8580 - val_loss: 0.3496 - val_accuracy: 0.8600 - lr: 0.0091
Epoch 194/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3484 - accuracy: 0.
8561 - val_loss: 0.3519 - val_accuracy: 0.8550 - lr: 0.0091
Epoch 195/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3465 - accuracy: 0.
8544 - val_loss: 0.3475 - val_accuracy: 0.8612 - lr: 0.0091
Epoch 196/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3458 - accuracy: 0.
8581 - val_loss: 0.3496 - val_accuracy: 0.8556 - lr: 0.0091
Epoch 197/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3435 - accuracy: 0.
8586 - val_loss: 0.3604 - val_accuracy: 0.8531 - lr: 0.0091
Epoch 198/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3465 - accuracy: 0.
8595 - val_loss: 0.3622 - val_accuracy: 0.8550 - lr: 0.0091
Epoch 199/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3462 - accuracy: 0.
8558 - val_loss: 0.3523 - val_accuracy: 0.8556 - lr: 0.0091
Epoch 200/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3411 - accuracy: 0.
8584 - val_loss: 0.3500 - val_accuracy: 0.8594 - lr: 0.0091
Epoch 201/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3445 - accuracy: 0.
8559 - val_loss: 0.3483 - val_accuracy: 0.8594 - lr: 0.0090
Epoch 202/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3436 - accuracy: 0.
8569 - val_loss: 0.3503 - val_accuracy: 0.8550 - lr: 0.0090
Epoch 203/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3440 - accuracy: 0.
8572 - val_loss: 0.3513 - val_accuracy: 0.8512 - lr: 0.0090
```

```
Epoch 204/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3455 - accuracy: 0.
8569 - val_loss: 0.3483 - val_accuracy: 0.8587 - lr: 0.0090
Epoch 205/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3445 - accuracy: 0.
8577 - val_loss: 0.3441 - val_accuracy: 0.8581 - lr: 0.0090
Epoch 206/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3468 - accuracy: 0.
8595 - val_loss: 0.3458 - val_accuracy: 0.8606 - lr: 0.0090
Epoch 207/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3460 - accuracy: 0.
8550 - val_loss: 0.3483 - val_accuracy: 0.8575 - lr: 0.0090
Epoch 208/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3436 - accuracy: 0.
8584 - val_loss: 0.3471 - val_accuracy: 0.8575 - lr: 0.0090
Epoch 209/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3451 - accuracy: 0.
8575 - val_loss: 0.3465 - val_accuracy: 0.8606 - lr: 0.0090
Epoch 210/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3461 - accuracy: 0.
8597 - val_loss: 0.3516 - val_accuracy: 0.8569 - lr: 0.0090
Epoch 211/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3440 - accuracy: 0.
8586 - val_loss: 0.3555 - val_accuracy: 0.8537 - lr: 0.0090
Epoch 212/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3435 - accuracy: 0.
8586 - val_loss: 0.3490 - val_accuracy: 0.8587 - lr: 0.0089
Epoch 213/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3431 - accuracy: 0.
8578 - val_loss: 0.3491 - val_accuracy: 0.8600 - lr: 0.0089
Epoch 214/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3447 - accuracy: 0.
8575 - val_loss: 0.3594 - val_accuracy: 0.8531 - lr: 0.0089
Epoch 215/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3450 - accuracy: 0.
8594 - val_loss: 0.3531 - val_accuracy: 0.8556 - lr: 0.0089
Epoch 216/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3459 - accuracy: 0.
8570 - val_loss: 0.3465 - val_accuracy: 0.8644 - lr: 0.0089
Epoch 217/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3437 - accuracy: 0.
8567 - val_loss: 0.3483 - val_accuracy: 0.8569 - lr: 0.0089
Epoch 218/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3408 - accuracy: 0.
8587 - val_loss: 0.3510 - val_accuracy: 0.8594 - lr: 0.0089
Epoch 219/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3445 - accuracy: 0.
8577 - val_loss: 0.3459 - val_accuracy: 0.8606 - lr: 0.0089
Epoch 220/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3445 - accuracy: 0.
8562 - val_loss: 0.3486 - val_accuracy: 0.8619 - lr: 0.0089
Epoch 221/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3434 - accuracy: 0.
8567 - val_loss: 0.3535 - val_accuracy: 0.8525 - lr: 0.0089
Epoch 222/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3460 - accuracy: 0.
8566 - val_loss: 0.3575 - val_accuracy: 0.8544 - lr: 0.0088
Epoch 223/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3467 - accuracy: 0.
8575 - val_loss: 0.3509 - val_accuracy: 0.8550 - lr: 0.0088
Epoch 224/2000
7/7 [==============================] - 0s 6ms/step - loss: 0.3421 - accuracy: 0.
8573 - val_loss: 0.3486 - val_accuracy: 0.8556 - lr: 0.0088
Epoch 225/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3393 - accuracy: 0.
```

```
8619 - val_loss: 0.3474 - val_accuracy: 0.8569 - lr: 0.0088
Epoch 226/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3411 - accuracy: 0.
8581 - val_loss: 0.3474 - val_accuracy: 0.8556 - lr: 0.0088
Epoch 227/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3433 - accuracy: 0.
8570 - val_loss: 0.3497 - val_accuracy: 0.8525 - lr: 0.0088
Epoch 228/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3423 - accuracy: 0.
8545 - val_loss: 0.3482 - val_accuracy: 0.8575 - lr: 0.0088
Epoch 229/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3416 - accuracy: 0.
8612 - val_loss: 0.3576 - val_accuracy: 0.8531 - lr: 0.0088
Epoch 230/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3436 - accuracy: 0.
8591 - val_loss: 0.3504 - val_accuracy: 0.8531 - lr: 0.0088
Epoch 231/2000
7/7 [==============================] - 0s 6ms/step - loss: 0.3380 - accuracy: 0.
8603 - val_loss: 0.3480 - val_accuracy: 0.8550 - lr: 0.0088
Epoch 232/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3413 - accuracy: 0.
8628 - val_loss: 0.3498 - val_accuracy: 0.8569 - lr: 0.0087
Epoch 233/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3401 - accuracy: 0.
8609 - val_loss: 0.3569 - val_accuracy: 0.8531 - lr: 0.0087
Epoch 234/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3433 - accuracy: 0.
8583 - val_loss: 0.3589 - val_accuracy: 0.8519 - lr: 0.0087
Epoch 235/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3414 - accuracy: 0.
8591 - val_loss: 0.3504 - val_accuracy: 0.8612 - lr: 0.0087
Epoch 236/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3411 - accuracy: 0.
8581 - val_loss: 0.3476 - val_accuracy: 0.8569 - lr: 0.0087
Epoch 237/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3408 - accuracy: 0.
8595 - val_loss: 0.3526 - val_accuracy: 0.8531 - lr: 0.0087
Epoch 238/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3440 - accuracy: 0.
8609 - val_loss: 0.3495 - val_accuracy: 0.8562 - lr: 0.0087
Epoch 239/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3437 - accuracy: 0.
8556 - val_loss: 0.3529 - val_accuracy: 0.8600 - lr: 0.0087
Epoch 240/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3429 - accuracy: 0.
8614 - val_loss: 0.3563 - val_accuracy: 0.8519 - lr: 0.0087
Epoch 241/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3381 - accuracy: 0.
8603 - val_loss: 0.3489 - val_accuracy: 0.8550 - lr: 0.0087
Epoch 242/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3410 - accuracy: 0.
8612 - val_loss: 0.3568 - val_accuracy: 0.8525 - lr: 0.0086
Epoch 243/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3423 - accuracy: 0.
8595 - val_loss: 0.3477 - val_accuracy: 0.8594 - lr: 0.0086
Epoch 244/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3400 - accuracy: 0.
8591 - val_loss: 0.3511 - val_accuracy: 0.8519 - lr: 0.0086
Epoch 245/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3449 - accuracy: 0.
8595 - val_loss: 0.3560 - val_accuracy: 0.8487 - lr: 0.0086
Epoch 246/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3434 - accuracy: 0.
8566 - val_loss: 0.3527 - val_accuracy: 0.8506 - lr: 0.0086
Epoch 247/2000
```

```
7/7 [==============================] - 0s 5ms/step - loss: 0.3408 - accuracy: 0.
8611 - val_loss: 0.3485 - val_accuracy: 0.8587 - lr: 0.0086
Epoch 248/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3405 - accuracy: 0.
8592 - val_loss: 0.3508 - val_accuracy: 0.8537 - lr: 0.0086
Epoch 249/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3407 - accuracy: 0.
8608 - val_loss: 0.3467 - val_accuracy: 0.8575 - lr: 0.0086
Epoch 250/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3399 - accuracy: 0.
8581 - val_loss: 0.3504 - val_accuracy: 0.8612 - lr: 0.0086
Epoch 251/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3369 - accuracy: 0.
8633 - val_loss: 0.3526 - val_accuracy: 0.8537 - lr: 0.0085
Epoch 252/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3384 - accuracy: 0.
8589 - val_loss: 0.3524 - val_accuracy: 0.8512 - lr: 0.0085
Epoch 253/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3380 - accuracy: 0.
8612 - val_loss: 0.3499 - val_accuracy: 0.8556 - lr: 0.0085
Epoch 254/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3426 - accuracy: 0.
8592 - val_loss: 0.3467 - val_accuracy: 0.8556 - lr: 0.0085
Epoch 255/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3397 - accuracy: 0.
8584 - val_loss: 0.3480 - val_accuracy: 0.8612 - lr: 0.0085
Epoch 256/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3383 - accuracy: 0.
8617 - val_loss: 0.3501 - val_accuracy: 0.8512 - lr: 0.0085
Epoch 257/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3381 - accuracy: 0.
8612 - val_loss: 0.3472 - val_accuracy: 0.8594 - lr: 0.0085
Epoch 258/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3396 - accuracy: 0.
8603 - val_loss: 0.3490 - val_accuracy: 0.8556 - lr: 0.0085
Epoch 259/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3398 - accuracy: 0.
8609 - val_loss: 0.3469 - val_accuracy: 0.8587 - lr: 0.0085
Epoch 260/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3403 - accuracy: 0.
8597 - val_loss: 0.3495 - val_accuracy: 0.8575 - lr: 0.0085
Epoch 261/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3374 - accuracy: 0.
8620 - val_loss: 0.3497 - val_accuracy: 0.8562 - lr: 0.0084
Epoch 262/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3420 - accuracy: 0.
8602 - val_loss: 0.3522 - val_accuracy: 0.8506 - lr: 0.0084
Epoch 263/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3370 - accuracy: 0.
8627 - val_loss: 0.3490 - val_accuracy: 0.8562 - lr: 0.0084
Epoch 264/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3394 - accuracy: 0.
8620 - val_loss: 0.3503 - val_accuracy: 0.8519 - lr: 0.0084
Epoch 265/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3401 - accuracy: 0.
8631 - val_loss: 0.3542 - val_accuracy: 0.8512 - lr: 0.0084
Epoch 266/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3386 - accuracy: 0.
8608 - val_loss: 0.3467 - val_accuracy: 0.8575 - lr: 0.0084
Epoch 267/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3344 - accuracy: 0.
8617 - val_loss: 0.3463 - val_accuracy: 0.8600 - lr: 0.0084
Epoch 268/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3374 - accuracy: 0.
8636 - val_loss: 0.3496 - val_accuracy: 0.8550 - lr: 0.0084
```

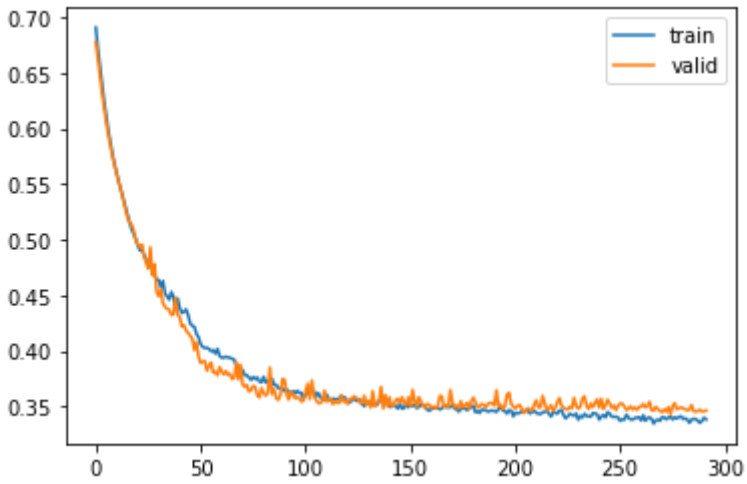
```
Epoch 269/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3380 - accuracy: 0.
8608 - val_loss: 0.3475 - val_accuracy: 0.8600 - lr: 0.0084
Epoch 270/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3370 - accuracy: 0.
8589 - val_loss: 0.3460 - val_accuracy: 0.8581 - lr: 0.0083
Epoch 271/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3404 - accuracy: 0.
8575 - val_loss: 0.3449 - val_accuracy: 0.8544 - lr: 0.0083
Epoch 272/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3400 - accuracy: 0.
8589 - val_loss: 0.3474 - val_accuracy: 0.8581 - lr: 0.0083
Epoch 273/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3384 - accuracy: 0.
8627 - val_loss: 0.3451 - val_accuracy: 0.8575 - lr: 0.0083
Epoch 274/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3399 - accuracy: 0.
8625 - val_loss: 0.3493 - val_accuracy: 0.8562 - lr: 0.0083
Epoch 275/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3411 - accuracy: 0.
8619 - val_loss: 0.3429 - val_accuracy: 0.8619 - lr: 0.0083
Epoch 276/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3382 - accuracy: 0.
8609 - val_loss: 0.3502 - val_accuracy: 0.8550 - lr: 0.0083
Epoch 277/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3401 - accuracy: 0.
8598 - val_loss: 0.3529 - val_accuracy: 0.8481 - lr: 0.0083
Epoch 278/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3391 - accuracy: 0.
8616 - val_loss: 0.3474 - val_accuracy: 0.8562 - lr: 0.0082
Epoch 279/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3405 - accuracy: 0.
8630 - val_loss: 0.3482 - val_accuracy: 0.8525 - lr: 0.0082
Epoch 280/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3410 - accuracy: 0.
8609 - val_loss: 0.3491 - val_accuracy: 0.8550 - lr: 0.0082
Epoch 281/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3386 - accuracy: 0.
8608 - val_loss: 0.3482 - val_accuracy: 0.8506 - lr: 0.0082
Epoch 282/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3392 - accuracy: 0.
8591 - val_loss: 0.3475 - val_accuracy: 0.8525 - lr: 0.0082
Epoch 283/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3383 - accuracy: 0.
8625 - val_loss: 0.3466 - val_accuracy: 0.8556 - lr: 0.0082
Epoch 284/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3352 - accuracy: 0.
8631 - val_loss: 0.3469 - val_accuracy: 0.8587 - lr: 0.0082
Epoch 285/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3379 - accuracy: 0.
8608 - val_loss: 0.3512 - val_accuracy: 0.8544 - lr: 0.0082
Epoch 286/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3389 - accuracy: 0.
8602 - val_loss: 0.3459 - val_accuracy: 0.8562 - lr: 0.0082
Epoch 287/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3386 - accuracy: 0.
8630 - val_loss: 0.3452 - val_accuracy: 0.8587 - lr: 0.0081
Epoch 288/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3371 - accuracy: 0.
8616 - val_loss: 0.3459 - val_accuracy: 0.8544 - lr: 0.0081
Epoch 289/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3351 - accuracy: 0.
8614 - val_loss: 0.3470 - val_accuracy: 0.8562 - lr: 0.0081
Epoch 290/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3369 - accuracy: 0.
```

```
8616 - val_loss: 0.3453 - val_accuracy: 0.8594 - lr: 0.0081
Epoch 291/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3398 - accuracy: 0.
8589 - val_loss: 0.3456 - val_accuracy: 0.8562 - lr: 0.0081
Epoch 292/2000
7/7 [==============================] - 0s 5ms/step - loss: 0.3382 - accuracy: 0.
8619 - val_loss: 0.3463 - val_accuracy: 0.8556 - lr: 0.0081
```

In [77]:
```
# Capturing learning history per epoch
hist5 = pd.DataFrame(hist_mod5.history)
hist5["epoch"] = hist_mod5.epoch

# Plotting accuracy at different epochs
plt.plot(hist5["loss"])
plt.plot(hist5["val_loss"])
plt.legend(("train", "valid"), loc=0)
```

Out[77]:
```
<matplotlib.legend.Legend at 0x18591969880>
```



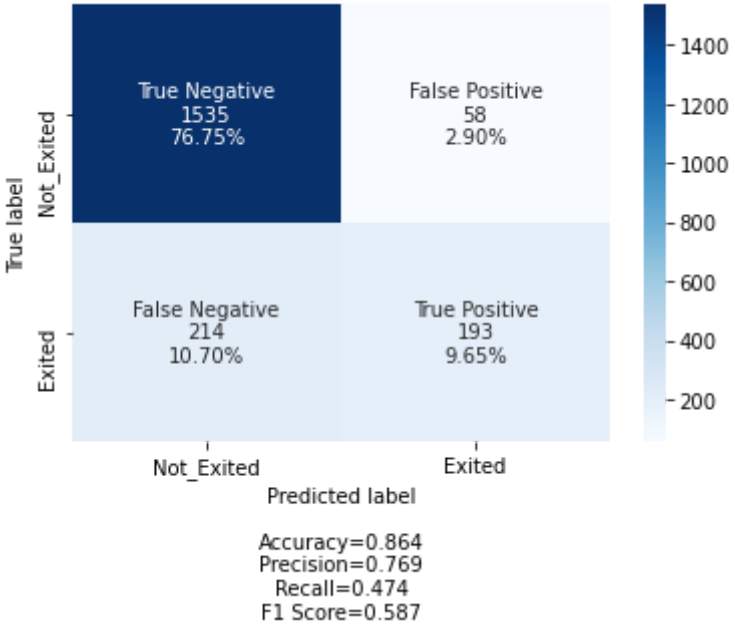
In [78]:
```
model5_score = model5.evaluate(scaled_test_X, scaled_test_y)
```

```
63/63 [==============================] - 0s 662us/step - loss: 0.3505 - accurac
y: 0.8640
```

In [79]:
```
## Confusion Matrix on unsee test set
import seaborn as sn

y_pred5 = model5.predict(scaled_test_X)
for i in range(len(scaled_test_y)):
    if y_pred5[i] > 0.5:
        y_pred5[i] = 1
    else:
        y_pred5[i] = 0


cm5 = confusion_matrix(y_test, y_pred5)
labels = ["True Negative", "False Positive", "False Negative", "True Positive"]
categories = ["Not_Exited", "Exited"]
make_confusion_matrix(cm5, group_names=labels, categories=categories, cmap="Blue
```



In [80]:
```
model6 = Sequential()

model6.add(
    Dense(units=9, input_dim=12, kernel_initializer="HeNormal", activation="leak
)

model6.add(Dropout(0.1))

model6.add(Dense(units=7, kernel_initializer="HeNormal", activation="leaky_relu"

model6.add(Dense(units=5, kernel_initializer="HeNormal", activation="leaky_relu"

model6.add(Dense(units=2, activation="relu"))

model6.add(Dense(1, kernel_initializer="HeNormal", activation="sigmoid"))

model6.compile(Nadam(lr=0.01), loss="binary_crossentropy", metrics=["accuracy"])

model6.summary()
```

```
Model: "sequential_5"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 dense_19 (Dense)            (None, 9)                 117

 dropout_4 (Dropout)         (None, 9)                 0

 dense_20 (Dense)            (None, 7)                 70

 dense_21 (Dense)            (None, 5)                 40

 dense_22 (Dense)            (None, 2)                 12

 dense_23 (Dense)            (None, 1)                 3

=================================================================
Total params: 242
Trainable params: 242
```

```
Non-trainable params: 0
_________________________________________________________________
```

In [81]:
```
initial_learning_rate = 0.01
epochs = 2000
decay = initial_learning_rate / epochs


def lr_time_based_decay(epoch, lr):
    return lr * 1 / (1 + decay * epoch)
```

In [82]:
```
hist_mod6 = model6.fit(
    scaled_train_un_X,
    scaled_train_un_y,
    batch_size=1000,
    epochs=2000,
    validation_split=0.2,
    callbacks=[LearningRateScheduler(lr_time_based_decay), (es2)],
)
```

```
Epoch 1/2000
3/3 [==============================] - 1s 66ms/step - loss: 0.6874 - accuracy:
0.5951 - val_loss: 0.9080 - val_accuracy: 0.2868 - lr: 0.0100
Epoch 2/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.6567 - accuracy:
0.6154 - val_loss: 0.8739 - val_accuracy: 0.2991 - lr: 0.0100
Epoch 3/2000
3/3 [==============================] - 0s 13ms/step - loss: 0.6374 - accuracy:
0.6365 - val_loss: 0.9600 - val_accuracy: 0.2209 - lr: 0.0100
Epoch 4/2000
3/3 [==============================] - 0s 13ms/step - loss: 0.6310 - accuracy:
0.6426 - val_loss: 0.9538 - val_accuracy: 0.1948 - lr: 0.0100
Epoch 5/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.6227 - accuracy:
0.6515 - val_loss: 0.9150 - val_accuracy: 0.2531 - lr: 0.0100
Epoch 6/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.6207 - accuracy:
0.6572 - val_loss: 0.9178 - val_accuracy: 0.2561 - lr: 0.0100
Epoch 7/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.6131 - accuracy:
0.6599 - val_loss: 0.8882 - val_accuracy: 0.3528 - lr: 0.0100
Epoch 8/2000
3/3 [==============================] - 0s 13ms/step - loss: 0.6066 - accuracy:
0.6691 - val_loss: 0.9400 - val_accuracy: 0.3328 - lr: 0.0100
Epoch 9/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.6034 - accuracy:
0.6672 - val_loss: 0.8758 - val_accuracy: 0.3911 - lr: 0.0100
Epoch 10/2000
3/3 [==============================] - 0s 13ms/step - loss: 0.5982 - accuracy:
0.6748 - val_loss: 0.8487 - val_accuracy: 0.4387 - lr: 0.0100
Epoch 11/2000
3/3 [==============================] - 0s 13ms/step - loss: 0.5946 - accuracy:
0.6879 - val_loss: 0.8087 - val_accuracy: 0.4678 - lr: 0.0100
Epoch 12/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5956 - accuracy:
0.6829 - val_loss: 0.8968 - val_accuracy: 0.3482 - lr: 0.0100
Epoch 13/2000
3/3 [==============================] - 0s 13ms/step - loss: 0.5915 - accuracy:
0.6898 - val_loss: 0.8415 - val_accuracy: 0.4279 - lr: 0.0100
Epoch 14/2000
3/3 [==============================] - 0s 13ms/step - loss: 0.5872 - accuracy:
```

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0.6906 - val_loss: 0.7952 - val_accuracy: 0.4877 - lr: 0.0100
Epoch 15/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5831 - accuracy:
0.6921 - val_loss: 0.8997 - val_accuracy: 0.3819 - lr: 0.0100
Epoch 16/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5780 - accuracy:
0.6910 - val_loss: 0.9364 - val_accuracy: 0.3436 - lr: 0.0100
Epoch 17/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5735 - accuracy:
0.6994 - val_loss: 0.9770 - val_accuracy: 0.3512 - lr: 0.0100
Epoch 18/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5755 - accuracy:
0.7032 - val_loss: 0.8122 - val_accuracy: 0.4969 - lr: 0.0100
Epoch 19/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5746 - accuracy:
0.6967 - val_loss: 0.6377 - val_accuracy: 0.6779 - lr: 0.0100
Epoch 20/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5792 - accuracy:
0.6890 - val_loss: 0.9265 - val_accuracy: 0.3758 - lr: 0.0100
Epoch 21/2000
3/3 [==============================] - 0s 13ms/step - loss: 0.5624 - accuracy:
0.7120 - val_loss: 0.7628 - val_accuracy: 0.5460 - lr: 0.0100
Epoch 22/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5645 - accuracy:
0.7124 - val_loss: 0.8900 - val_accuracy: 0.4310 - lr: 0.0100
Epoch 23/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5601 - accuracy:
0.7105 - val_loss: 0.8985 - val_accuracy: 0.4264 - lr: 0.0100
Epoch 24/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5634 - accuracy:
0.7128 - val_loss: 0.7446 - val_accuracy: 0.5629 - lr: 0.0100
Epoch 25/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5583 - accuracy:
0.7159 - val_loss: 0.7241 - val_accuracy: 0.5798 - lr: 0.0100
Epoch 26/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5610 - accuracy:
0.7163 - val_loss: 1.0005 - val_accuracy: 0.3543 - lr: 0.0100
Epoch 27/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5586 - accuracy:
0.7143 - val_loss: 0.9254 - val_accuracy: 0.4187 - lr: 0.0100
Epoch 28/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5453 - accuracy:
0.7239 - val_loss: 0.8496 - val_accuracy: 0.5015 - lr: 0.0100
Epoch 29/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5502 - accuracy:
0.7239 - val_loss: 0.8002 - val_accuracy: 0.5261 - lr: 0.0100
Epoch 30/2000
3/3 [==============================] - 0s 13ms/step - loss: 0.5420 - accuracy:
0.7350 - val_loss: 0.8783 - val_accuracy: 0.4893 - lr: 0.0100
Epoch 31/2000
3/3 [==============================] - 0s 13ms/step - loss: 0.5519 - accuracy:
0.7201 - val_loss: 0.7486 - val_accuracy: 0.5598 - lr: 0.0100
Epoch 32/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5406 - accuracy:
0.7327 - val_loss: 0.7243 - val_accuracy: 0.5844 - lr: 0.0100
Epoch 33/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5434 - accuracy:
0.7331 - val_loss: 0.7085 - val_accuracy: 0.6012 - lr: 0.0100
Epoch 34/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5425 - accuracy:
0.7243 - val_loss: 0.9703 - val_accuracy: 0.4034 - lr: 0.0100
Epoch 35/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5509 - accuracy:
0.7262 - val_loss: 0.8180 - val_accuracy: 0.5092 - lr: 0.0100
Epoch 36/2000
```

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3/3 [==============================] - 0s 12ms/step - loss: 0.5400 - accuracy:
0.7270 - val_loss: 0.8956 - val_accuracy: 0.4770 - lr: 0.0100
Epoch 37/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5409 - accuracy:
0.7343 - val_loss: 0.7801 - val_accuracy: 0.5383 - lr: 0.0100
Epoch 38/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5420 - accuracy:
0.7335 - val_loss: 0.9207 - val_accuracy: 0.4555 - lr: 0.0100
Epoch 39/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5402 - accuracy:
0.7358 - val_loss: 0.8231 - val_accuracy: 0.5153 - lr: 0.0100
Epoch 40/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5352 - accuracy:
0.7389 - val_loss: 0.8413 - val_accuracy: 0.5153 - lr: 0.0100
Epoch 41/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5373 - accuracy:
0.7381 - val_loss: 0.8219 - val_accuracy: 0.5123 - lr: 0.0100
Epoch 42/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5395 - accuracy:
0.7370 - val_loss: 0.7789 - val_accuracy: 0.5230 - lr: 0.0100
Epoch 43/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5315 - accuracy:
0.7404 - val_loss: 0.9534 - val_accuracy: 0.4340 - lr: 0.0100
Epoch 44/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5352 - accuracy:
0.7354 - val_loss: 0.7076 - val_accuracy: 0.5813 - lr: 0.0100
Epoch 45/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5397 - accuracy:
0.7358 - val_loss: 0.8547 - val_accuracy: 0.5015 - lr: 0.0100
Epoch 46/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5341 - accuracy:
0.7404 - val_loss: 0.6623 - val_accuracy: 0.6104 - lr: 0.0099
Epoch 47/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5393 - accuracy:
0.7304 - val_loss: 0.7868 - val_accuracy: 0.5307 - lr: 0.0099
Epoch 48/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5314 - accuracy:
0.7435 - val_loss: 0.8176 - val_accuracy: 0.5153 - lr: 0.0099
Epoch 49/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5297 - accuracy:
0.7439 - val_loss: 0.9005 - val_accuracy: 0.4831 - lr: 0.0099
Epoch 50/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5302 - accuracy:
0.7469 - val_loss: 0.7857 - val_accuracy: 0.5322 - lr: 0.0099
Epoch 51/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5302 - accuracy:
0.7366 - val_loss: 0.8447 - val_accuracy: 0.5000 - lr: 0.0099
Epoch 52/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5288 - accuracy:
0.7446 - val_loss: 0.8607 - val_accuracy: 0.4954 - lr: 0.0099
Epoch 53/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5276 - accuracy:
0.7427 - val_loss: 0.8429 - val_accuracy: 0.5061 - lr: 0.0099
Epoch 54/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5260 - accuracy:
0.7496 - val_loss: 0.7446 - val_accuracy: 0.5583 - lr: 0.0099
Epoch 55/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5335 - accuracy:
0.7446 - val_loss: 0.9762 - val_accuracy: 0.4248 - lr: 0.0099
Epoch 56/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5272 - accuracy:
0.7469 - val_loss: 0.8293 - val_accuracy: 0.5061 - lr: 0.0099
Epoch 57/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5254 - accuracy:
0.7439 - val_loss: 0.9028 - val_accuracy: 0.4785 - lr: 0.0099
```

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Epoch 58/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5257 - accuracy:
0.7550 - val_loss: 0.9935 - val_accuracy: 0.4218 - lr: 0.0099
Epoch 59/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5297 - accuracy:
0.7458 - val_loss: 0.8851 - val_accuracy: 0.4831 - lr: 0.0099
Epoch 60/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5221 - accuracy:
0.7488 - val_loss: 0.8217 - val_accuracy: 0.5184 - lr: 0.0099
Epoch 61/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.5257 - accuracy:
0.7450 - val_loss: 0.8612 - val_accuracy: 0.5000 - lr: 0.0099
Epoch 62/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5170 - accuracy:
0.7538 - val_loss: 0.8786 - val_accuracy: 0.4831 - lr: 0.0099
Epoch 63/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.5207 - accuracy:
0.7512 - val_loss: 0.7178 - val_accuracy: 0.5706 - lr: 0.0099
Epoch 64/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5197 - accuracy:
0.7512 - val_loss: 0.7722 - val_accuracy: 0.5383 - lr: 0.0099
Epoch 65/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5215 - accuracy:
0.7558 - val_loss: 0.8652 - val_accuracy: 0.4831 - lr: 0.0099
Epoch 66/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5143 - accuracy:
0.7531 - val_loss: 0.7089 - val_accuracy: 0.5844 - lr: 0.0099
Epoch 67/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5234 - accuracy:
0.7488 - val_loss: 0.9971 - val_accuracy: 0.4018 - lr: 0.0099
Epoch 68/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.5342 - accuracy:
0.7416 - val_loss: 0.7565 - val_accuracy: 0.5429 - lr: 0.0099
Epoch 69/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5149 - accuracy:
0.7535 - val_loss: 0.8630 - val_accuracy: 0.4877 - lr: 0.0099
Epoch 70/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.5144 - accuracy:
0.7538 - val_loss: 0.6897 - val_accuracy: 0.5813 - lr: 0.0099
Epoch 71/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5215 - accuracy:
0.7488 - val_loss: 0.8435 - val_accuracy: 0.5077 - lr: 0.0099
Epoch 72/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5176 - accuracy:
0.7538 - val_loss: 0.7662 - val_accuracy: 0.5399 - lr: 0.0099
Epoch 73/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5118 - accuracy:
0.7527 - val_loss: 0.8079 - val_accuracy: 0.5322 - lr: 0.0099
Epoch 74/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5181 - accuracy:
0.7515 - val_loss: 0.9928 - val_accuracy: 0.4034 - lr: 0.0099
Epoch 75/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5324 - accuracy:
0.7396 - val_loss: 0.6638 - val_accuracy: 0.6074 - lr: 0.0099
Epoch 76/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5158 - accuracy:
0.7450 - val_loss: 0.7445 - val_accuracy: 0.5567 - lr: 0.0099
Epoch 77/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5124 - accuracy:
0.7561 - val_loss: 0.9351 - val_accuracy: 0.4402 - lr: 0.0099
Epoch 78/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5098 - accuracy:
0.7565 - val_loss: 0.8284 - val_accuracy: 0.5199 - lr: 0.0099
Epoch 79/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5107 - accuracy:
```

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0.7607 - val_loss: 0.9287 - val_accuracy: 0.4555 - lr: 0.0098
Epoch 80/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5091 - accuracy:
0.7600 - val_loss: 0.7912 - val_accuracy: 0.5399 - lr: 0.0098
Epoch 81/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5101 - accuracy:
0.7596 - val_loss: 0.6996 - val_accuracy: 0.5813 - lr: 0.0098
Epoch 82/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5046 - accuracy:
0.7561 - val_loss: 0.7411 - val_accuracy: 0.5721 - lr: 0.0098
Epoch 83/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4987 - accuracy:
0.7634 - val_loss: 0.7304 - val_accuracy: 0.5798 - lr: 0.0098
Epoch 84/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4934 - accuracy:
0.7669 - val_loss: 0.6705 - val_accuracy: 0.6135 - lr: 0.0098
Epoch 85/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5079 - accuracy:
0.7661 - val_loss: 0.8609 - val_accuracy: 0.4939 - lr: 0.0098
Epoch 86/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5005 - accuracy:
0.7653 - val_loss: 0.6734 - val_accuracy: 0.6181 - lr: 0.0098
Epoch 87/2000
3/3 [==============================] - 0s 13ms/step - loss: 0.4896 - accuracy:
0.7776 - val_loss: 0.7394 - val_accuracy: 0.5890 - lr: 0.0098
Epoch 88/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4915 - accuracy:
0.7692 - val_loss: 0.8171 - val_accuracy: 0.5583 - lr: 0.0098
Epoch 89/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4842 - accuracy:
0.7761 - val_loss: 0.6607 - val_accuracy: 0.6426 - lr: 0.0098
Epoch 90/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4813 - accuracy:
0.7772 - val_loss: 0.8144 - val_accuracy: 0.5583 - lr: 0.0098
Epoch 91/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4986 - accuracy:
0.7611 - val_loss: 0.8723 - val_accuracy: 0.5184 - lr: 0.0098
Epoch 92/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4831 - accuracy:
0.7799 - val_loss: 0.6687 - val_accuracy: 0.6350 - lr: 0.0098
Epoch 93/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4850 - accuracy:
0.7768 - val_loss: 1.1060 - val_accuracy: 0.3865 - lr: 0.0098
Epoch 94/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.5278 - accuracy:
0.7431 - val_loss: 0.6780 - val_accuracy: 0.6396 - lr: 0.0098
Epoch 95/2000
3/3 [==============================] - 0s 13ms/step - loss: 0.4722 - accuracy:
0.7876 - val_loss: 0.6757 - val_accuracy: 0.6396 - lr: 0.0098
Epoch 96/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4688 - accuracy:
0.7834 - val_loss: 0.7402 - val_accuracy: 0.6181 - lr: 0.0098
Epoch 97/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4685 - accuracy:
0.7849 - val_loss: 0.7060 - val_accuracy: 0.6104 - lr: 0.0098
Epoch 98/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4719 - accuracy:
0.7811 - val_loss: 0.5586 - val_accuracy: 0.7132 - lr: 0.0098
Epoch 99/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4802 - accuracy:
0.7807 - val_loss: 0.6790 - val_accuracy: 0.6319 - lr: 0.0098
Epoch 100/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4760 - accuracy:
0.7868 - val_loss: 0.5090 - val_accuracy: 0.7331 - lr: 0.0098
Epoch 101/2000
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3/3 [==============================] - 0s 12ms/step - loss: 0.4767 - accuracy:
0.7742 - val_loss: 0.7650 - val_accuracy: 0.5890 - lr: 0.0098
Epoch 102/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4591 - accuracy:
0.7860 - val_loss: 0.9004 - val_accuracy: 0.5107 - lr: 0.0097
Epoch 103/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4703 - accuracy:
0.7814 - val_loss: 0.6277 - val_accuracy: 0.6794 - lr: 0.0097
Epoch 104/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4740 - accuracy:
0.7837 - val_loss: 0.8328 - val_accuracy: 0.5353 - lr: 0.0097
Epoch 105/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4617 - accuracy:
0.7872 - val_loss: 0.7129 - val_accuracy: 0.6196 - lr: 0.0097
Epoch 106/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4505 - accuracy:
0.7929 - val_loss: 0.6833 - val_accuracy: 0.6196 - lr: 0.0097
Epoch 107/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4608 - accuracy:
0.7837 - val_loss: 0.8044 - val_accuracy: 0.5644 - lr: 0.0097
Epoch 108/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4564 - accuracy:
0.7914 - val_loss: 0.6152 - val_accuracy: 0.6764 - lr: 0.0097
Epoch 109/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4574 - accuracy:
0.7868 - val_loss: 0.6889 - val_accuracy: 0.6334 - lr: 0.0097
Epoch 110/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4608 - accuracy:
0.7857 - val_loss: 0.7068 - val_accuracy: 0.6288 - lr: 0.0097
Epoch 111/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4525 - accuracy:
0.7899 - val_loss: 0.8051 - val_accuracy: 0.5690 - lr: 0.0097
Epoch 112/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4582 - accuracy:
0.7803 - val_loss: 0.6515 - val_accuracy: 0.6503 - lr: 0.0097
Epoch 113/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4501 - accuracy:
0.7910 - val_loss: 0.5620 - val_accuracy: 0.7117 - lr: 0.0097
Epoch 114/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4709 - accuracy:
0.7768 - val_loss: 0.7844 - val_accuracy: 0.5874 - lr: 0.0097
Epoch 115/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4472 - accuracy:
0.8014 - val_loss: 0.8408 - val_accuracy: 0.5521 - lr: 0.0097
Epoch 116/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4524 - accuracy:
0.7864 - val_loss: 0.6207 - val_accuracy: 0.6641 - lr: 0.0097
Epoch 117/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4493 - accuracy:
0.7929 - val_loss: 0.8894 - val_accuracy: 0.5291 - lr: 0.0097
Epoch 118/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4635 - accuracy:
0.7772 - val_loss: 0.6394 - val_accuracy: 0.6687 - lr: 0.0097
Epoch 119/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4471 - accuracy:
0.7945 - val_loss: 0.6034 - val_accuracy: 0.6794 - lr: 0.0097
Epoch 120/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4466 - accuracy:
0.7952 - val_loss: 0.5966 - val_accuracy: 0.6963 - lr: 0.0096
Epoch 121/2000
3/3 [==============================] - 0s 13ms/step - loss: 0.4445 - accuracy:
0.8010 - val_loss: 0.7801 - val_accuracy: 0.5936 - lr: 0.0096
Epoch 122/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4458 - accuracy:
0.7929 - val_loss: 0.6997 - val_accuracy: 0.6196 - lr: 0.0096
```

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Epoch 123/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4467 - accuracy:
0.7914 - val_loss: 0.6367 - val_accuracy: 0.6718 - lr: 0.0096
Epoch 124/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4539 - accuracy:
0.7864 - val_loss: 0.6283 - val_accuracy: 0.6733 - lr: 0.0096
Epoch 125/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4480 - accuracy:
0.7922 - val_loss: 0.6747 - val_accuracy: 0.6304 - lr: 0.0096
Epoch 126/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4474 - accuracy:
0.8010 - val_loss: 0.7078 - val_accuracy: 0.6166 - lr: 0.0096
Epoch 127/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4483 - accuracy:
0.8025 - val_loss: 0.7668 - val_accuracy: 0.6166 - lr: 0.0096
Epoch 128/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4501 - accuracy:
0.7964 - val_loss: 0.6852 - val_accuracy: 0.6748 - lr: 0.0096
Epoch 129/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4548 - accuracy:
0.7918 - val_loss: 0.8481 - val_accuracy: 0.5583 - lr: 0.0096
Epoch 130/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4448 - accuracy:
0.7987 - val_loss: 0.7088 - val_accuracy: 0.6227 - lr: 0.0096
Epoch 131/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4464 - accuracy:
0.7998 - val_loss: 0.7085 - val_accuracy: 0.6457 - lr: 0.0096
Epoch 132/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4448 - accuracy:
0.7987 - val_loss: 0.7809 - val_accuracy: 0.5920 - lr: 0.0096
Epoch 133/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4472 - accuracy:
0.7929 - val_loss: 0.5479 - val_accuracy: 0.7147 - lr: 0.0096
Epoch 134/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4510 - accuracy:
0.7918 - val_loss: 0.6979 - val_accuracy: 0.6350 - lr: 0.0096
Epoch 135/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4425 - accuracy:
0.8006 - val_loss: 0.5064 - val_accuracy: 0.7393 - lr: 0.0096
Epoch 136/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4573 - accuracy:
0.7845 - val_loss: 0.7289 - val_accuracy: 0.6273 - lr: 0.0096
Epoch 137/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4423 - accuracy:
0.7952 - val_loss: 0.6508 - val_accuracy: 0.6534 - lr: 0.0095
Epoch 138/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4443 - accuracy:
0.8014 - val_loss: 0.8837 - val_accuracy: 0.5307 - lr: 0.0095
Epoch 139/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4532 - accuracy:
0.7868 - val_loss: 0.7649 - val_accuracy: 0.6120 - lr: 0.0095
Epoch 140/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4431 - accuracy:
0.7975 - val_loss: 0.7476 - val_accuracy: 0.6104 - lr: 0.0095
Epoch 141/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4356 - accuracy:
0.8010 - val_loss: 0.6846 - val_accuracy: 0.6442 - lr: 0.0095
Epoch 142/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4391 - accuracy:
0.7995 - val_loss: 0.6961 - val_accuracy: 0.6258 - lr: 0.0095
Epoch 143/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4397 - accuracy:
0.7929 - val_loss: 0.8084 - val_accuracy: 0.5767 - lr: 0.0095
Epoch 144/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4509 - accuracy:
```

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0.7895 - val_loss: 0.6619 - val_accuracy: 0.6580 - lr: 0.0095
Epoch 145/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4395 - accuracy:
0.8010 - val_loss: 0.5941 - val_accuracy: 0.6748 - lr: 0.0095
Epoch 146/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4474 - accuracy:
0.7968 - val_loss: 0.6991 - val_accuracy: 0.6350 - lr: 0.0095
Epoch 147/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4365 - accuracy:
0.8010 - val_loss: 0.7981 - val_accuracy: 0.5874 - lr: 0.0095
Epoch 148/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4368 - accuracy:
0.7968 - val_loss: 0.7074 - val_accuracy: 0.6472 - lr: 0.0095
Epoch 149/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4433 - accuracy:
0.8014 - val_loss: 0.6196 - val_accuracy: 0.6733 - lr: 0.0095
Epoch 150/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4414 - accuracy:
0.8021 - val_loss: 0.7571 - val_accuracy: 0.6043 - lr: 0.0095
Epoch 151/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4362 - accuracy:
0.8067 - val_loss: 0.7386 - val_accuracy: 0.6288 - lr: 0.0094
Epoch 152/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4395 - accuracy:
0.7998 - val_loss: 0.6201 - val_accuracy: 0.6825 - lr: 0.0094
Epoch 153/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4427 - accuracy:
0.7972 - val_loss: 0.6524 - val_accuracy: 0.6764 - lr: 0.0094
Epoch 154/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4424 - accuracy:
0.8021 - val_loss: 0.7506 - val_accuracy: 0.6426 - lr: 0.0094
Epoch 155/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4399 - accuracy:
0.7975 - val_loss: 0.6569 - val_accuracy: 0.6610 - lr: 0.0094
Epoch 156/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4402 - accuracy:
0.7995 - val_loss: 0.7126 - val_accuracy: 0.6304 - lr: 0.0094
Epoch 157/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4406 - accuracy:
0.8021 - val_loss: 0.6354 - val_accuracy: 0.6672 - lr: 0.0094
Epoch 158/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4408 - accuracy:
0.8010 - val_loss: 0.6851 - val_accuracy: 0.6503 - lr: 0.0094
Epoch 159/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4395 - accuracy:
0.8018 - val_loss: 0.5790 - val_accuracy: 0.6948 - lr: 0.0094
Epoch 160/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4410 - accuracy:
0.7952 - val_loss: 0.6857 - val_accuracy: 0.6442 - lr: 0.0094
Epoch 161/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4407 - accuracy:
0.7945 - val_loss: 0.7182 - val_accuracy: 0.6304 - lr: 0.0094
Epoch 162/2000
3/3 [==============================] - 0s 13ms/step - loss: 0.4315 - accuracy:
0.8014 - val_loss: 0.6926 - val_accuracy: 0.6472 - lr: 0.0094
Epoch 163/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4315 - accuracy:
0.8064 - val_loss: 0.6461 - val_accuracy: 0.6641 - lr: 0.0094
Epoch 164/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4387 - accuracy:
0.8006 - val_loss: 0.6764 - val_accuracy: 0.6641 - lr: 0.0094
Epoch 165/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4347 - accuracy:
0.8021 - val_loss: 0.8099 - val_accuracy: 0.5813 - lr: 0.0093
Epoch 166/2000
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3/3 [==============================] - 0s 12ms/step - loss: 0.4346 - accuracy:
0.7995 - val_loss: 0.8892 - val_accuracy: 0.5445 - lr: 0.0093
Epoch 167/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4444 - accuracy:
0.7906 - val_loss: 0.7220 - val_accuracy: 0.6212 - lr: 0.0093
Epoch 168/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4381 - accuracy:
0.7972 - val_loss: 0.7258 - val_accuracy: 0.6457 - lr: 0.0093
Epoch 169/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4350 - accuracy:
0.7995 - val_loss: 0.6343 - val_accuracy: 0.6656 - lr: 0.0093
Epoch 170/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4303 - accuracy:
0.8025 - val_loss: 0.6898 - val_accuracy: 0.6518 - lr: 0.0093
Epoch 171/2000
3/3 [==============================] - 0s 13ms/step - loss: 0.4296 - accuracy:
0.8060 - val_loss: 0.7485 - val_accuracy: 0.6181 - lr: 0.0093
Epoch 172/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4342 - accuracy:
0.8014 - val_loss: 0.7535 - val_accuracy: 0.6012 - lr: 0.0093
Epoch 173/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4336 - accuracy:
0.8018 - val_loss: 0.6786 - val_accuracy: 0.6687 - lr: 0.0093
Epoch 174/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4371 - accuracy:
0.7983 - val_loss: 0.6170 - val_accuracy: 0.6902 - lr: 0.0093
Epoch 175/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4453 - accuracy:
0.7956 - val_loss: 0.8008 - val_accuracy: 0.5706 - lr: 0.0093
Epoch 176/2000
3/3 [==============================] - 0s 13ms/step - loss: 0.4367 - accuracy:
0.7972 - val_loss: 0.6388 - val_accuracy: 0.6764 - lr: 0.0093
Epoch 177/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4386 - accuracy:
0.8014 - val_loss: 0.7303 - val_accuracy: 0.6196 - lr: 0.0093
Epoch 178/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4339 - accuracy:
0.7983 - val_loss: 0.7151 - val_accuracy: 0.6472 - lr: 0.0092
Epoch 179/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4336 - accuracy:
0.7998 - val_loss: 0.6812 - val_accuracy: 0.6626 - lr: 0.0092
Epoch 180/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4329 - accuracy:
0.8018 - val_loss: 0.7258 - val_accuracy: 0.6365 - lr: 0.0092
Epoch 181/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4284 - accuracy:
0.8060 - val_loss: 0.7320 - val_accuracy: 0.6273 - lr: 0.0092
Epoch 182/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4325 - accuracy:
0.8090 - val_loss: 0.7586 - val_accuracy: 0.6166 - lr: 0.0092
Epoch 183/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4364 - accuracy:
0.8048 - val_loss: 0.6778 - val_accuracy: 0.6564 - lr: 0.0092
Epoch 184/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4298 - accuracy:
0.8029 - val_loss: 0.7130 - val_accuracy: 0.6442 - lr: 0.0092
Epoch 185/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4331 - accuracy:
0.8033 - val_loss: 0.6980 - val_accuracy: 0.6610 - lr: 0.0092
Epoch 186/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4376 - accuracy:
0.8010 - val_loss: 0.6869 - val_accuracy: 0.6488 - lr: 0.0092
Epoch 187/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4449 - accuracy:
0.7910 - val_loss: 0.5844 - val_accuracy: 0.6887 - lr: 0.0092
```

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Epoch 188/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4325 - accuracy:
0.7995 - val_loss: 0.7357 - val_accuracy: 0.6150 - lr: 0.0092
Epoch 189/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4300 - accuracy:
0.8041 - val_loss: 0.4830 - val_accuracy: 0.7561 - lr: 0.0092
Epoch 190/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4437 - accuracy:
0.7960 - val_loss: 0.5661 - val_accuracy: 0.7009 - lr: 0.0091
Epoch 191/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4375 - accuracy:
0.7998 - val_loss: 0.7154 - val_accuracy: 0.6334 - lr: 0.0091
Epoch 192/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4338 - accuracy:
0.8010 - val_loss: 0.5949 - val_accuracy: 0.6979 - lr: 0.0091
Epoch 193/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4329 - accuracy:
0.7979 - val_loss: 0.6790 - val_accuracy: 0.6610 - lr: 0.0091
Epoch 194/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4389 - accuracy:
0.8014 - val_loss: 0.7077 - val_accuracy: 0.6426 - lr: 0.0091
Epoch 195/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4306 - accuracy:
0.8090 - val_loss: 0.6700 - val_accuracy: 0.6779 - lr: 0.0091
Epoch 196/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4311 - accuracy:
0.8129 - val_loss: 0.7578 - val_accuracy: 0.6166 - lr: 0.0091
Epoch 197/2000
3/3 [==============================] - 0s 13ms/step - loss: 0.4249 - accuracy:
0.8110 - val_loss: 0.6077 - val_accuracy: 0.6917 - lr: 0.0091
Epoch 198/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4322 - accuracy:
0.8041 - val_loss: 0.7164 - val_accuracy: 0.6442 - lr: 0.0091
Epoch 199/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4262 - accuracy:
0.8041 - val_loss: 0.7402 - val_accuracy: 0.6104 - lr: 0.0091
Epoch 200/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4331 - accuracy:
0.8033 - val_loss: 0.6834 - val_accuracy: 0.6672 - lr: 0.0091
Epoch 201/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4333 - accuracy:
0.8079 - val_loss: 0.8058 - val_accuracy: 0.5752 - lr: 0.0090
Epoch 202/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4313 - accuracy:
0.8052 - val_loss: 0.7554 - val_accuracy: 0.6104 - lr: 0.0090
Epoch 203/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4284 - accuracy:
0.8048 - val_loss: 0.6506 - val_accuracy: 0.6718 - lr: 0.0090
Epoch 204/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4334 - accuracy:
0.8018 - val_loss: 0.6730 - val_accuracy: 0.6687 - lr: 0.0090
Epoch 205/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4309 - accuracy:
0.8052 - val_loss: 0.6983 - val_accuracy: 0.6580 - lr: 0.0090
Epoch 206/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4297 - accuracy:
0.8079 - val_loss: 0.6521 - val_accuracy: 0.6794 - lr: 0.0090
Epoch 207/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4342 - accuracy:
0.7972 - val_loss: 0.7440 - val_accuracy: 0.5905 - lr: 0.0090
Epoch 208/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4361 - accuracy:
0.7972 - val_loss: 0.7156 - val_accuracy: 0.6350 - lr: 0.0090
Epoch 209/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4265 - accuracy:
```

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0.8067 - val_loss: 0.6099 - val_accuracy: 0.6902 - lr: 0.0090
Epoch 210/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4310 - accuracy:
0.8110 - val_loss: 0.7753 - val_accuracy: 0.5997 - lr: 0.0090
Epoch 211/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4336 - accuracy:
0.7995 - val_loss: 0.7212 - val_accuracy: 0.6380 - lr: 0.0090
Epoch 212/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4337 - accuracy:
0.8033 - val_loss: 0.7159 - val_accuracy: 0.6426 - lr: 0.0089
Epoch 213/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4296 - accuracy:
0.8029 - val_loss: 0.7077 - val_accuracy: 0.6457 - lr: 0.0089
Epoch 214/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4286 - accuracy:
0.8067 - val_loss: 0.6327 - val_accuracy: 0.6810 - lr: 0.0089
Epoch 215/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4311 - accuracy:
0.8079 - val_loss: 0.7123 - val_accuracy: 0.6549 - lr: 0.0089
Epoch 216/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4288 - accuracy:
0.8048 - val_loss: 0.6229 - val_accuracy: 0.6902 - lr: 0.0089
Epoch 217/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4345 - accuracy:
0.8010 - val_loss: 0.6366 - val_accuracy: 0.6810 - lr: 0.0089
Epoch 218/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4342 - accuracy:
0.8033 - val_loss: 0.8249 - val_accuracy: 0.5629 - lr: 0.0089
Epoch 219/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4302 - accuracy:
0.8129 - val_loss: 0.5750 - val_accuracy: 0.7025 - lr: 0.0089
Epoch 220/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4308 - accuracy:
0.8010 - val_loss: 0.7738 - val_accuracy: 0.6012 - lr: 0.0089
Epoch 221/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4245 - accuracy:
0.8098 - val_loss: 0.6457 - val_accuracy: 0.6687 - lr: 0.0089
Epoch 222/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4301 - accuracy:
0.8052 - val_loss: 0.7282 - val_accuracy: 0.6181 - lr: 0.0088
Epoch 223/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4333 - accuracy:
0.7987 - val_loss: 0.8152 - val_accuracy: 0.5828 - lr: 0.0088
Epoch 224/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4370 - accuracy:
0.7972 - val_loss: 0.6763 - val_accuracy: 0.6595 - lr: 0.0088
Epoch 225/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4341 - accuracy:
0.8041 - val_loss: 0.7718 - val_accuracy: 0.5936 - lr: 0.0088
Epoch 226/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4307 - accuracy:
0.8075 - val_loss: 0.7104 - val_accuracy: 0.6365 - lr: 0.0088
Epoch 227/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4277 - accuracy:
0.8087 - val_loss: 0.6765 - val_accuracy: 0.6518 - lr: 0.0088
Epoch 228/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4304 - accuracy:
0.8033 - val_loss: 0.7037 - val_accuracy: 0.6380 - lr: 0.0088
Epoch 229/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4238 - accuracy:
0.8079 - val_loss: 0.6968 - val_accuracy: 0.6472 - lr: 0.0088
Epoch 230/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4299 - accuracy:
0.8071 - val_loss: 0.6847 - val_accuracy: 0.6564 - lr: 0.0088
Epoch 231/2000
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3/3 [==============================] - 0s 12ms/step - loss: 0.4258 - accuracy:
0.8110 - val_loss: 0.8070 - val_accuracy: 0.5675 - lr: 0.0088
Epoch 232/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4232 - accuracy:
0.8083 - val_loss: 0.6726 - val_accuracy: 0.6626 - lr: 0.0087
Epoch 233/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4210 - accuracy:
0.8079 - val_loss: 0.7349 - val_accuracy: 0.6380 - lr: 0.0087
Epoch 234/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4243 - accuracy:
0.8090 - val_loss: 0.7958 - val_accuracy: 0.5890 - lr: 0.0087
Epoch 235/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4268 - accuracy:
0.8106 - val_loss: 0.7284 - val_accuracy: 0.6365 - lr: 0.0087
Epoch 236/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4265 - accuracy:
0.8087 - val_loss: 0.7284 - val_accuracy: 0.6304 - lr: 0.0087
Epoch 237/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4267 - accuracy:
0.7983 - val_loss: 0.6420 - val_accuracy: 0.6718 - lr: 0.0087
Epoch 238/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4244 - accuracy:
0.8021 - val_loss: 0.6480 - val_accuracy: 0.6825 - lr: 0.0087
Epoch 239/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4287 - accuracy:
0.8006 - val_loss: 0.6572 - val_accuracy: 0.6641 - lr: 0.0087
Epoch 240/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4283 - accuracy:
0.8002 - val_loss: 0.8080 - val_accuracy: 0.5966 - lr: 0.0087
Epoch 241/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4239 - accuracy:
0.8079 - val_loss: 0.5856 - val_accuracy: 0.7009 - lr: 0.0087
Epoch 242/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4304 - accuracy:
0.8021 - val_loss: 0.6876 - val_accuracy: 0.6518 - lr: 0.0086
Epoch 243/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4266 - accuracy:
0.8044 - val_loss: 0.7776 - val_accuracy: 0.5890 - lr: 0.0086
Epoch 244/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4169 - accuracy:
0.8133 - val_loss: 0.6259 - val_accuracy: 0.6764 - lr: 0.0086
Epoch 245/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4305 - accuracy:
0.8075 - val_loss: 0.7198 - val_accuracy: 0.6350 - lr: 0.0086
Epoch 246/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4254 - accuracy:
0.8056 - val_loss: 0.6709 - val_accuracy: 0.6534 - lr: 0.0086
Epoch 247/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4271 - accuracy:
0.8079 - val_loss: 0.7262 - val_accuracy: 0.6365 - lr: 0.0086
Epoch 248/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4214 - accuracy:
0.8121 - val_loss: 0.6494 - val_accuracy: 0.6656 - lr: 0.0086
Epoch 249/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4294 - accuracy:
0.8044 - val_loss: 0.7381 - val_accuracy: 0.6273 - lr: 0.0086
Epoch 250/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4232 - accuracy:
0.8110 - val_loss: 0.6740 - val_accuracy: 0.6672 - lr: 0.0086
Epoch 251/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4262 - accuracy:
0.8010 - val_loss: 0.7199 - val_accuracy: 0.6365 - lr: 0.0085
Epoch 252/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4320 - accuracy:
0.8079 - val_loss: 0.6586 - val_accuracy: 0.6718 - lr: 0.0085
```

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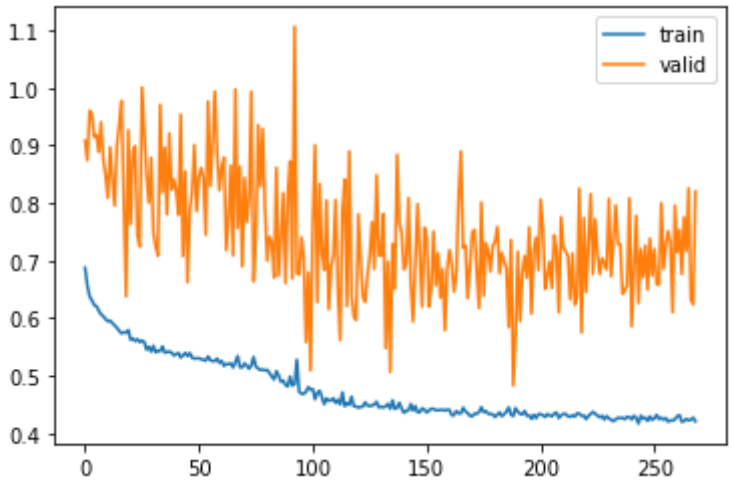
Epoch 253/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4244 - accuracy:
0.8071 - val_loss: 0.6582 - val_accuracy: 0.6748 - lr: 0.0085
Epoch 254/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4271 - accuracy:
0.8067 - val_loss: 0.7996 - val_accuracy: 0.5752 - lr: 0.0085
Epoch 255/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4237 - accuracy:
0.8014 - val_loss: 0.6857 - val_accuracy: 0.6564 - lr: 0.0085
Epoch 256/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4265 - accuracy:
0.8064 - val_loss: 0.7271 - val_accuracy: 0.6319 - lr: 0.0085
Epoch 257/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4203 - accuracy:
0.8090 - val_loss: 0.7510 - val_accuracy: 0.6028 - lr: 0.0085
Epoch 258/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4223 - accuracy:
0.8044 - val_loss: 0.7304 - val_accuracy: 0.6319 - lr: 0.0085
Epoch 259/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4220 - accuracy:
0.8102 - val_loss: 0.6102 - val_accuracy: 0.6887 - lr: 0.0085
Epoch 260/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4241 - accuracy:
0.8041 - val_loss: 0.7954 - val_accuracy: 0.5936 - lr: 0.0085
Epoch 261/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4297 - accuracy:
0.8060 - val_loss: 0.7140 - val_accuracy: 0.6227 - lr: 0.0084
Epoch 262/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4315 - accuracy:
0.8018 - val_loss: 0.7534 - val_accuracy: 0.5997 - lr: 0.0084
Epoch 263/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4200 - accuracy:
0.8041 - val_loss: 0.6763 - val_accuracy: 0.6580 - lr: 0.0084
Epoch 264/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4212 - accuracy:
0.8102 - val_loss: 0.7753 - val_accuracy: 0.5966 - lr: 0.0084
Epoch 265/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4251 - accuracy:
0.8018 - val_loss: 0.7164 - val_accuracy: 0.6380 - lr: 0.0084
Epoch 266/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4223 - accuracy:
0.8064 - val_loss: 0.8253 - val_accuracy: 0.5736 - lr: 0.0084
Epoch 267/2000
3/3 [==============================] - 0s 11ms/step - loss: 0.4236 - accuracy:
0.8021 - val_loss: 0.6328 - val_accuracy: 0.6733 - lr: 0.0084
Epoch 268/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4271 - accuracy:
0.8106 - val_loss: 0.6239 - val_accuracy: 0.6748 - lr: 0.0084
Epoch 269/2000
3/3 [==============================] - 0s 12ms/step - loss: 0.4208 - accuracy:
0.8117 - val_loss: 0.8195 - val_accuracy: 0.5721 - lr: 0.0084
```

In [83]:
```
# Capturing learning history per epoch
hist6 = pd.DataFrame(hist_mod6.history)
hist6["epoch"] = hist_mod6.epoch

# Plotting accuracy at different epochs
plt.plot(hist6["loss"])
plt.plot(hist6["val_loss"])
plt.legend(("train", "valid"), loc=0)
```

Out[83]:
```
<matplotlib.legend.Legend at 0x18591b6bf40>
```



In [84]:
```
model7 = Sequential()

model7.add(
    Dense(units=61, input_dim=12, kernel_initializer="HeNormal", activation="rel
)

model7.add(Dense(1, kernel_initializer="HeNormal", activation="sigmoid"))

model7.compile(Adam(lr=0.01), loss="binary_crossentropy", metrics=["accuracy"])

model7.summary()
```

```
Model: "sequential_6"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 dense_24 (Dense)            (None, 61)                793

 dense_25 (Dense)            (None, 1)                 62

=================================================================
Total params: 855
Trainable params: 855
Non-trainable params: 0
_________________________________________________________________
```

In [85]:
```
hist_mod7 = model7.fit(
    scaled_train_X,
    scaled_train_y,
    batch_size=15,
    epochs=20,
    validation_split=0.2,
)
```

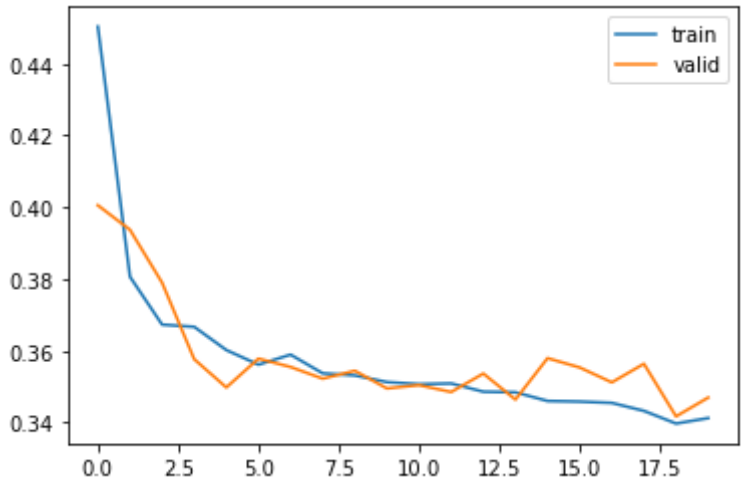
```
Epoch 1/20
427/427 [==============================] - 1s 1ms/step - loss: 0.4503 - accurac
y: 0.8070 - val_loss: 0.4005 - val_accuracy: 0.8306
Epoch 2/20
427/427 [==============================] - 0s 984us/step - loss: 0.3806 - accura
cy: 0.8377 - val_loss: 0.3937 - val_accuracy: 0.8300
Epoch 3/20
427/427 [==============================] - 0s 984us/step - loss: 0.3673 - accura
cy: 0.8430 - val_loss: 0.3790 - val_accuracy: 0.8487
Epoch 4/20
```

```
427/427 [==============================] - 0s 981us/step - loss: 0.3667 - accura
cy: 0.8448 - val_loss: 0.3577 - val_accuracy: 0.8569
Epoch 5/20
427/427 [==============================] - 0s 968us/step - loss: 0.3602 - accura
cy: 0.8489 - val_loss: 0.3498 - val_accuracy: 0.8550
Epoch 6/20
427/427 [==============================] - 0s 989us/step - loss: 0.3561 - accura
cy: 0.8491 - val_loss: 0.3578 - val_accuracy: 0.8581
Epoch 7/20
427/427 [==============================] - 0s 1ms/step - loss: 0.3589 - accurac
y: 0.8505 - val_loss: 0.3555 - val_accuracy: 0.8587
Epoch 8/20
427/427 [==============================] - 0s 991us/step - loss: 0.3537 - accura
cy: 0.8508 - val_loss: 0.3522 - val_accuracy: 0.8581
Epoch 9/20
427/427 [==============================] - 0s 992us/step - loss: 0.3531 - accura
cy: 0.8558 - val_loss: 0.3544 - val_accuracy: 0.8569
Epoch 10/20
427/427 [==============================] - 0s 977us/step - loss: 0.3513 - accura
cy: 0.8542 - val_loss: 0.3495 - val_accuracy: 0.8525
Epoch 11/20
427/427 [==============================] - 0s 994us/step - loss: 0.3507 - accura
cy: 0.8550 - val_loss: 0.3504 - val_accuracy: 0.8587
Epoch 12/20
427/427 [==============================] - 0s 970us/step - loss: 0.3509 - accura
cy: 0.8539 - val_loss: 0.3485 - val_accuracy: 0.8562
Epoch 13/20
427/427 [==============================] - 0s 975us/step - loss: 0.3486 - accura
cy: 0.8594 - val_loss: 0.3537 - val_accuracy: 0.8525
Epoch 14/20
427/427 [==============================] - 0s 989us/step - loss: 0.3484 - accura
cy: 0.8550 - val_loss: 0.3464 - val_accuracy: 0.8525
Epoch 15/20
427/427 [==============================] - 0s 975us/step - loss: 0.3460 - accura
cy: 0.8578 - val_loss: 0.3579 - val_accuracy: 0.8512
Epoch 16/20
427/427 [==============================] - 0s 977us/step - loss: 0.3458 - accura
cy: 0.8558 - val_loss: 0.3554 - val_accuracy: 0.8519
Epoch 17/20
427/427 [==============================] - 0s 977us/step - loss: 0.3455 - accura
cy: 0.8589 - val_loss: 0.3512 - val_accuracy: 0.8506
Epoch 18/20
427/427 [==============================] - 0s 994us/step - loss: 0.3433 - accura
cy: 0.8573 - val_loss: 0.3564 - val_accuracy: 0.8519
Epoch 19/20
427/427 [==============================] - 0s 975us/step - loss: 0.3397 - accura
cy: 0.8600 - val_loss: 0.3417 - val_accuracy: 0.8587
Epoch 20/20
427/427 [==============================] - 0s 977us/step - loss: 0.3412 - accura
cy: 0.8611 - val_loss: 0.3470 - val_accuracy: 0.8581
```

In [86]:
```
# Capturing learning history per epoch
hist7 = pd.DataFrame(hist_mod7.history)
hist7["epoch"] = hist_mod7.epoch

# Plotting accuracy at different epochs
plt.plot(hist7["loss"])
plt.plot(hist7["val_loss"])
plt.legend(("train", "valid"), loc=0)
```

Out[86]:
```
<matplotlib.legend.Legend at 0x185954dde20>
```



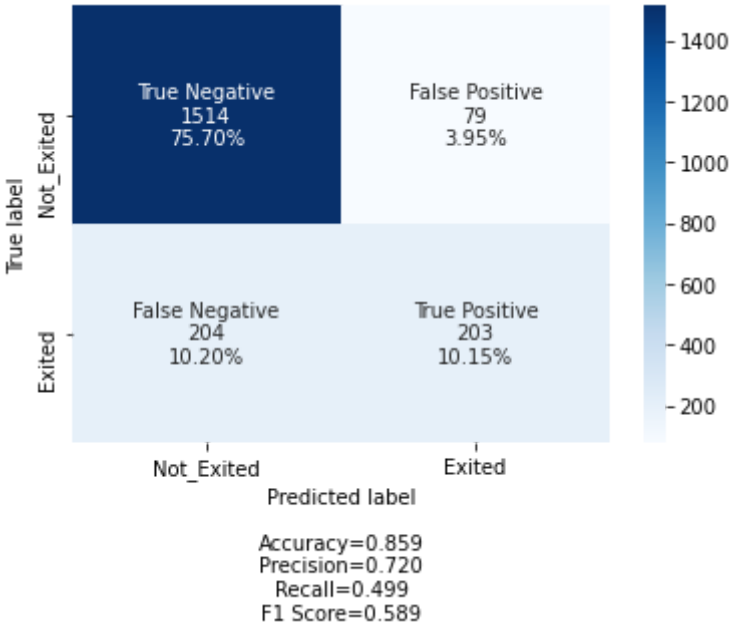
In [87]:
```
model7_score = model7.evaluate(scaled_test_X, scaled_test_y)
```

```
63/63 [==============================] - 0s 662us/step - loss: 0.3541 - accurac
y: 0.8585
```

In [88]:
```
## Confusion Matrix on unsee test set
import seaborn as sn

y_pred7 = model7.predict(scaled_test_X)
for i in range(len(scaled_test_y)):
    if y_pred7[i] > 0.5:
        y_pred7[i] = 1
    else:
        y_pred7[i] = 0


cm7 = confusion_matrix(y_test, y_pred7)
labels = ["True Negative", "False Positive", "False Negative", "True Positive"]
categories = ["Not_Exited", "Exited"]
make_confusion_matrix(cm7, group_names=labels, categories=categories, cmap="Blue
```



In [89]:
```
model8 = Sequential()

model8.add(
    Dense(
        units=61, input_dim=12, kernel_initializer="HeNormal", activation="leaky
    )
)

model8.add(Dense(1, kernel_initializer="HeNormal", activation="sigmoid"))

model8.compile(Nadam(lr=0.01), loss="binary_crossentropy", metrics=["accuracy"])

model8.summary()
```

```
Model: "sequential_7"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 dense_26 (Dense)            (None, 61)                793

 dense_27 (Dense)            (None, 1)                 62

=================================================================
Total params: 855
Trainable params: 855
Non-trainable params: 0
_________________________________________________________________
```

In [90]:
```
hist_mod8 = model8.fit(
    scaled_train_over_X,
    scaled_train_over_y,
    batch_size=32,
    epochs=20,
    validation_split=0.2,
)
```

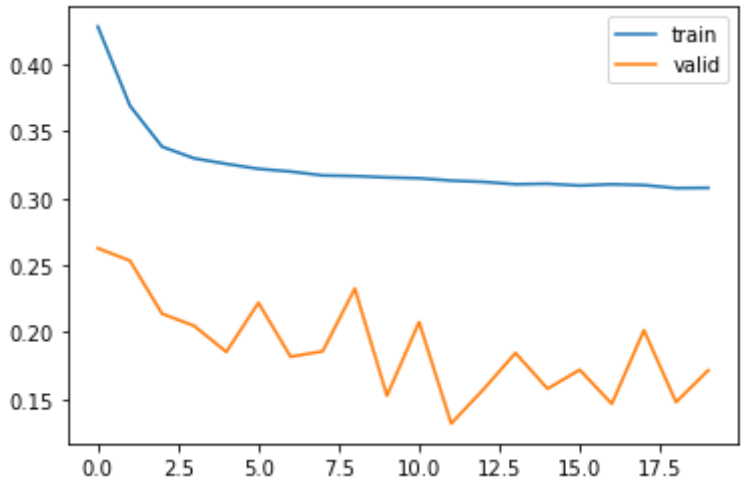
```
Epoch 1/20
319/319 [==============================] - 1s 1ms/step - loss: 0.4282 - accurac
y: 0.8083 - val_loss: 0.2627 - val_accuracy: 0.8736
Epoch 2/20
319/319 [==============================] - 0s 998us/step - loss: 0.3691 - accura
cy: 0.8364 - val_loss: 0.2535 - val_accuracy: 0.8666
Epoch 3/20
319/319 [==============================] - 0s 963us/step - loss: 0.3385 - accura
cy: 0.8506 - val_loss: 0.2139 - val_accuracy: 0.8960
Epoch 4/20
319/319 [==============================] - 0s 985us/step - loss: 0.3298 - accura
cy: 0.8543 - val_loss: 0.2048 - val_accuracy: 0.8952
Epoch 5/20
319/319 [==============================] - 0s 988us/step - loss: 0.3257 - accura
cy: 0.8573 - val_loss: 0.1854 - val_accuracy: 0.9062
Epoch 6/20
319/319 [==============================] - 0s 986us/step - loss: 0.3220 - accura
cy: 0.8580 - val_loss: 0.2220 - val_accuracy: 0.8807
Epoch 7/20
319/319 [==============================] - 0s 994us/step - loss: 0.3200 - accura
cy: 0.8606 - val_loss: 0.1818 - val_accuracy: 0.9117
Epoch 8/20
319/319 [==============================] - 0s 978us/step - loss: 0.3171 - accura
cy: 0.8632 - val_loss: 0.1858 - val_accuracy: 0.9066
Epoch 9/20
319/319 [==============================] - 0s 979us/step - loss: 0.3166 - accura
```

```
cy: 0.8638 - val_loss: 0.2327 - val_accuracy: 0.8842
Epoch 10/20
319/319 [==============================] - 0s 963us/step - loss: 0.3156 - accura
cy: 0.8633 - val_loss: 0.1527 - val_accuracy: 0.9278
Epoch 11/20
319/319 [==============================] - 0s 988us/step - loss: 0.3150 - accura
cy: 0.8622 - val_loss: 0.2076 - val_accuracy: 0.8995
Epoch 12/20
319/319 [==============================] - 0s 994us/step - loss: 0.3132 - accura
cy: 0.8660 - val_loss: 0.1319 - val_accuracy: 0.9372
Epoch 13/20
319/319 [==============================] - 0s 986us/step - loss: 0.3123 - accura
cy: 0.8650 - val_loss: 0.1573 - val_accuracy: 0.9278
Epoch 14/20
319/319 [==============================] - 0s 981us/step - loss: 0.3105 - accura
cy: 0.8663 - val_loss: 0.1846 - val_accuracy: 0.9113
Epoch 15/20
319/319 [==============================] - 0s 968us/step - loss: 0.3109 - accura
cy: 0.8629 - val_loss: 0.1579 - val_accuracy: 0.9235
Epoch 16/20
319/319 [==============================] - 0s 992us/step - loss: 0.3095 - accura
cy: 0.8679 - val_loss: 0.1720 - val_accuracy: 0.9211
Epoch 17/20
319/319 [==============================] - 0s 963us/step - loss: 0.3105 - accura
cy: 0.8649 - val_loss: 0.1466 - val_accuracy: 0.9313
Epoch 18/20
319/319 [==============================] - 0s 985us/step - loss: 0.3099 - accura
cy: 0.8645 - val_loss: 0.2016 - val_accuracy: 0.8964
Epoch 19/20
319/319 [==============================] - 0s 991us/step - loss: 0.3076 - accura
cy: 0.8668 - val_loss: 0.1479 - val_accuracy: 0.9297
Epoch 20/20
319/319 [==============================] - 0s 982us/step - loss: 0.3078 - accura
cy: 0.8666 - val_loss: 0.1716 - val_accuracy: 0.9148
```

In [91]:
```
# Capturing learning history per epoch
hist8 = pd.DataFrame(hist_mod8.history)
hist8["epoch"] = hist_mod8.epoch

# Plotting accuracy at different epochs
plt.plot(hist8["loss"])
plt.plot(hist8["val_loss"])
plt.legend(("train", "valid"), loc=0)
```

Out[91]:
```
<matplotlib.legend.Legend at 0x18595834a90>
```



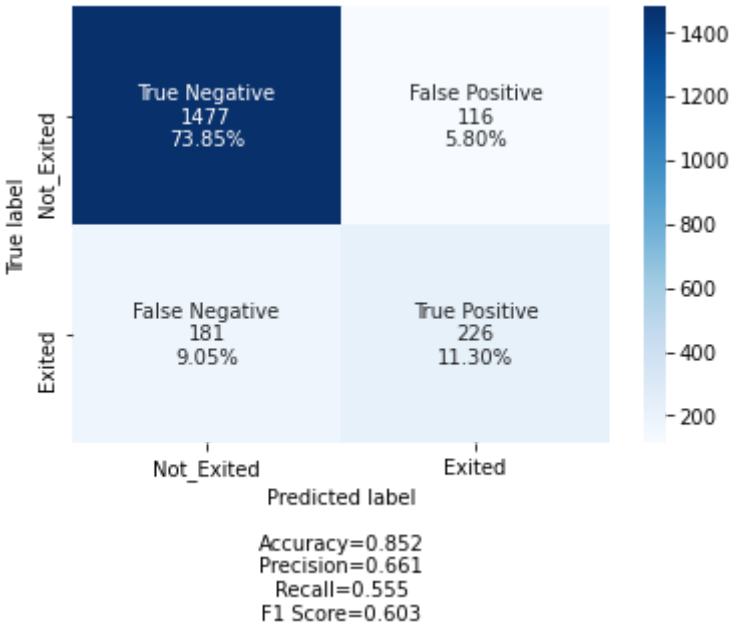
In [92]:
```
model8_score = model8.evaluate(scaled_test_X, scaled_test_y)
```

```
63/63 [==============================] - 0s 630us/step - loss: 0.3671 - accurac
y: 0.8515
```

In [93]:
```
## Confusion Matrix on unsee test set
import seaborn as sn

y_pred8 = model8.predict(scaled_test_X)
for i in range(len(scaled_test_y)):
    if y_pred8[i] > 0.5:
        y_pred8[i] = 1
    else:
        y_pred8[i] = 0


cm8 = confusion_matrix(y_test, y_pred8)
labels = ["True Negative", "False Positive", "False Negative", "True Positive"]
categories = ["Not_Exited", "Exited"]
make_confusion_matrix(cm8, group_names=labels, categories=categories, cmap="Blue
```



Model Performance Improvement/Evaluation

My first set of models have more layers/dropouts

- **Model-5** is giving me the highest accuracy score of 86% on test set
  - loss is similar on the train and validation set
  - The recall is quite low at 47%, but precision is at 77%

I decided to try a smaller architecture with only 1 hidden layer, but with much more nodes.

- **Model-7** is giving me an accuracy score very close to 86% on test set
  - loss is similar on the train and validation set

    - The recall is a little higher at 50%, while the precision is at 72%

With the same 1 hidden layer architecture, I changed the activation, optimizer, batch size, and ran the model on the oversampled training data.

- **Model-8** is giving me an accuracy score of 85% on test set
    - val_loss is quite a bit lower than train_loss
    - The recall is higher at 55% with a precision of 66%

(Model-5 and Model-7 were ran on the non-sampled data)

I tried running some models on the undersampled data, but the losses were pretty high and accuracy was low. (Probably not enough data)

Conclusion/Key Takeaways

- Sampled data influences the behavior of the model greatly.
- Finding the right combination of layers/nodes, optimizer, activation, batch size, epoch, learning rate, etc., can be quite difficult.
- I need more practice and guidance.