final (2)

May 28, 2023

[2]:
```
# Import libraries and magics

import numpy as np
import pandas as pd
from scipy import stats
from pandas import DatetimeIndex as dt
from seaborn import pairplot
import matplotlib.pyplot as plt
%matplotlib inline
plt.style.use('bmh')
import pandas as pd
import seaborn as sns
import numpy as np
import os
import matplotlib.pyplot as plt
%matplotlib inline
from IPython.display import display
pd.options.display.max_columns = None
import warnings
warnings.filterwarnings("ignore")
from statsmodels.stats.outliers_influence import variance_inflation_factor
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import classification_report, confusion_matrix

from sklearn.model_selection import train_test_split, GridSearchCV,␣
 ↪RandomizedSearchCV, cross_val_score
from sklearn.preprocessing import StandardScaler, OneHotEncoder,␣
 ↪OrdinalEncoder, PolynomialFeatures
from sklearn.pipeline import Pipeline
from sklearn.compose import ColumnTransformer
from sklearn.impute import SimpleImputer
```

```
import joblib
from sklearn.linear_model import LinearRegression, Lasso, LogisticRegression
from sklearn.ensemble import RandomForestClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import r2_score, accuracy_score, confusion_matrix,␣
 ↪classification_report
```

[2]:

[3]:
```
# Going through the data
data = pd.read_csv('starcraft_player_data.csv')
data
```

[3]:

	GameID	LeagueIndex	Age	HoursPerWeek	TotalHours	APM
0	52	5	27	10	3000	143.7180
1	55	5	23	10	5000	129.2322
2	56	4	30	10	200	69.9612
3	57	3	19	20	400	107.6016
4	58	3	32	10	500	122.8908
…	…	…	..	…	…	…
3390	10089	8	?	?	?	259.6296
3391	10090	8	?	?	?	314.6700
3392	10092	8	?	?	?	299.4282
3393	10094	8	?	?	?	375.8664
3394	10095	8	?	?	?	348.3576

	SelectByHotkeys	AssignToHotkeys	UniqueHotkeys	MinimapAttacks
0	0.003515	0.000220	7	0.000110
1	0.003304	0.000259	4	0.000294
2	0.001101	0.000336	4	0.000294
3	0.001034	0.000213	1	0.000053
4	0.001136	0.000327	2	0.000000
…	…	…	…	…
3390	0.020425	0.000743	9	0.000621
3391	0.028043	0.001157	10	0.000246
3392	0.028341	0.000860	7	0.000338
3393	0.036436	0.000594	5	0.000204
3394	0.029855	0.000811	4	0.000224

	MinimapRightClicks	NumberOfPACs	GapBetweenPACs	ActionLatency
0	0.000392	0.004849	32.6677	40.8673
1	0.000432	0.004307	32.9194	42.3454
2	0.000461	0.002926	44.6475	75.3548
3	0.000543	0.003783	29.2203	53.7352
4	0.001329	0.002368	22.6885	62.0813
…	…	…	…	…
3390	0.000146	0.004555	18.6059	42.8342

```
3391            0.001083      0.004259         14.3023        36.1156
3392            0.000169      0.004439         12.4028        39.5156
3393            0.000780      0.004346         11.6910        34.8547
3394            0.001315      0.005566         20.0537        33.5142

      ActionsInPAC  TotalMapExplored  WorkersMade  UniqueUnitsMade  \
0           4.7508                28     0.001397                6
1           4.8434                22     0.001193                5
2           4.0430                22     0.000745                6
3           4.9155                19     0.000426                7
4           9.3740                15     0.001174                4
…              …               …           …               …
3390        6.2754                46     0.000877                5
3391        7.1965                16     0.000788                4
3392        6.3979                19     0.001260                4
3393        7.9615                15     0.000613                6
3394        6.3719                27     0.001566                7

      ComplexUnitsMade  ComplexAbilitiesUsed
0             0.000000              0.000000
1             0.000000              0.000208
2             0.000000              0.000189
3             0.000000              0.000384
4             0.000000              0.000019
…                ...                   …
3390          0.000000              0.000000
3391          0.000000              0.000000
3392          0.000000              0.000000
3393          0.000000              0.000631
3394          0.000457              0.000895

[3395 rows x 20 columns]
```

[4]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3395 entries, 0 to 3394
Data columns (total 20 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   GameID                3395 non-null   int64
 1   LeagueIndex           3395 non-null   int64
 2   Age                   3395 non-null   object
 3   HoursPerWeek          3395 non-null   object
 4   TotalHours            3395 non-null   object
 5   APM                   3395 non-null   float64
 6   SelectByHotkeys       3395 non-null   float64
```

```
 7   AssignToHotkeys       3395 non-null   float64
 8   UniqueHotkeys         3395 non-null   int64
 9   MinimapAttacks        3395 non-null   float64
 10  MinimapRightClicks    3395 non-null   float64
 11  NumberOfPACs          3395 non-null   float64
 12  GapBetweenPACs        3395 non-null   float64
 13  ActionLatency         3395 non-null   float64
 14  ActionsInPAC          3395 non-null   float64
 15  TotalMapExplored      3395 non-null   int64
 16  WorkersMade           3395 non-null   float64
 17  UniqueUnitsMade       3395 non-null   int64
 18  ComplexUnitsMade      3395 non-null   float64
 19  ComplexAbilitiesUsed  3395 non-null   float64
dtypes: float64(12), int64(5), object(3)
memory usage: 530.6+ KB
```

[5]:
```
data.isnull().sum()
```

[5]:
```
GameID                  0
LeagueIndex             0
Age                     0
HoursPerWeek            0
TotalHours              0
APM                     0
SelectByHotkeys         0
AssignToHotkeys         0
UniqueHotkeys           0
MinimapAttacks          0
MinimapRightClicks      0
NumberOfPACs            0
GapBetweenPACs          0
ActionLatency           0
ActionsInPAC            0
TotalMapExplored        0
WorkersMade             0
UniqueUnitsMade         0
ComplexUnitsMade        0
ComplexAbilitiesUsed    0
dtype: int64
```

0.1 We convert these 3 columns to numeric datatypes from object and find out that there are null values that are present. We use errors=‘coerce’ since there are ‘?’ values present in these 3 features. We convert it to null from ‘?’

[6]:
```
data['Age'] = pd.to_numeric(data['Age'], errors='coerce')
data['HoursPerWeek'] = pd.to_numeric(data['HoursPerWeek'], errors='coerce')
data['TotalHours'] = pd.to_numeric(data['TotalHours'], errors='coerce')
```

[7]:
```
data.isnull().sum()
```

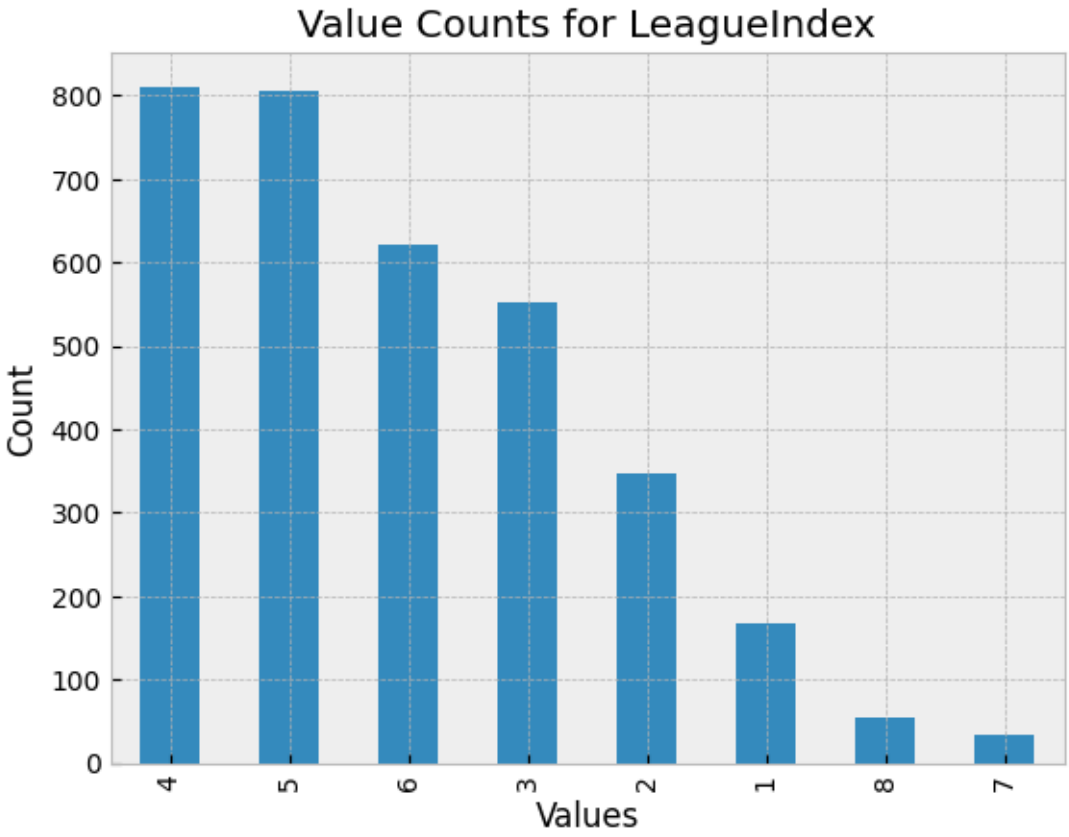
[7]:
```
GameID                 0
LeagueIndex            0
Age                   55
HoursPerWeek          56
TotalHours            57
APM                    0
SelectByHotkeys        0
AssignToHotkeys        0
UniqueHotkeys          0
MinimapAttacks         0
MinimapRightClicks     0
NumberOfPACs           0
GapBetweenPACs         0
ActionLatency          0
ActionsInPAC           0
TotalMapExplored       0
WorkersMade            0
UniqueUnitsMade        0
ComplexUnitsMade       0
ComplexAbilitiesUsed   0
dtype: int64
```

0.2 Conclusions we can form from this data:

1. We can see that for LeagueIndex we don’t have many instances in the range 7-8.
2. The null values in those 3 features are about 1% of the entire dataset and we can use some inputing techniques for it.
3. We can come up with individual techniques to fill in the null values so that noise is not added to our dataset.

[8]:
```
interesting_columns=[ 'LeagueIndex']
for column in interesting_columns:
    plt.figure()  # Create a new figure for each column
    data[column].value_counts().plot(kind='bar')
    plt.title(f'Value Counts for {column}')
```

```
    plt.xlabel('Values')
    plt.ylabel('Count')
    plt.show()
```



0.3 For age, we see that the LeagueIndex 8 has all missing values. Furthermore, we also see that as LeagueIndex increases the the distribution of the age decreases even though the mean remains relatvely same. We take the median of LeagueIndex 7 to impute the null values.

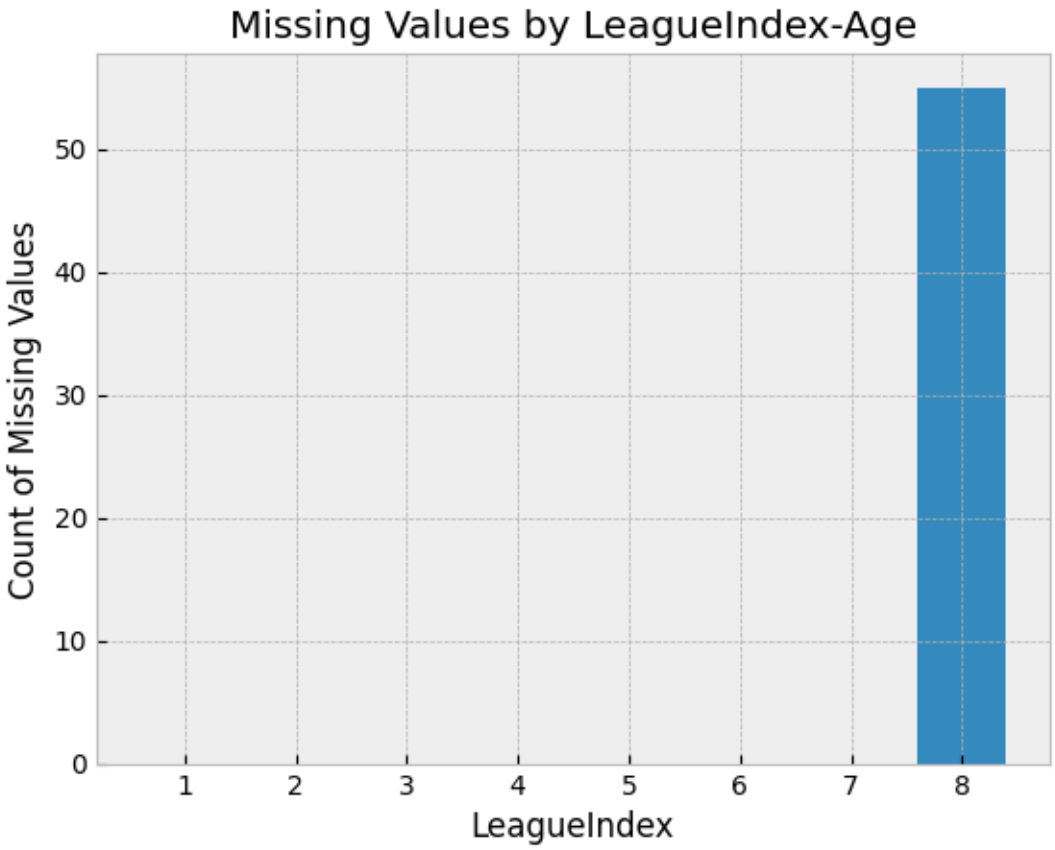
[9]:
```
import matplotlib.pyplot as plt

# Create a range of LeagueIndex values from 1 to 8
league_index_range = range(1, 9)

# Initialize a list to store the count of missing values for each LeagueIndex␣
 ↪category
missing_values_count = []
```

```
# Iterate over each LeagueIndex category
for index in league_index_range:
    count = data[(data["LeagueIndex"] == index) & (data["Age"].isnull())].
 ↪shape[0]
    missing_values_count.append(count)

# Plot the bar chart
plt.bar(league_index_range, missing_values_count)
plt.xlabel("LeagueIndex")
plt.ylabel("Count of Missing Values")
plt.title("Missing Values by LeagueIndex-Age")
plt.show()
```

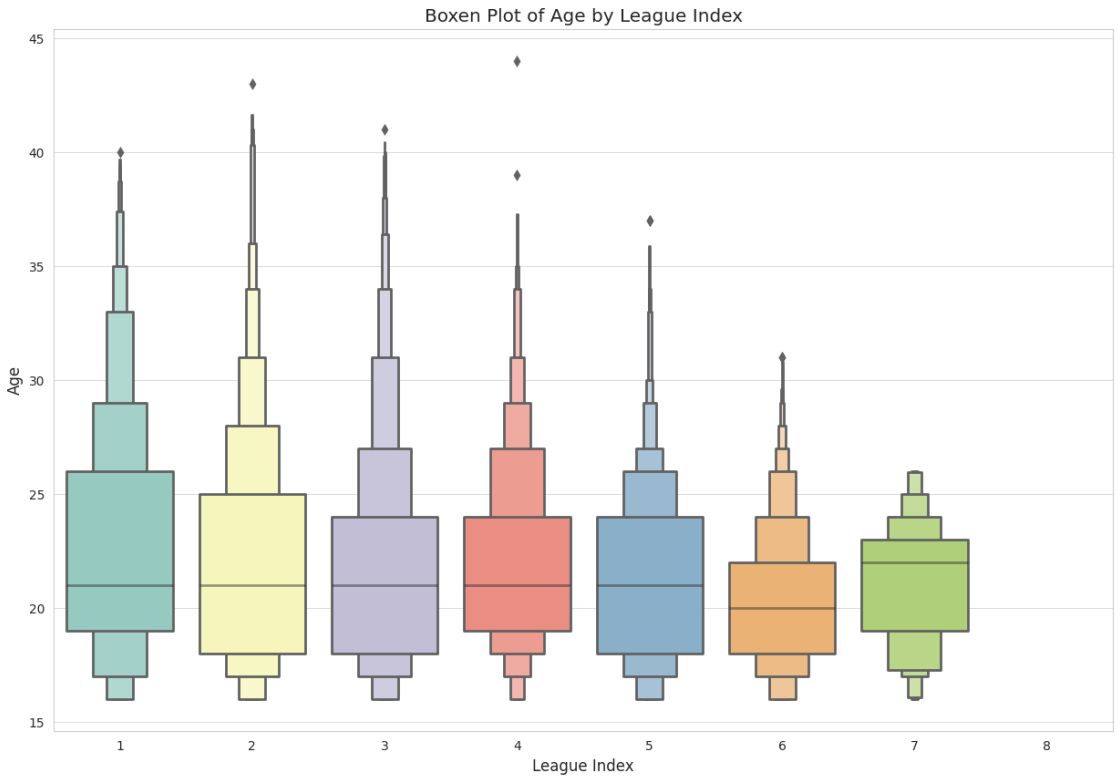


[10]:
```
import seaborn as sns
import matplotlib.pyplot as plt

plt.figure(figsize=(15, 10))
sns.set_style("whitegrid")  # Set the style of the plot
```

```
sns.boxenplot(data=data, x="LeagueIndex", y="Age", palette="Set3",␣
 ↪k_depth="proportion")
plt.xlabel("League Index")
plt.ylabel("Age")
plt.title("Boxen Plot of Age by League Index")

plt.show()
```



[11]:
```
med_val = data[data["LeagueIndex"] == 7]["Age"].median()
data["Age"] = data["Age"].fillna(med_val)
```

0.4 For HoursPerWeek we see that most null values are present in leageIndex 8 and one null value is present in LeagueIndex 5. The hours per week spent increases as the LeagueIndex increases which makes logical sense. Since there is quite a difference in the mean of all leagueIndex, we fill with individual median LeagueIndex values.

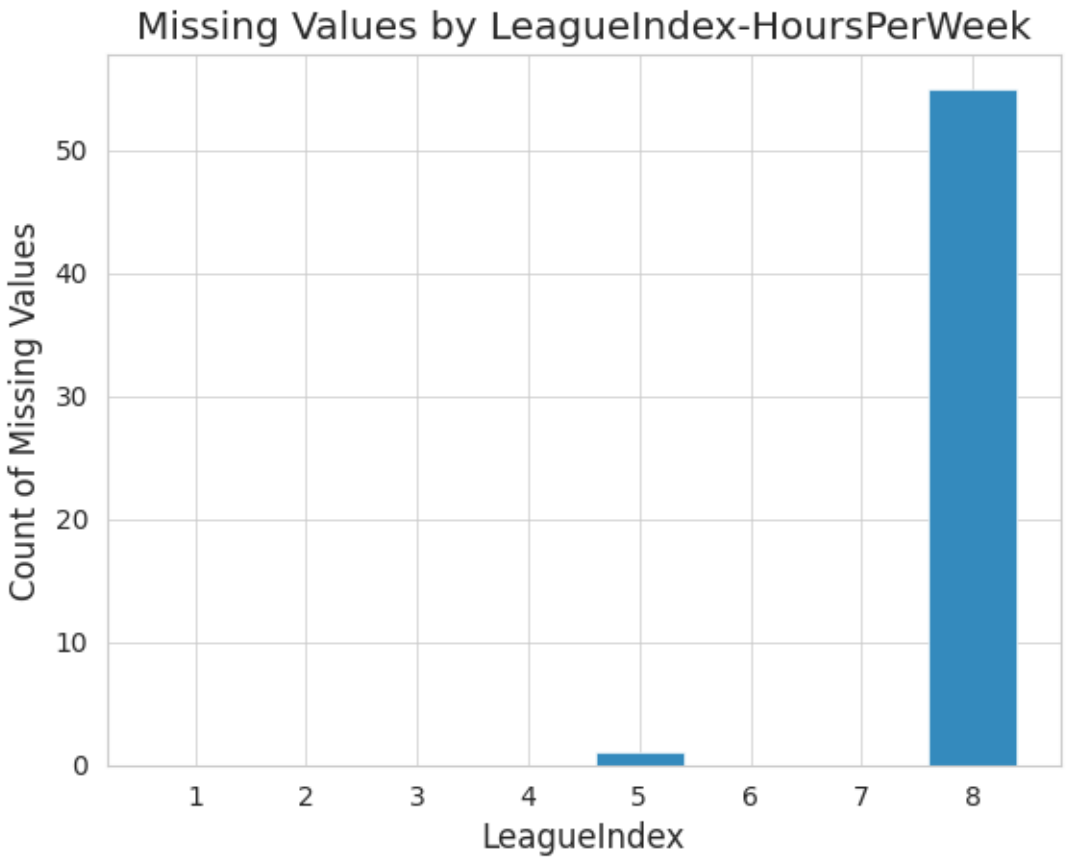
[12]:
```
import matplotlib.pyplot as plt

# Create a range of LeagueIndex values from 1 to 8
league_index_range = range(1, 9)
```

```
# Initialize a list to store the count of missing values for each LeagueIndex
 ↪category
missing_values_count = []

# Iterate over each LeagueIndex category
for index in league_index_range:
    count = data[(data["LeagueIndex"] == index) & (data["HoursPerWeek"].
 ↪isnull())].shape[0]
    missing_values_count.append(count)

# Plot the bar chart
plt.bar(league_index_range, missing_values_count)
plt.xlabel("LeagueIndex")
plt.ylabel("Count of Missing Values")
plt.title("Missing Values by LeagueIndex-HoursPerWeek")
plt.show()
```

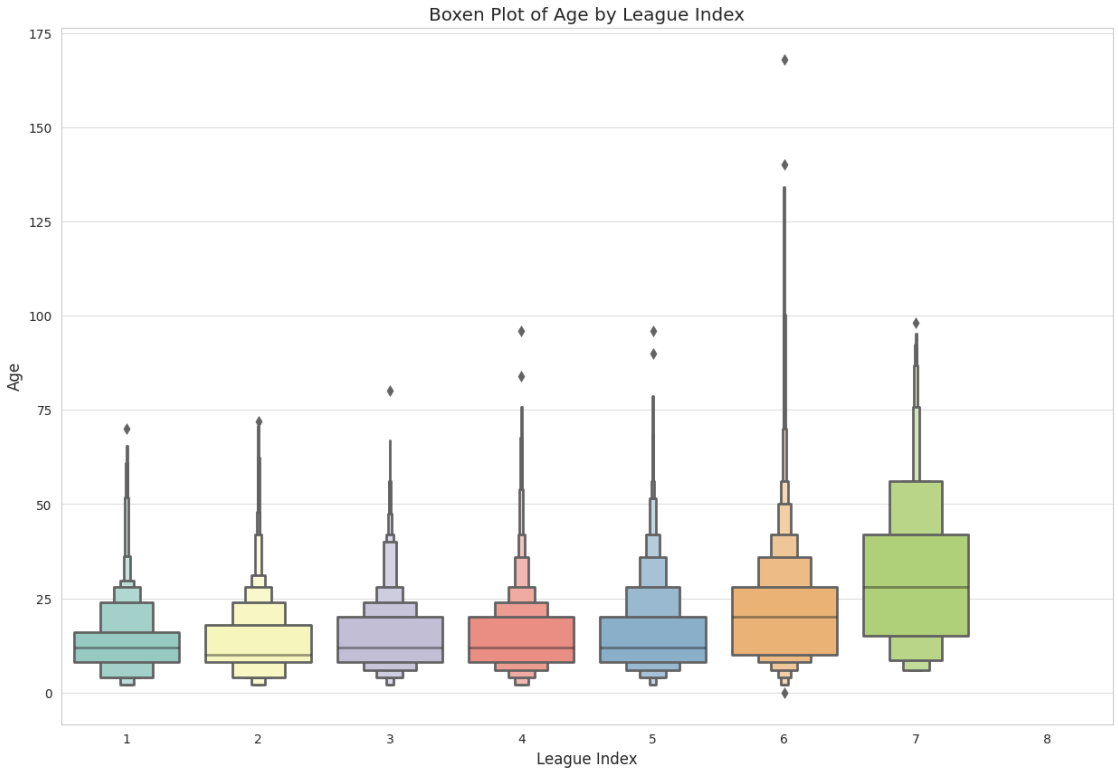


[13]:
```
import seaborn as sns
import matplotlib.pyplot as plt

plt.figure(figsize=(15, 10))
sns.set_style("whitegrid")  # Set the style of the plot

sns.boxenplot(data=data, x="LeagueIndex", y="HoursPerWeek", palette="Set3",␣
 ↪k_depth="proportion")
plt.xlabel("League Index")
plt.ylabel("Age")
plt.title("Boxen Plot of Age by League Index")

plt.show()
```



[14]:
```
med_val_l5 = data[data["LeagueIndex"] == 5]["HoursPerWeek"].median()
data.loc[
    (data["HoursPerWeek"].isnull()) & (data["LeagueIndex"] == 5), "HoursPerWeek"
] = med_val_l5

# Now imputing the missing value for player with missing hoursperweek for␣
 ↪leagueindex = 8
med_val_l8 = data[data["LeagueIndex"] == 7]["HoursPerWeek"].median()
```

```
data.loc[
    (data["HoursPerWeek"].isnull()) & (data["LeagueIndex"] == 8), "HoursPerWeek"
] = med_val_18
```

0.5 Logically the total hours increases as the LeagueIndex increases, since the more you play the better you are. Since the box plot is on the log normal scale, there is quite a big difference between the mean total hours per leagueindex. Yet again, most of the missing values are from LeagueIndex 8 and a few from index 5. We fill these with the median values from the individual Total Hours per leagueIndex.

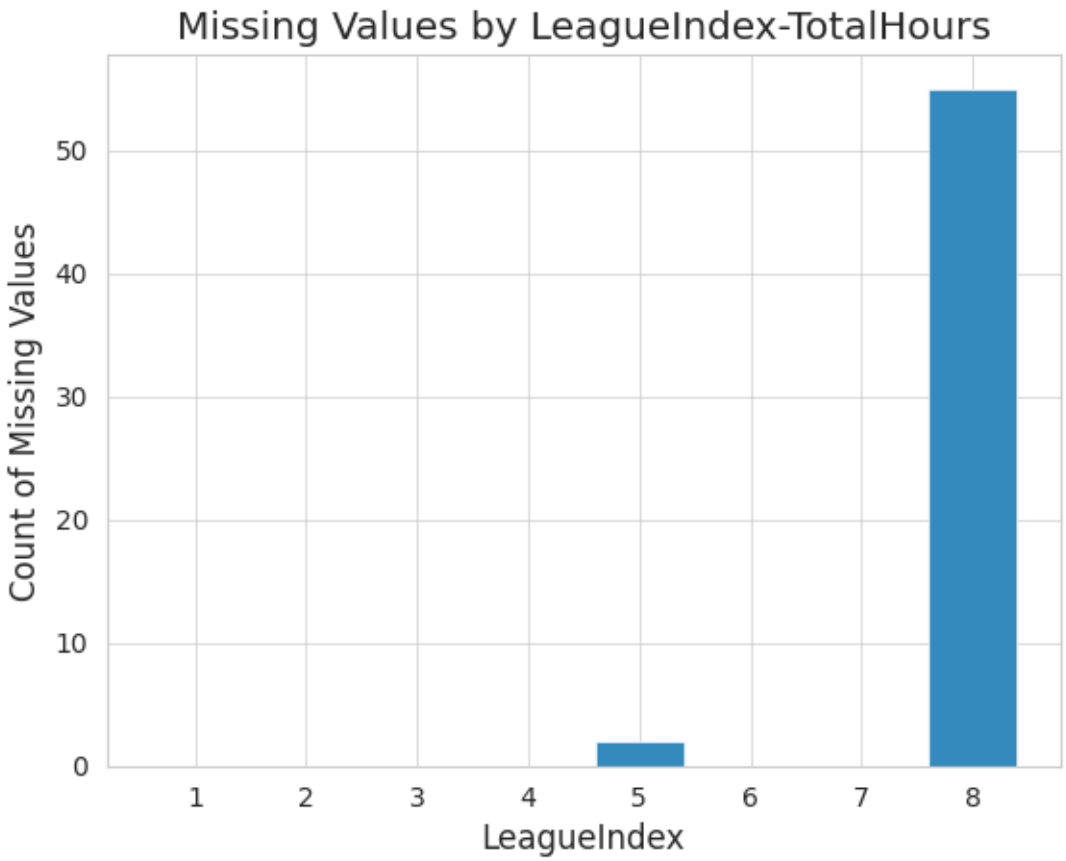
[15]:
```
import matplotlib.pyplot as plt

# Create a range of LeagueIndex values from 1 to 8
league_index_range = range(1, 9)

# Initialize a list to store the count of missing values for each LeagueIndex␣
 ↪category
missing_values_count = []

# Iterate over each LeagueIndex category
for index in league_index_range:
    count = data[(data["LeagueIndex"] == index) & (data["TotalHours"].
 ↪isnull())].shape[0]
    missing_values_count.append(count)

# Plot the bar chart
plt.bar(league_index_range, missing_values_count)
plt.xlabel("LeagueIndex")
plt.ylabel("Count of Missing Values")
plt.title("Missing Values by LeagueIndex-TotalHours")
plt.show()
```



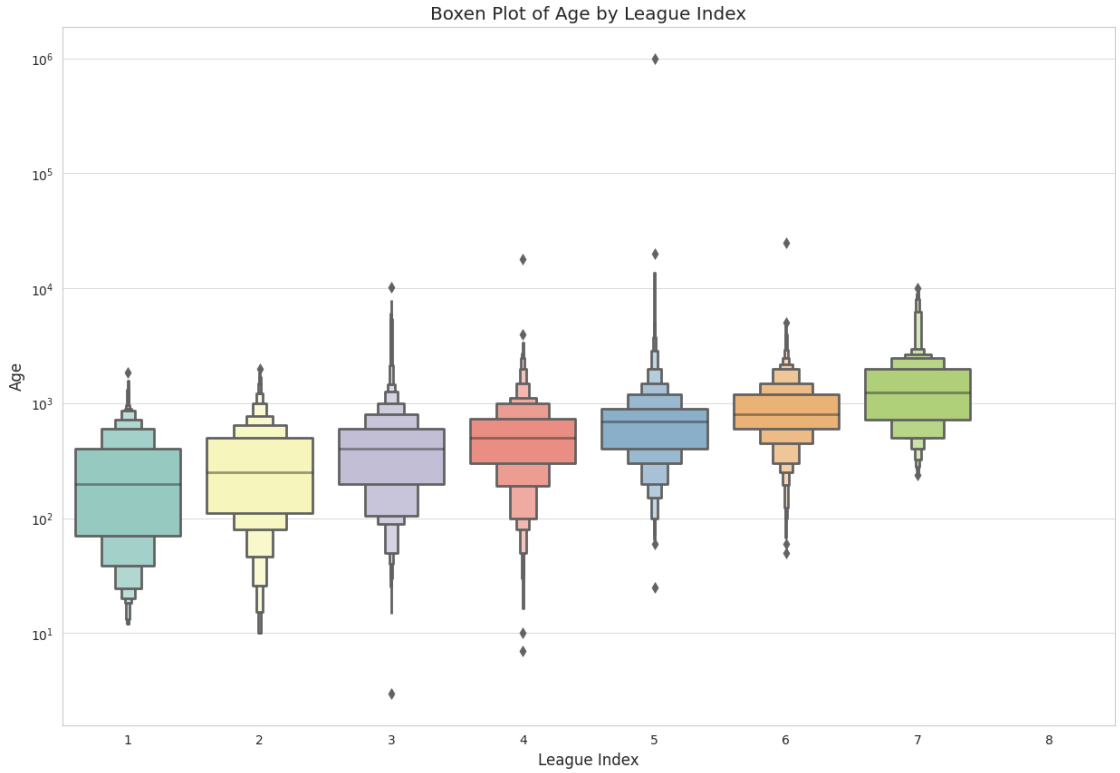
[16]:
```
import seaborn as sns
import matplotlib.pyplot as plt

plt.figure(figsize=(15, 10))
sns.set_style("whitegrid")  # Set the style of the plot

sns.boxenplot(data=data, x="LeagueIndex", y="TotalHours", palette="Set3",␣
↪k_depth="proportion")
plt.xlabel("League Index")
plt.ylabel("Age")
plt.title("Boxen Plot of Age by League Index")

plt.yscale("log")  # Change the scale of the y-axis to logarithmic


plt.show()
```



[17]:
```
med_val_l5 = data[data["LeagueIndex"] == 5]["TotalHours"].median()
data.loc[
    (data["TotalHours"].isnull()) & (data["LeagueIndex"] == 5), "TotalHours"
] = med_val_l5

# Now imputing the missing value for player with missing hoursperweek for␣
 ↪leagueindex = 8
med_val_l8 = data[data["LeagueIndex"] == 7]["TotalHours"].median()
data.loc[
    (data["TotalHours"].isnull()) & (data["LeagueIndex"] == 8), "TotalHours"
] = med_val_l8
```

[18]:
```
data.describe()
```

[18]:

	GameID	LeagueIndex	Age	HoursPerWeek	TotalHours
count	3395.000000	3395.000000	3395.000000	3395.000000	3395.000000
mean	4805.012371	4.184094	21.653608	16.105449	964.959647
std	2719.944851	1.517327	4.172356	11.961811	17172.134959
min	52.000000	1.000000	16.000000	0.000000	3.000000
25%	2464.500000	3.000000	19.000000	8.000000	300.000000
50%	4874.000000	4.000000	21.000000	12.000000	500.000000
75%	7108.500000	5.000000	24.000000	20.000000	800.000000

```
max    10095.000000     8.000000    44.000000    168.000000  1000000.000000

                APM  SelectByHotkeys  AssignToHotkeys  UniqueHotkeys  \
count  3395.000000      3395.000000      3395.000000    3395.000000
mean    117.046947         0.004299         0.000374       4.364654
std      51.945291         0.005284         0.000225       2.360333
min      22.059600         0.000000         0.000000       0.000000
25%      79.900200         0.001258         0.000204       3.000000
50%     108.010200         0.002500         0.000353       4.000000
75%     142.790400         0.005133         0.000499       6.000000
max     389.831400         0.043088         0.001752      10.000000

       MinimapAttacks  MinimapRightClicks  NumberOfPACs  GapBetweenPACs  \
count     3395.000000         3395.000000   3395.000000     3395.000000
mean         0.000098            0.000387      0.003463       40.361562
std          0.000166            0.000377      0.000992       17.153570
min          0.000000            0.000000      0.000679        6.666700
25%          0.000000            0.000140      0.002754       28.957750
50%          0.000040            0.000281      0.003395       36.723500
75%          0.000119            0.000514      0.004027       48.290500
max          0.003019            0.004041      0.007971      237.142900

       ActionLatency  ActionsInPAC  TotalMapExplored  WorkersMade  \
count    3395.000000   3395.000000       3395.000000  3395.000000
mean       63.739403      5.272988         22.131664     0.001032
std        19.238869      1.494835          7.431719     0.000519
min        24.093600      2.038900          5.000000     0.000077
25%        50.446600      4.272850         17.000000     0.000683
50%        60.931800      5.095500         22.000000     0.000905
75%        73.681300      6.033600         27.000000     0.001259
max       176.372100     18.558100         58.000000     0.005149

       UniqueUnitsMade  ComplexUnitsMade  ComplexAbilitiesUsed
count      3395.000000       3395.000000           3395.000000
mean          6.534021          0.000059              0.000142
std           1.857697          0.000111              0.000265
min           2.000000          0.000000              0.000000
25%           5.000000          0.000000              0.000000
50%           6.000000          0.000000              0.000020
75%           8.000000          0.000086              0.000181
max          13.000000          0.000902              0.003084
```

[19]:
```
# Since it is not possible to play the entire week
data.loc[data["HoursPerWeek"] > 120, "HoursPerWeek"] = 120
```

[20]:
```
data.describe()
```

[20]:

	GameID	LeagueIndex	Age	HoursPerWeek	TotalHours
count	3395.000000	3395.000000	3395.000000	3395.000000	3395.000000
mean	4805.012371	4.184094	21.653608	16.085420	964.959647
std	2719.944851	1.517327	4.172356	11.752646	17172.134959
min	52.000000	1.000000	16.000000	0.000000	3.000000
25%	2464.500000	3.000000	19.000000	8.000000	300.000000
50%	4874.000000	4.000000	21.000000	12.000000	500.000000
75%	7108.500000	5.000000	24.000000	20.000000	800.000000
max	10095.000000	8.000000	44.000000	120.000000	1000000.000000

	APM	SelectByHotkeys	AssignToHotkeys	UniqueHotkeys
count	3395.000000	3395.000000	3395.000000	3395.000000
mean	117.046947	0.004299	0.000374	4.364654
std	51.945291	0.005284	0.000225	2.360333
min	22.059600	0.000000	0.000000	0.000000
25%	79.900200	0.001258	0.000204	3.000000
50%	108.010200	0.002500	0.000353	4.000000
75%	142.790400	0.005133	0.000499	6.000000
max	389.831400	0.043088	0.001752	10.000000

	MinimapAttacks	MinimapRightClicks	NumberOfPACs	GapBetweenPACs
count	3395.000000	3395.000000	3395.000000	3395.000000
mean	0.000098	0.000387	0.003463	40.361562
std	0.000166	0.000377	0.000992	17.153570
min	0.000000	0.000000	0.000679	6.666700
25%	0.000000	0.000140	0.002754	28.957750
50%	0.000040	0.000281	0.003395	36.723500
75%	0.000119	0.000514	0.004027	48.290500
max	0.003019	0.004041	0.007971	237.142900

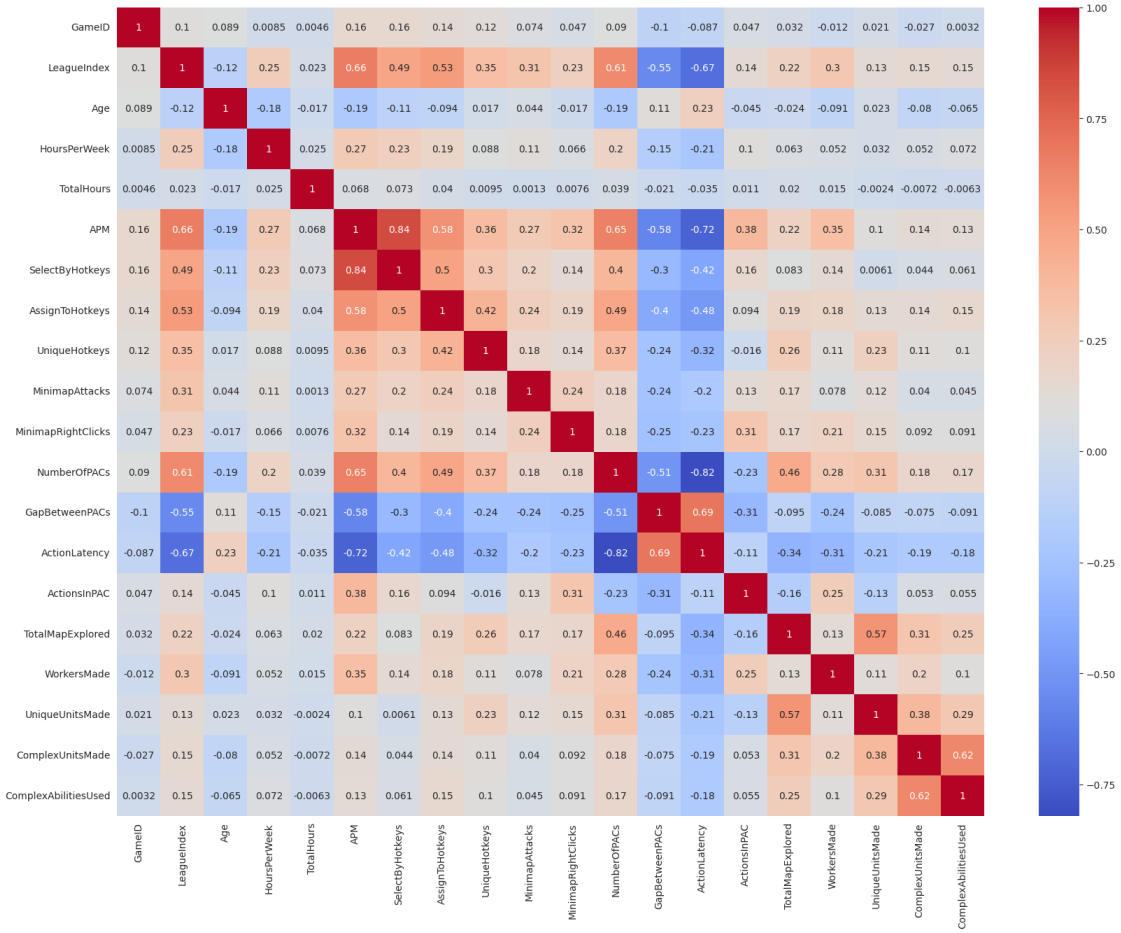
	ActionLatency	ActionsInPAC	TotalMapExplored	WorkersMade
count	3395.000000	3395.000000	3395.000000	3395.000000
mean	63.739403	5.272988	22.131664	0.001032
std	19.238869	1.494835	7.431719	0.000519
min	24.093600	2.038900	5.000000	0.000077
25%	50.446600	4.272850	17.000000	0.000683
50%	60.931800	5.095500	22.000000	0.000905
75%	73.681300	6.033600	27.000000	0.001259
max	176.372100	18.558100	58.000000	0.005149

	UniqueUnitsMade	ComplexUnitsMade	ComplexAbilitiesUsed
count	3395.000000	3395.000000	3395.000000
mean	6.534021	0.000059	0.000142
std	1.857697	0.000111	0.000265
min	2.000000	0.000000	0.000000
25%	5.000000	0.000000	0.000000
50%	6.000000	0.000000	0.000020

75%	8.000000	0.000086	0.000181
max	13.000000	0.000902	0.003084

0.6 We can see that there is high correlation between LeagueIndex and predictor variables, as is indicated by the heatmap where there are multiple values greater than 0.5 and lesser than -0.5. We see that multicollinearity is present in the data which would indicate that we can drop some features since some features would be redundant.

[21]:
```
plt.figure(figsize=(20,15))
sns.heatmap(data.corr(), annot=True, cmap='coolwarm')
plt.show()
```



0.7 We are removing the GameID and LeagueIndex features. GameID offers no valuable information intuitively and the correlation is also low with LeagueIndex. We can try to to use techniques like Variance inflation factor to measure multicollienarity in the features.

Interpretation of VIF:

VIF=1 There is no multicollinearity; the predictor variable is not correlated with other predictors.

VIF > 1 and < 5: There is moderate multicollinearity, indicating a moderate correlation with other predictors.

VIF >= 5: There is a high degree of multicollinearity, indicating a strong correlation with other predictors.

[22]:
```
data_re = data.drop(["LeagueIndex","GameID"], axis=1)
```

[23]:
```
vif_data = pd.DataFrame()
vif_data["feature"] = data_re.columns

# calculating VIF for each feature
vif_data["VIF"] = [
    variance_inflation_factor(data_re.values, i)
    for i in range(len(data_re.columns))
]
```

[24]:
```
vif_data.sort_values(["VIF"], ascending=False)
```

[24]:

	feature	VIF
3	APM	232.141090
9	NumberOfPACs	87.009324
12	ActionsInPAC	68.410297
11	ActionLatency	40.244447
0	Age	29.483299
4	SelectByHotkeys	23.235798
15	UniqueUnitsMade	22.060698
13	TotalMapExplored	18.184561
10	GapBetweenPACs	14.802954
5	AssignToHotkeys	6.491549
14	WorkersMade	6.445501
6	UniqueHotkeys	5.897251
1	HoursPerWeek	3.202471
8	MinimapRightClicks	2.636975
16	ComplexUnitsMade	2.323360
17	ComplexAbilitiesUsed	2.134550
7	MinimapAttacks	1.579499
2	TotalHours	1.010096

Next we also remove some features where the correlation is low with the target variable and the

VIF factor is high. In this case “ActionsInPAC”, “UniqueUnitsMade”

[25]:
```
gamedf_indpt = data.drop(
    ["LeagueIndex", "ActionsInPAC", "UniqueUnitsMade"], axis=1
)
vif_data = pd.DataFrame()
vif_data["feature"] = gamedf_indpt.columns

# calculating VIF for each feature
vif_data["VIF"] = [
    variance_inflation_factor(gamedf_indpt.values, i)
    for i in range(len(gamedf_indpt.columns))
]
vif_data.sort_values(["VIF"], ascending=False)
```

[25]:

	feature	VIF
4	APM	51.618980
10	NumberOfPACs	34.791021
1	Age	28.122009
12	ActionLatency	26.916903
13	TotalMapExplored	14.854583
11	GapBetweenPACs	14.741981
5	SelectByHotkeys	8.119519
6	AssignToHotkeys	6.481163
14	WorkersMade	6.460107
7	UniqueHotkeys	5.857128
0	GameID	4.340584
2	HoursPerWeek	3.166164
9	MinimapRightClicks	2.620920
15	ComplexUnitsMade	2.238089
16	ComplexAbilitiesUsed	2.112293
8	MinimapAttacks	1.573936
3	TotalHours	1.009968

We also remove APM since it is highly correlated with ActionLatency which is further highly correlated with LeagueIndex

[26]:
```
gamedf_indpt = data.drop(
    ["LeagueIndex", "ActionsInPAC", "UniqueUnitsMade","APM"], axis=1
)
vif_data = pd.DataFrame()
vif_data["feature"] = gamedf_indpt.columns

# calculating VIF for each feature
vif_data["VIF"] = [
    variance_inflation_factor(gamedf_indpt.values, i)
    for i in range(len(gamedf_indpt.columns))
]
```

```
vif_data.sort_values(["VIF"], ascending=False)
```

[26]:

	feature	VIF
1	Age	27.691425
11	ActionLatency	26.866244
9	NumberOfPACs	23.400289
12	TotalMapExplored	14.853234
10	GapBetweenPACs	13.937734
5	AssignToHotkeys	6.461673
6	UniqueHotkeys	5.856953
13	WorkersMade	5.568088
0	GameID	4.308569
2	HoursPerWeek	3.098915
4	SelectByHotkeys	2.507283
8	MinimapRightClicks	2.372744
14	ComplexUnitsMade	2.237685
15	ComplexAbilitiesUsed	2.112131
7	MinimapAttacks	1.570528
3	TotalHours	1.009875

[27]:
```
tmp=data
data=data.drop(["ActionsInPAC", "UniqueUnitsMade","APM"], axis=1)
```

0.8 Steps before feeding the data into the model"

1. We split our dataset in train and test dividing it into a 80:20 split. We do a stratified split since we want to divide the classes in a proportionate manner between the train and test dataset.
2. Furthermore we use a pipeline to standardize our dataset. We fit it on the training set and just transform it on the testing dataset.
3. I use F1 macro score since the dataset is imbalanced, and it is a multi class classification along with the fact that all classes are of equal importance.

[76]:
```
X = data.drop(columns=['LeagueIndex'])
y = data['LeagueIndex']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2,␣
 ↪stratify=y, random_state=0)

X_train.shape, y_train.shape,X_test.shape, y_test.shape
```

[76]:
```
((2716, 16), (2716,), (679, 16), (679,))
```

[77]:
```
num_2scale_attribs = list(X_train.columns)
```

```
# Pipeline for numerical attributes to be scaled
num_2scale_pipeline = Pipeline([('std_scaler', StandardScaler())])


train_set_prepared = num_2scale_pipeline.fit_transform(X_train)
```

[78]:
```
train_set_prepared.shape
```

[78]:
```
(2716, 16)
```

[79]:
```
test_set_prepared = num_2scale_pipeline.transform(X_test)
```

[80]:
```
df_train_set_prepared = pd.DataFrame(data=train_set_prepared,␣
 ↪columns=num_2scale_attribs)

df_train_set_prepared
```

[80]:

	GameID	Age	HoursPerWeek	TotalHours	SelectByHotkeys	\
0	1.318432	-0.156888	-0.010148	-0.033614	-0.647269	
1	1.155848	-0.873436	1.010672	-0.002345	0.186175	
2	0.366676	-0.634587	1.010672	-0.012768	1.516507	
3	-1.013281	-1.351135	-0.860831	-0.019543	-0.710278	
4	1.599758	1.276208	-0.690695	-0.017980	-0.082602	
…	…	…	…	…	…	
2711	0.227109	0.081962	-0.860831	-0.033614	-0.071696	
2712	-0.788586	-0.156888	0.330125	-0.012768	-0.118653	
2713	-0.349060	-1.351135	-0.180285	-0.036220	-0.394137	
2714	1.402830	-1.351135	-0.690695	-0.028403	0.286839	
2715	1.080950	-0.156888	-0.010148	-0.012768	3.447158	

	AssignToHotkeys	UniqueHotkeys	MinimapAttacks	MinimapRightClicks	\
0	-0.786519	-1.859269	-0.601104	-0.685494	
1	0.592114	1.504724	-0.601104	-0.440049	
2	2.064971	0.663726	0.005912	2.201970	
3	-0.478394	-1.438770	-0.566649	-0.930200	
4	-0.143502	0.243227	-0.146569	1.028012	
…	…	…	…	…	
2711	0.896602	0.243227	3.547702	0.295307	
2712	0.248477	-0.597771	8.596995	-0.306486	
2713	0.374336	-0.597771	-0.545344	0.064697	
2714	0.485182	-0.597771	-0.421196	1.967961	
2715	1.195197	2.345722	0.633667	0.224789	

	NumberOfPACs	GapBetweenPACs	ActionLatency	TotalMapExplored	\
0	0.105141	-0.175572	-0.541348	-1.228037	
1	0.830187	-0.922867	-0.389448	1.180543	
2	1.339523	-1.595382	-1.465478	-0.558987	

```
3        -1.611500        3.704689        2.495767         0.110063
4        -0.351144        1.588008        0.087515        -1.361847
…              …              …               …               …
2711      0.092809       -0.988751       -0.425834         1.046733
2712      1.165477       -0.770078       -0.825397         0.377683
2713     -0.068947        0.588303       -0.521695         0.377683
2714     -1.046775       -0.717350        0.367619         0.243873
2715      0.852495       -1.000858       -1.259717        -0.425177

      WorkersMade  ComplexUnitsMade  ComplexAbilitiesUsed
0        0.228589         -0.534712             -0.533526
1        0.940189         -0.272220             -0.533526
2        0.626469         -0.534712              2.018332
3       -1.032991         -0.088638              0.190684
4       -0.146098         -0.534712             -0.533526
…             …                …                     …
2711    -0.911631         -0.534712             -0.533526
2712     3.038640         -0.231699             -0.533526
2713     0.175446          2.032074              0.939938
2714     0.035378          0.845552              2.275640
2715     0.333492         -0.534712             -0.533526

[2716 rows x 16 columns]
```

0.9 Model Selection

1. We use random forest classfier,gradient boosting, logistic regression and neural networks and see that it overfits on the training data and that is evident by the testing accuracy that is slightly low(42%).
2. Furthermore, we see that the model classifies the LeagueIndex 8 datapoints at a 100% accuracy as compared to the other LeagueIndex's.
3. This is clearly erroneous since we have filled AGE, TOTAL_HOURS, HOURS_PER_WEEK with the median of LeagueIndex 7. This is easy for the model to identify.
4. I tried using for SMOTE for generating synthetic data since the classes were imbalanced but that does not increase the performance on the test dataset.
5. Cross validation was applied, and a 95% confidence interval was also calculated. However, on unseen data the accuracy did not increase more than 42%.
6. Hyperparameter tuning was also done for developing a robust model.
7. In this specific case, we are trying to predict one out of eight possible ranks for each player. Since the ranks are closely related and can vary by only one position, we introduced an error range of plus or minus 1. This means that if our model predicts a rank that is one position higher or lower than the actual rank, we consider it an acceptable prediction. By incorporating this error range, our accuracy significantly improves to 88%. This means that in nearly 9 out of 10 cases, our model predicts the rank either correctly or within one position of the true rank. This level of performance is quite promising, considering the closely related nature of the ranks. Even if the model predicts a rank that is off by one, it is still considered

a valuable prediction since it is very close to the actual rank.

8. Dropping the features that have a high VIF value does not help increase the performance on the test dataset.

[64]:
```
# Random Forest classifier
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import GridSearchCV, cross_val_score,␣
 ↪StratifiedKFold
from sklearn.metrics import classification_report
import numpy as np
import scipy.stats as stats


from keras.layers import Dropout
from sklearn.utils import class_weight
from imblearn.over_sampling import SMOTE
from sklearn.preprocessing import StandardScaler
from keras.optimizers import Adam

# Apply SMOTE to handle class imbalance
smote = SMOTE()
#df_train_set_prepared, y_train = smote.fit_resample(df_train_set_prepared,␣
 ↪y_train)
# Create the Random Forest classifier
rf = RandomForestClassifier(bootstrap=True, oob_score=True, max_samples=0.8,␣
 ↪random_state=3)

# Define the parameter grid for tuning
param_grid = {'n_estimators': [100],
              'max_depth': [None, 5, 10, 15],
              'min_samples_split': [10],
              'min_samples_leaf': [4],
              'max_features': ['sqrt', 'log2']}

# Perform grid search with cross-validation
cv = StratifiedKFold(n_splits=10, shuffle=True, random_state=42)  # Stratified␣
 ↪K-fold for multi-class
grid_search = GridSearchCV(rf, param_grid, scoring='f1_macro', n_jobs=-1,␣
 ↪cv=cv, refit=True)
grid_search.fit(df_train_set_prepared, y_train)

# Get the best parameters and best estimator from grid search
best_params = grid_search.best_params_
best_estimator = grid_search.best_estimator_

# Use the best estimator to make predictions on the training set
y_train_model_rf = best_estimator.predict(df_train_set_prepared)
```

```
# Perform cross-validation on the best estimator
scores_model_rf = cross_val_score(best_estimator, df_train_set_prepared,␣
 ↪y_train, cv=cv, scoring='f1_macro')

# Print the cross-validation scores
print('Cross-Validation Scores:')
print(scores_model_rf)
confidence = 0.95
print('Training F1 Score:', np.mean(scores_model_rf))
print('95% CI:', stats.t.interval(confidence, len(scores_model_rf) - 1,
                                  loc=np.mean(scores_model_rf),
                                  scale=np.std(scores_model_rf, ddof=1) / np.
 ↪sqrt(len(scores_model_rf))))


# Evaluate performance on the test set
y_test_model_rf = best_estimator.predict(test_set_prepared)
print('Test Set Evaluation:')
print(classification_report(y_test, y_test_model_rf))
```

```
Cross-Validation Scores:
[0.42197991 0.4265486  0.41008572 0.44823598 0.39075007 0.4320571
 0.4404112  0.41490338 0.44287559 0.42667718]
Training F1 Score: 0.4254524710587309
95% CI: (0.4131623994947289, 0.43774254262273293)
Test Set Evaluation:
              precision    recall  f1-score   support

           1       0.57      0.39      0.46        33
           2       0.34      0.30      0.32        70
           3       0.37      0.24      0.29       111
           4       0.36      0.46      0.40       162
           5       0.37      0.44      0.40       161
           6       0.56      0.50      0.53       124
           7       0.00      0.00      0.00         7
           8       1.00      1.00      1.00        11

    accuracy                           0.41       679
   macro avg       0.45      0.42      0.43       679
weighted avg       0.42      0.41      0.41       679
```

[ ]:
```
best_params
```

[ ]:
```
{'max_depth': None,
 'max_features': 'sqrt',
```

```
 'min_samples_leaf': 4,
 'min_samples_split': 10,
 'n_estimators': 95}
```

[56]:
```
y_test_model_rf = best_estimator.predict(df_train_set_prepared)
print('Train Set Evaluation:')
print(classification_report(y_train, y_test_model_rf))
# This is actually the train set result, did not run it again since I didn't␣
 ↪save my model, we can clearly see that the model is overfitting
# on the training data.
```

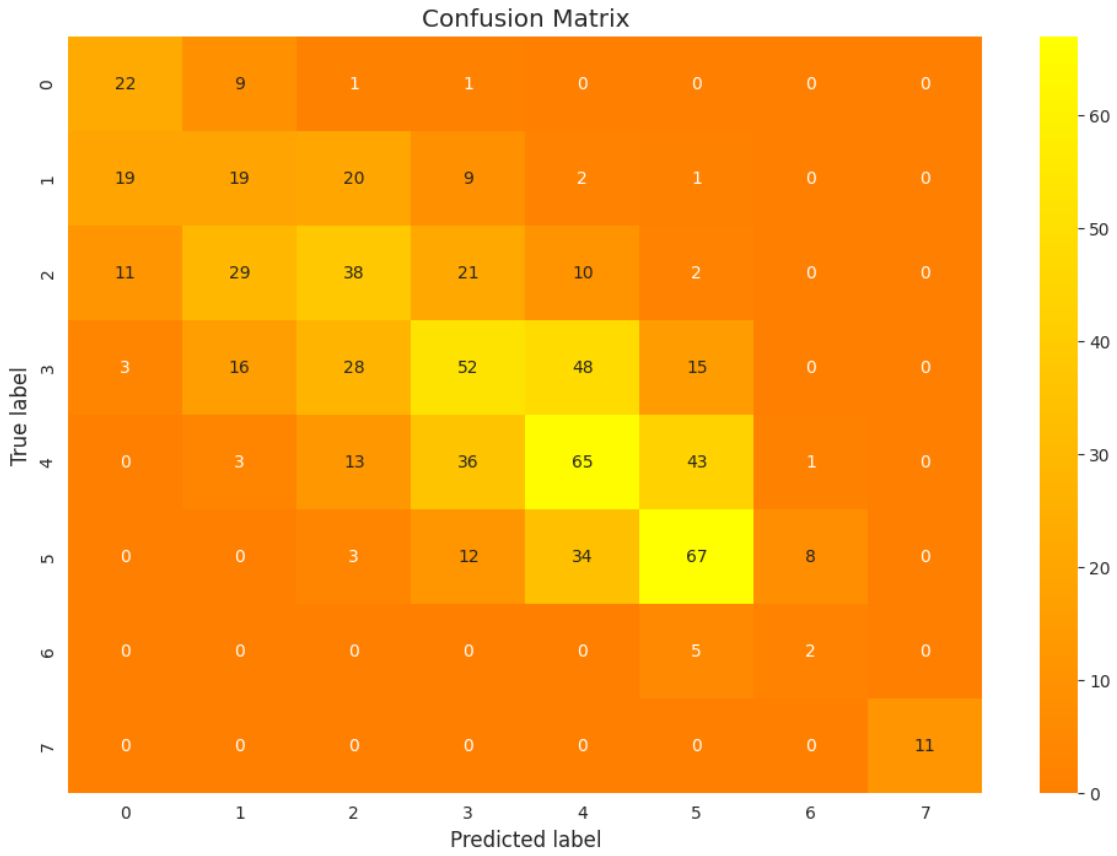
```
Train Set Evaluation:
              precision    recall  f1-score   support

           1       0.93      0.99      0.96       649
           2       0.94      0.97      0.95       649
           3       0.94      0.91      0.92       649
           4       0.94      0.86      0.89       649
           5       0.93      0.87      0.90       649
           6       0.87      0.94      0.90       649
           7       0.98      1.00      0.99       649
           8       1.00      1.00      1.00       649

    accuracy                           0.94      5192
   macro avg       0.94      0.94      0.94      5192
weighted avg       0.94      0.94      0.94      5192
```

[57]:
```
def draw_confusion_matrix(cm):
    plt.figure(figsize=(12,8))
    sns.heatmap(cm,annot=True,fmt="d", center=0, cmap='autumn')
    plt.title("Confusion Matrix")
    plt.ylabel('True label')
    plt.xlabel('Predicted label')
    plt.show()
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score, confusion_matrix
y_test_model_rf = best_estimator.predict(test_set_prepared)
print('Test Set Evaluation:')
cm_rf = confusion_matrix(y_test, y_test_model_rf)
draw_confusion_matrix(cm_rf)
```

```
Test Set Evaluation:
```



[65]:
```
def calculate_accuracy(true_labels, predicted_labels):
    total_predictions = len(true_labels)
    correct_predictions = 0

    for true_label, predicted_label in zip(true_labels, predicted_labels):
        if abs(predicted_label - true_label) <= 1:
            correct_predictions += 1

    accuracy = (correct_predictions / total_predictions) * 100
    return accuracy
calculate_accuracy(y_test, y_test_model_rf)
```

[65]: 87.77614138438881

[ ]:
```
 # Gradient Boosting Classifier
from sklearn.ensemble import GradientBoostingClassifier
from sklearn.model_selection import GridSearchCV, cross_val_score,␣
 ↪StratifiedKFold
from sklearn.metrics import classification_report
import numpy as np
```

```
import scipy.stats as stats

# Create the Gradient Boosting classifier
gb = GradientBoostingClassifier(random_state=3)

# Define the parameter grid for tuning
param_grid = {'n_estimators': [100, 200, 300],
              'learning_rate': [0.1, 0.01, 0.001],
              'max_depth': [3, 5, 7]}

# Perform grid search with cross-validation
cv = StratifiedKFold(n_splits=10, shuffle=True, random_state=42)  # Stratified␣
 ↪K-fold for multi-class
grid_search = GridSearchCV(gb, param_grid, scoring='f1_macro', n_jobs=-1,␣
 ↪cv=cv, refit=True)
grid_search.fit(df_train_set_prepared, y_train)

# Get the best parameters and best estimator from grid search
best_params = grid_search.best_params_
best_estimator = grid_search.best_estimator_

# Use the best estimator to make predictions on the training set
y_train_model_gb = best_estimator.predict(df_train_set_prepared)

# Perform cross-validation on the best estimator
scores_model_gb = cross_val_score(best_estimator, df_train_set_prepared,␣
 ↪y_train, cv=cv, scoring='f1_macro')

# Print the cross-validation scores
print('Cross-Validation Scores:')
print(scores_model_gb)
confidence = 0.95
print('Training F1 Score:', np.mean(scores_model_gb))
print('95% CI:', stats.t.interval(confidence, len(scores_model_gb) - 1,
                                  loc=np.mean(scores_model_gb),
                                  scale=np.std(scores_model_gb, ddof=1) / np.
 ↪sqrt(len(scores_model_gb))))


# Evaluate performance on the test set
y_test_model_gb = best_estimator.predict(test_set_prepared)
print('Test Set Evaluation:')
print(classification_report(y_test, y_test_model_gb))
```

```
Cross-Validation Scores:
[0.46310942 0.40819944 0.38094769 0.42026116 0.40590591 0.39066955
 0.47724717 0.38618565 0.45498668 0.41665838]
```

```
Training F1 Score: 0.4204171040090823
95% CI: (0.3962922725246684, 0.44454193549349613)
Test Set Evaluation:
              precision    recall  f1-score   support

           1       0.58      0.45      0.51        33
           2       0.34      0.31      0.33        70
           3       0.37      0.23      0.28       111
           4       0.37      0.45      0.41       162
           5       0.37      0.44      0.40       161
           6       0.55      0.53      0.54       124
           7       1.00      0.14      0.25         7
           8       1.00      1.00      1.00        11

    accuracy                           0.42       679
   macro avg       0.57      0.45      0.46       679
weighted avg       0.43      0.42      0.41       679
```

[66]:
```
#Logistic Regression
log_reg = LogisticRegression(multi_class='multinomial', solver='saga',␣
 ↪random_state=0)

param_grid = {'penalty': ['l1','l2', 'none', 'elasticnet'],
              'C': np.linspace(0.5, 1.5, 100)}

grid_search = GridSearchCV(log_reg, param_grid,
                           scoring='accuracy',
                           n_jobs=-1,
                           cv=10,
                           refit=True)
grid_search.fit(train_set_prepared, y_train)

grid_search.best_params_
```

[66]:
```
{'C': 0.5202020202020202, 'penalty': 'l1'}
```

[67]:
```
log_reg_final = grid_search.best_estimator_

y_train_model6_logreg = log_reg_final.predict(train_set_prepared)
```

[68]:
```
scores_model6_logreg = cross_val_score(log_reg_final,
                                train_set_prepared, y_train,
                                n_jobs=-1,
                                cv=10,
                                scoring='accuracy')
```

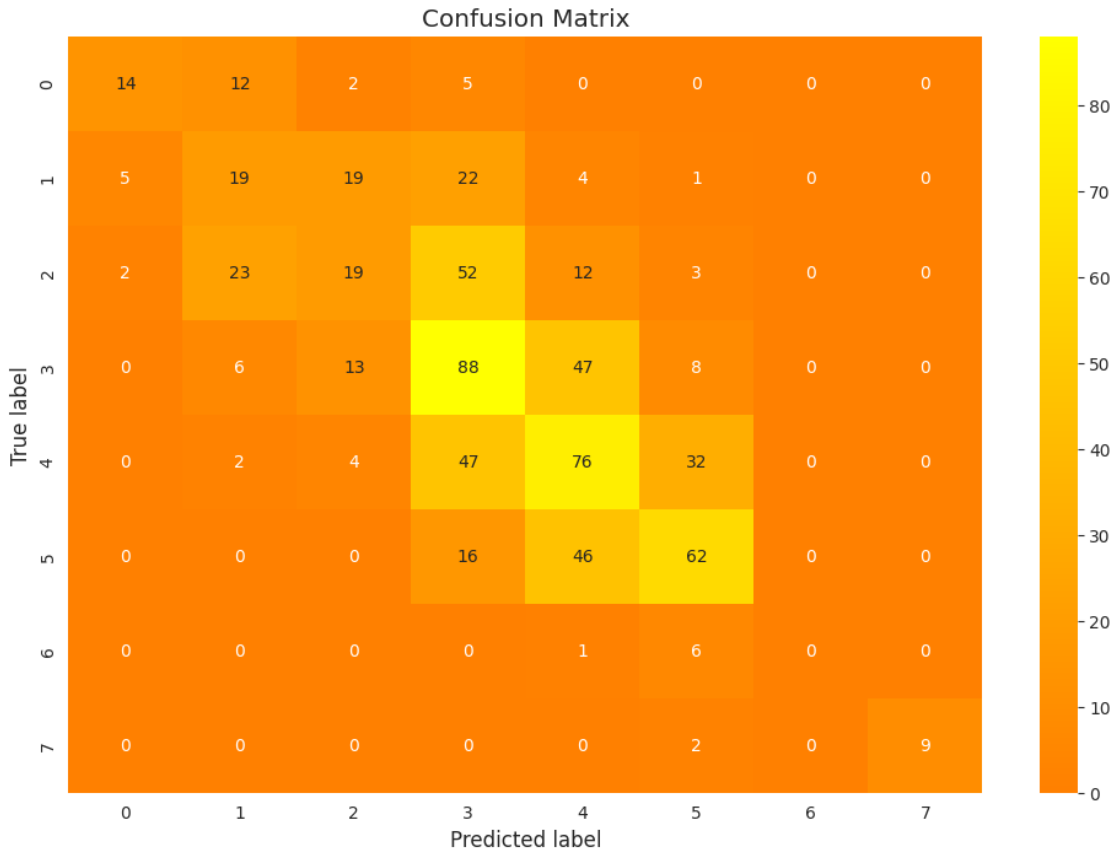
```
print(scores_model6_logreg)
confidence = 0.95
print('Training accuracy: ', accuracy_score(y_train, y_train_model6_logreg))
print('95% CI: ', stats.t.interval(confidence, len(scores_model6_logreg) - 1,
                 loc=scores_model6_logreg.mean(),
                 scale=scores_model6_logreg.std(ddof=1)/np.
 ↪sqrt(len(scores_model6_logreg))))
```

```
[0.40073529 0.43014706 0.40808824 0.40441176 0.42279412 0.41544118
 0.42066421 0.4501845  0.39114391 0.4095941 ]
Training accuracy:  0.43041237113402064
95% CI:  (0.4033476521249959, 0.4272932204602006)
```

[70]:
```
def draw_confusion_matrix(cm):
    plt.figure(figsize=(12,8))
    sns.heatmap(cm,annot=True,fmt="d", center=0, cmap='autumn')
    plt.title("Confusion Matrix")
    plt.ylabel('True label')
    plt.xlabel('Predicted label')
    plt.show()

y_test_model_rf = log_reg_final.predict(test_set_prepared)
print('Test Set Evaluation:')
cm_rf = confusion_matrix(y_test, y_test_model_rf)
draw_confusion_matrix(cm_rf)
```

```
Test Set Evaluation:
```



[71]:
```
def calculate_accuracy(true_labels, predicted_labels):
    total_predictions = len(true_labels)
    correct_predictions = 0

    for true_label, predicted_label in zip(true_labels, predicted_labels):
        if abs(predicted_label - true_label) <= 1:
            correct_predictions += 1

    accuracy = (correct_predictions / total_predictions) * 100
    return accuracy
calculate_accuracy(y_test, y_test_model_rf)
```

[71]: 86.74521354933727

[81]:
```
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.metrics import classification_report
from keras.models import Sequential
from keras.layers import Dense
from keras.wrappers.scikit_learn import KerasClassifier
```

```
from sklearn.model_selection import GridSearchCV, StratifiedKFold
from sklearn.metrics import f1_score

# Define a function to create the neural network model
def create_model(learn_rate=0.01):
    model = Sequential()
    model.add(Dense(128, activation='relu', input_shape=(16,)))
    model.add(Dropout(0.2))
    model.add(Dense(128, activation='relu'))
    model.add(Dropout(0.2))
    model.add(Dense(8, activation='softmax'))
    optimizer = Adam(lr=learn_rate)
    model.compile(optimizer=optimizer, loss='categorical_crossentropy',␣
 ↪metrics=['accuracy'])
    return model

# Modify param_grid
param_grid = {'batch_size': [16,32],
              'epochs': [200],
              'learn_rate': [0.001, 0.01, 0.1]}
# Create the KerasClassifier wrapper
model = KerasClassifier(build_fn=create_model)

# Perform grid search with cross-validation
cv = StratifiedKFold(n_splits=5, shuffle=True, random_state=42)  # Stratified␣
 ↪K-fold for multi-class
grid_search = GridSearchCV(estimator=model, param_grid=param_grid,␣
 ↪scoring='f1_macro', cv=cv, refit=True)
grid_search.fit(df_train_set_prepared, y_train)

# Get the best parameters and best estimator from grid search
best_params = grid_search.best_params_
best_estimator = grid_search.best_estimator_

# Use the best estimator to make predictions on the training set
y_train_model_nn = best_estimator.predict(df_train_set_prepared)

# Convert the predicted labels to match the shape of y_train (if necessary)

# Perform cross-validation on the best estimator
scores_model_nn = cross_val_score(best_estimator, df_train_set_prepared,␣
 ↪y_train, cv=cv, scoring='f1_macro')

# Print the cross-validation scores
print('Cross-Validation Scores:')
print(scores_model_nn)
confidence = 0.95
```

```
print('Training F1 Score:', np.mean(scores_model_nn))
print('95% CI:', stats.t.interval(confidence, len(scores_model_nn) - 1,
                                  loc=np.mean(scores_model_nn),
                                  scale=np.std(scores_model_nn, ddof=1) / np.
 ↪sqrt(len(scores_model_nn))))

# Evaluate performance on the test set
y_test_model_nn = best_estimator.predict(test_set_prepared)
# Convert the predicted labels to match the shape of y_test (if necessary)

print('Test Set Evaluation:')
print(classification_report(y_test, y_test_model_nn))
```

```
Streaming output truncated to the last 5000 lines.
Epoch 118/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7708 - accuracy:
0.6861
Epoch 119/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7098 - accuracy:
0.7124
Epoch 120/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7560 - accuracy:
0.7073
Epoch 121/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7428 - accuracy:
0.6931
Epoch 122/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7232 - accuracy:
0.7082
Epoch 123/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7768 - accuracy:
0.6898
Epoch 124/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7748 - accuracy:
0.6815
Epoch 125/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7383 - accuracy:
0.7055
Epoch 126/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7386 - accuracy:
0.7073
Epoch 127/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7513 - accuracy:
0.7082
Epoch 128/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7089 - accuracy:
0.7257
```

```
Epoch 129/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7242 - accuracy:
0.7174
Epoch 130/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7273 - accuracy:
0.7101
Epoch 131/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6669 - accuracy:
0.7345
Epoch 132/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7189 - accuracy:
0.7096
Epoch 133/200
68/68 [==============================] - 0s 3ms/step - loss: 0.7038 - accuracy:
0.7119
Epoch 134/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6919 - accuracy:
0.7266
Epoch 135/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7164 - accuracy:
0.7220
Epoch 136/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7686 - accuracy:
0.7082
Epoch 137/200
68/68 [==============================] - 0s 3ms/step - loss: 0.7664 - accuracy:
0.7096
Epoch 138/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7760 - accuracy:
0.7069
Epoch 139/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7234 - accuracy:
0.7096
Epoch 140/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7290 - accuracy:
0.7193
Epoch 141/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7270 - accuracy:
0.7069
Epoch 142/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7000 - accuracy:
0.7303
Epoch 143/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7161 - accuracy:
0.7257
Epoch 144/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7075 - accuracy:
0.7303
```

```
Epoch 145/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7210 - accuracy:
0.7225
Epoch 146/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7009 - accuracy:
0.7266
Epoch 147/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6912 - accuracy:
0.7289
Epoch 148/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6659 - accuracy:
0.7414
Epoch 149/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6911 - accuracy:
0.7239
Epoch 150/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6794 - accuracy:
0.7243
Epoch 151/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6587 - accuracy:
0.7312
Epoch 152/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7280 - accuracy:
0.7312
Epoch 153/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6932 - accuracy:
0.7317
Epoch 154/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7618 - accuracy:
0.7027
Epoch 155/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6824 - accuracy:
0.7271
Epoch 156/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6883 - accuracy:
0.7464
Epoch 157/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6728 - accuracy:
0.7294
Epoch 158/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6703 - accuracy:
0.7276
Epoch 159/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6513 - accuracy:
0.7478
Epoch 160/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7161 - accuracy:
0.7262
```

```
Epoch 161/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6899 - accuracy:
0.7349
Epoch 162/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7075 - accuracy:
0.7073
Epoch 163/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6887 - accuracy:
0.7331
Epoch 164/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6874 - accuracy:
0.7253
Epoch 165/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6242 - accuracy:
0.7520
Epoch 166/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6863 - accuracy:
0.7395
Epoch 167/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6885 - accuracy:
0.7395
Epoch 168/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6669 - accuracy:
0.7446
Epoch 169/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6882 - accuracy:
0.7289
Epoch 170/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6737 - accuracy:
0.7372
Epoch 171/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7110 - accuracy:
0.7340
Epoch 172/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7072 - accuracy:
0.7317
Epoch 173/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6981 - accuracy:
0.7391
Epoch 174/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6867 - accuracy:
0.7308
Epoch 175/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6757 - accuracy:
0.7391
Epoch 176/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6633 - accuracy:
0.7474
```

```
Epoch 177/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6909 - accuracy:
0.7455
Epoch 178/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6385 - accuracy:
0.7529
Epoch 179/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6339 - accuracy:
0.7506
Epoch 180/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6612 - accuracy:
0.7547
Epoch 181/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6706 - accuracy:
0.7382
Epoch 182/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6739 - accuracy:
0.7510
Epoch 183/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6850 - accuracy:
0.7354
Epoch 184/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6705 - accuracy:
0.7400
Epoch 185/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6852 - accuracy:
0.7441
Epoch 186/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6524 - accuracy:
0.7515
Epoch 187/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6219 - accuracy:
0.7533
Epoch 188/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6177 - accuracy:
0.7621
Epoch 189/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6541 - accuracy:
0.7524
Epoch 190/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6645 - accuracy:
0.7561
Epoch 191/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6325 - accuracy:
0.7607
Epoch 192/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6560 - accuracy:
0.7506
```

```
Epoch 193/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6785 - accuracy:
0.7363
Epoch 194/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6213 - accuracy:
0.7515
Epoch 195/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6638 - accuracy:
0.7520
Epoch 196/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6485 - accuracy:
0.7566
Epoch 197/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6509 - accuracy:
0.7566
Epoch 198/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6909 - accuracy:
0.7395
Epoch 199/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6677 - accuracy:
0.7497
Epoch 200/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6733 - accuracy:
0.7437
17/17 [==============================] - 0s 1ms/step
Epoch 1/200
68/68 [==============================] - 1s 2ms/step - loss: 1.5961 - accuracy:
0.3290
Epoch 2/200
68/68 [==============================] - 0s 2ms/step - loss: 1.4153 - accuracy:
0.3594
Epoch 3/200
68/68 [==============================] - 0s 3ms/step - loss: 1.3686 - accuracy:
0.3912
Epoch 4/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3705 - accuracy:
0.4004
Epoch 5/200
68/68 [==============================] - 0s 3ms/step - loss: 1.3607 - accuracy:
0.3990
Epoch 6/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3492 - accuracy:
0.4027
Epoch 7/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3383 - accuracy:
0.4013
Epoch 8/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3353 - accuracy:
```

```
0.4100
Epoch 9/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3155 - accuracy:
0.4114
Epoch 10/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2963 - accuracy:
0.4229
Epoch 11/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2796 - accuracy:
0.4326
Epoch 12/200
68/68 [==============================] - 0s 3ms/step - loss: 1.2739 - accuracy:
0.4363
Epoch 13/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3222 - accuracy:
0.4202
Epoch 14/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2686 - accuracy:
0.4372
Epoch 15/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2409 - accuracy:
0.4330
Epoch 16/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2397 - accuracy:
0.4501
Epoch 17/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2320 - accuracy:
0.4501
Epoch 18/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2233 - accuracy:
0.4694
Epoch 19/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2104 - accuracy:
0.4694
Epoch 20/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1999 - accuracy:
0.4666
Epoch 21/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1872 - accuracy:
0.4855
Epoch 22/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1858 - accuracy:
0.4818
Epoch 23/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1694 - accuracy:
0.4818
Epoch 24/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1499 - accuracy:
```

```
0.4929
Epoch 25/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1558 - accuracy:
0.4906
Epoch 26/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1765 - accuracy:
0.4883
Epoch 27/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1532 - accuracy:
0.5007
Epoch 28/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1533 - accuracy:
0.5090
Epoch 29/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1283 - accuracy:
0.5085
Epoch 30/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0954 - accuracy:
0.5177
Epoch 31/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1236 - accuracy:
0.5191
Epoch 32/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0817 - accuracy:
0.5255
Epoch 33/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0831 - accuracy:
0.5421
Epoch 34/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0827 - accuracy:
0.5223
Epoch 35/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0851 - accuracy:
0.5255
Epoch 36/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0667 - accuracy:
0.5292
Epoch 37/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0686 - accuracy:
0.5444
Epoch 38/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0697 - accuracy:
0.5366
Epoch 39/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0436 - accuracy:
0.5453
Epoch 40/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0628 - accuracy:
```

```
0.5495
Epoch 41/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0303 - accuracy:
0.5619
Epoch 42/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0371 - accuracy:
0.5550
Epoch 43/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0344 - accuracy:
0.5596
Epoch 44/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0132 - accuracy:
0.5656
Epoch 45/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0300 - accuracy:
0.5545
Epoch 46/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9968 - accuracy:
0.5785
Epoch 47/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9981 - accuracy:
0.5808
Epoch 48/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0006 - accuracy:
0.5550
Epoch 49/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9936 - accuracy:
0.5863
Epoch 50/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9834 - accuracy:
0.5872
Epoch 51/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9916 - accuracy:
0.5780
Epoch 52/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9648 - accuracy:
0.6029
Epoch 53/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9934 - accuracy:
0.5854
Epoch 54/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9527 - accuracy:
0.6079
Epoch 55/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9447 - accuracy:
0.6052
Epoch 56/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9633 - accuracy:
```

```
0.5757
Epoch 57/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9523 - accuracy:
0.5923
Epoch 58/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0192 - accuracy:
0.5950
Epoch 59/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9585 - accuracy:
0.6065
Epoch 60/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9309 - accuracy:
0.6075
Epoch 61/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9481 - accuracy:
0.6079
Epoch 62/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9646 - accuracy:
0.6001
Epoch 63/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9521 - accuracy:
0.6075
Epoch 64/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9243 - accuracy:
0.6134
Epoch 65/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9330 - accuracy:
0.6130
Epoch 66/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9327 - accuracy:
0.6153
Epoch 67/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9335 - accuracy:
0.6213
Epoch 68/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9103 - accuracy:
0.6309
Epoch 69/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8815 - accuracy:
0.6249
Epoch 70/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9462 - accuracy:
0.6245
Epoch 71/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8831 - accuracy:
0.6420
Epoch 72/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8969 - accuracy:
```

```
0.6213
Epoch 73/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8768 - accuracy:
0.6337
Epoch 74/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8663 - accuracy:
0.6420
Epoch 75/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8963 - accuracy:
0.6457
Epoch 76/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8767 - accuracy:
0.6406
Epoch 77/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8314 - accuracy:
0.6447
Epoch 78/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8868 - accuracy:
0.6374
Epoch 79/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8731 - accuracy:
0.6378
Epoch 80/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8685 - accuracy:
0.6249
Epoch 81/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8875 - accuracy:
0.6346
Epoch 82/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8416 - accuracy:
0.6576
Epoch 83/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8811 - accuracy:
0.6332
Epoch 84/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8350 - accuracy:
0.6562
Epoch 85/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8324 - accuracy:
0.6535
Epoch 86/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9187 - accuracy:
0.6263
Epoch 87/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8700 - accuracy:
0.6406
Epoch 88/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8353 - accuracy:
```

```
0.6539
Epoch 89/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8861 - accuracy:
0.6438
Epoch 90/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8742 - accuracy:
0.6424
Epoch 91/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8313 - accuracy:
0.6530
Epoch 92/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8320 - accuracy:
0.6654
Epoch 93/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8149 - accuracy:
0.6549
Epoch 94/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8242 - accuracy:
0.6526
Epoch 95/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8472 - accuracy:
0.6530
Epoch 96/200
68/68 [==============================] - 0s 3ms/step - loss: 0.8419 - accuracy:
0.6567
Epoch 97/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8403 - accuracy:
0.6618
Epoch 98/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8718 - accuracy:
0.6535
Epoch 99/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8358 - accuracy:
0.6595
Epoch 100/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8251 - accuracy:
0.6631
Epoch 101/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8181 - accuracy:
0.6585
Epoch 102/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8112 - accuracy:
0.6696
Epoch 103/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8030 - accuracy:
0.6733
Epoch 104/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8442 - accuracy:
```

```
0.6622
Epoch 105/200
68/68 [==============================] - 0s 3ms/step - loss: 0.8200 - accuracy:
0.6572
Epoch 106/200
68/68 [==============================] - 0s 3ms/step - loss: 0.7859 - accuracy:
0.6848
Epoch 107/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8339 - accuracy:
0.6567
Epoch 108/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8172 - accuracy:
0.6590
Epoch 109/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8297 - accuracy:
0.6788
Epoch 110/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7911 - accuracy:
0.6857
Epoch 111/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7960 - accuracy:
0.6889
Epoch 112/200
68/68 [==============================] - 0s 3ms/step - loss: 0.8074 - accuracy:
0.6815
Epoch 113/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8099 - accuracy:
0.6723
Epoch 114/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8120 - accuracy:
0.6723
Epoch 115/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7928 - accuracy:
0.6756
Epoch 116/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7799 - accuracy:
0.6935
Epoch 117/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8446 - accuracy:
0.6608
Epoch 118/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8275 - accuracy:
0.6650
Epoch 119/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7702 - accuracy:
0.6820
Epoch 120/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7682 - accuracy:
```

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0.6861
Epoch 121/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7844 - accuracy:
0.6723
Epoch 122/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7896 - accuracy:
0.6820
Epoch 123/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8235 - accuracy:
0.6599
Epoch 124/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8255 - accuracy:
0.6742
Epoch 125/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8733 - accuracy:
0.6654
Epoch 126/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8331 - accuracy:
0.6696
Epoch 127/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8292 - accuracy:
0.6673
Epoch 128/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8240 - accuracy:
0.6746
Epoch 129/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7614 - accuracy:
0.6908
Epoch 130/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8209 - accuracy:
0.6848
Epoch 131/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7969 - accuracy:
0.6705
Epoch 132/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7813 - accuracy:
0.6838
Epoch 133/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7800 - accuracy:
0.6908
Epoch 134/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8109 - accuracy:
0.6802
Epoch 135/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7901 - accuracy:
0.6852
Epoch 136/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7807 - accuracy:
```

```
0.6825
Epoch 137/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7589 - accuracy:
0.6926
Epoch 138/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7871 - accuracy:
0.6958
Epoch 139/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7821 - accuracy:
0.6783
Epoch 140/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7407 - accuracy:
0.6935
Epoch 141/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7489 - accuracy:
0.6852
Epoch 142/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7623 - accuracy:
0.6829
Epoch 143/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7485 - accuracy:
0.6908
Epoch 144/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7243 - accuracy:
0.7050
Epoch 145/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8084 - accuracy:
0.6903
Epoch 146/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7670 - accuracy:
0.6940
Epoch 147/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7655 - accuracy:
0.6981
Epoch 148/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7151 - accuracy:
0.7110
Epoch 149/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7507 - accuracy:
0.7059
Epoch 150/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8161 - accuracy:
0.6783
Epoch 151/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7816 - accuracy:
0.6940
Epoch 152/200
68/68 [==============================] - 0s 3ms/step - loss: 0.7724 - accuracy:
```

```
0.6884
Epoch 153/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7275 - accuracy:
0.7046
Epoch 154/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7114 - accuracy:
0.7050
Epoch 155/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7587 - accuracy:
0.6931
Epoch 156/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7123 - accuracy:
0.7032
Epoch 157/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7287 - accuracy:
0.7064
Epoch 158/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7419 - accuracy:
0.7032
Epoch 159/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7565 - accuracy:
0.7027
Epoch 160/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7635 - accuracy:
0.7050
Epoch 161/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7486 - accuracy:
0.7013
Epoch 162/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7133 - accuracy:
0.7050
Epoch 163/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7272 - accuracy:
0.7105
Epoch 164/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7282 - accuracy:
0.7138
Epoch 165/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7612 - accuracy:
0.7046
Epoch 166/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7507 - accuracy:
0.6986
Epoch 167/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7397 - accuracy:
0.7128
Epoch 168/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7255 - accuracy:
```

```
0.7133
Epoch 169/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7158 - accuracy:
0.7179
Epoch 170/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7469 - accuracy:
0.7078
Epoch 171/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7510 - accuracy:
0.6995
Epoch 172/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7544 - accuracy:
0.7000
Epoch 173/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7581 - accuracy:
0.7009
Epoch 174/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7215 - accuracy:
0.7161
Epoch 175/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6925 - accuracy:
0.7280
Epoch 176/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7523 - accuracy:
0.7170
Epoch 177/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7405 - accuracy:
0.7096
Epoch 178/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7083 - accuracy:
0.7262
Epoch 179/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6938 - accuracy:
0.7216
Epoch 180/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7156 - accuracy:
0.7124
Epoch 181/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7470 - accuracy:
0.7138
Epoch 182/200
68/68 [==============================] - 0s 3ms/step - loss: 0.7091 - accuracy:
0.7050
Epoch 183/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7146 - accuracy:
0.7211
Epoch 184/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7868 - accuracy:
```

```
0.6871
Epoch 185/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7370 - accuracy:
0.7138
Epoch 186/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7526 - accuracy:
0.7073
Epoch 187/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7078 - accuracy:
0.7266
Epoch 188/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6996 - accuracy:
0.7225
Epoch 189/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7310 - accuracy:
0.7119
Epoch 190/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7403 - accuracy:
0.7041
Epoch 191/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7273 - accuracy:
0.7087
Epoch 192/200
68/68 [==============================] - 0s 3ms/step - loss: 0.7619 - accuracy:
0.7082
Epoch 193/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7100 - accuracy:
0.7128
Epoch 194/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7049 - accuracy:
0.7285
Epoch 195/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6791 - accuracy:
0.7303
Epoch 196/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7252 - accuracy:
0.7331
Epoch 197/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7077 - accuracy:
0.7170
Epoch 198/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7246 - accuracy:
0.7069
Epoch 199/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7391 - accuracy:
0.7165
Epoch 200/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6965 - accuracy:
```

```
0.7161
17/17 [==============================] - 0s 1ms/step
Epoch 1/200
68/68 [==============================] - 1s 2ms/step - loss: 2.1472 - accuracy:
0.2426
Epoch 2/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7977 - accuracy:
0.2316
Epoch 3/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8086 - accuracy:
0.2348
Epoch 4/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8027 - accuracy:
0.2192
Epoch 5/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7936 - accuracy:
0.2320
Epoch 6/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7955 - accuracy:
0.2247
Epoch 7/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7936 - accuracy:
0.2307
Epoch 8/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7957 - accuracy:
0.2307
Epoch 9/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7923 - accuracy:
0.2413
Epoch 10/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8052 - accuracy:
0.2330
Epoch 11/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8020 - accuracy:
0.2482
Epoch 12/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7932 - accuracy:
0.2302
Epoch 13/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7918 - accuracy:
0.2486
Epoch 14/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7967 - accuracy:
0.2325
Epoch 15/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7959 - accuracy:
0.2307
Epoch 16/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 1.7967 - accuracy:
0.2270
Epoch 17/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7999 - accuracy:
0.2297
Epoch 18/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7945 - accuracy:
0.2302
Epoch 19/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7935 - accuracy:
0.2362
Epoch 20/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7997 - accuracy:
0.2366
Epoch 21/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7949 - accuracy:
0.2357
Epoch 22/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7935 - accuracy:
0.2426
Epoch 23/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7971 - accuracy:
0.2215
Epoch 24/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8059 - accuracy:
0.2353
Epoch 25/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7950 - accuracy:
0.2265
Epoch 26/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7973 - accuracy:
0.2454
Epoch 27/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8019 - accuracy:
0.2320
Epoch 28/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7962 - accuracy:
0.2348
Epoch 29/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7940 - accuracy:
0.2247
Epoch 30/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7940 - accuracy:
0.2224
Epoch 31/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7957 - accuracy:
0.2385
Epoch 32/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 1.7972 - accuracy:
0.2339
Epoch 33/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7943 - accuracy:
0.2330
Epoch 34/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2408
Epoch 35/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7983 - accuracy:
0.2145
Epoch 36/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7945 - accuracy:
0.2371
Epoch 37/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8126 - accuracy:
0.2399
Epoch 38/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7918 - accuracy:
0.2279
Epoch 39/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7943 - accuracy:
0.2380
Epoch 40/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7945 - accuracy:
0.2417
Epoch 41/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7994 - accuracy:
0.2302
Epoch 42/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7925 - accuracy:
0.2385
Epoch 43/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7953 - accuracy:
0.2343
Epoch 44/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7909 - accuracy:
0.2288
Epoch 45/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7933 - accuracy:
0.2417
Epoch 46/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2334
Epoch 47/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2270
Epoch 48/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 1.7944 - accuracy:
0.2178
Epoch 49/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7958 - accuracy:
0.2440
Epoch 50/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7961 - accuracy:
0.2320
Epoch 51/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7961 - accuracy:
0.2357
Epoch 52/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7917 - accuracy:
0.2413
Epoch 53/200
68/68 [==============================] - 0s 2ms/step - loss: 2.4085 - accuracy:
0.2390
Epoch 54/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7972 - accuracy:
0.2113
Epoch 55/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7972 - accuracy:
0.2288
Epoch 56/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7935 - accuracy:
0.2399
Epoch 57/200
68/68 [==============================] - 0s 3ms/step - loss: 1.8003 - accuracy:
0.2228
Epoch 58/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8009 - accuracy:
0.2472
Epoch 59/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7972 - accuracy:
0.2307
Epoch 60/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7941 - accuracy:
0.2307
Epoch 61/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7990 - accuracy:
0.2459
Epoch 62/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7916 - accuracy:
0.2505
Epoch 63/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7956 - accuracy:
0.2366
Epoch 64/200
```

```
68/68 [==============================] - 0s 3ms/step - loss: 1.7927 - accuracy:
0.2284
Epoch 65/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7997 - accuracy:
0.2486
Epoch 66/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7949 - accuracy:
0.2366
Epoch 67/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7978 - accuracy:
0.2053
Epoch 68/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2339
Epoch 69/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7936 - accuracy:
0.2334
Epoch 70/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2288
Epoch 71/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7927 - accuracy:
0.2302
Epoch 72/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7957 - accuracy:
0.2311
Epoch 73/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7987 - accuracy:
0.2201
Epoch 74/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7940 - accuracy:
0.2320
Epoch 75/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2284
Epoch 76/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7919 - accuracy:
0.2390
Epoch 77/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8001 - accuracy:
0.2224
Epoch 78/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7937 - accuracy:
0.2251
Epoch 79/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7946 - accuracy:
0.2233
Epoch 80/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2390
Epoch 81/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7955 - accuracy:
0.2371
Epoch 82/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2380
Epoch 83/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7919 - accuracy:
0.2505
Epoch 84/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7962 - accuracy:
0.2233
Epoch 85/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8011 - accuracy:
0.2454
Epoch 86/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7955 - accuracy:
0.2302
Epoch 87/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7923 - accuracy:
0.2348
Epoch 88/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7990 - accuracy:
0.2302
Epoch 89/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7956 - accuracy:
0.2288
Epoch 90/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2408
Epoch 91/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7937 - accuracy:
0.2449
Epoch 92/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7949 - accuracy:
0.2288
Epoch 93/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7953 - accuracy:
0.2477
Epoch 94/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7933 - accuracy:
0.2357
Epoch 95/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7935 - accuracy:
0.2399
Epoch 96/200
```

```
68/68 [==============================] - 0s 3ms/step - loss: 1.7966 - accuracy:
0.2274
Epoch 97/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7908 - accuracy:
0.2426
Epoch 98/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8001 - accuracy:
0.2297
Epoch 99/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7943 - accuracy:
0.2297
Epoch 100/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7942 - accuracy:
0.2366
Epoch 101/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7965 - accuracy:
0.2422
Epoch 102/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2334
Epoch 103/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7957 - accuracy:
0.2362
Epoch 104/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7961 - accuracy:
0.2113
Epoch 105/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2403
Epoch 106/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7988 - accuracy:
0.2362
Epoch 107/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2422
Epoch 108/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7930 - accuracy:
0.2371
Epoch 109/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7904 - accuracy:
0.2541
Epoch 110/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2380
Epoch 111/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7986 - accuracy:
0.2366
Epoch 112/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2468
Epoch 113/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7955 - accuracy:
0.2445
Epoch 114/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7971 - accuracy:
0.2274
Epoch 115/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7953 - accuracy:
0.2376
Epoch 116/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7913 - accuracy:
0.2330
Epoch 117/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7955 - accuracy:
0.2302
Epoch 118/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7977 - accuracy:
0.2371
Epoch 119/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7986 - accuracy:
0.2182
Epoch 120/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7971 - accuracy:
0.2320
Epoch 121/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7986 - accuracy:
0.2343
Epoch 122/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7960 - accuracy:
0.2394
Epoch 123/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7957 - accuracy:
0.2449
Epoch 124/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7991 - accuracy:
0.2293
Epoch 125/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7994 - accuracy:
0.2297
Epoch 126/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7949 - accuracy:
0.2279
Epoch 127/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7971 - accuracy:
0.2293
Epoch 128/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 1.7934 - accuracy:
0.2371
Epoch 129/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7918 - accuracy:
0.2514
Epoch 130/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7928 - accuracy:
0.2403
Epoch 131/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2293
Epoch 132/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7958 - accuracy:
0.2385
Epoch 133/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7949 - accuracy:
0.2454
Epoch 134/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7968 - accuracy:
0.2210
Epoch 135/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8013 - accuracy:
0.2233
Epoch 136/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7935 - accuracy:
0.2343
Epoch 137/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7964 - accuracy:
0.2233
Epoch 138/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7987 - accuracy:
0.2390
Epoch 139/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7986 - accuracy:
0.2353
Epoch 140/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7972 - accuracy:
0.2353
Epoch 141/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7944 - accuracy:
0.2334
Epoch 142/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7935 - accuracy:
0.2422
Epoch 143/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7967 - accuracy:
0.2320
Epoch 144/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 1.7953 - accuracy:
0.2408
Epoch 145/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7964 - accuracy:
0.2468
Epoch 146/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7947 - accuracy:
0.2279
Epoch 147/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7969 - accuracy:
0.2274
Epoch 148/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7990 - accuracy:
0.2099
Epoch 149/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7977 - accuracy:
0.2362
Epoch 150/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7929 - accuracy:
0.2311
Epoch 151/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7941 - accuracy:
0.2509
Epoch 152/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7971 - accuracy:
0.2316
Epoch 153/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7984 - accuracy:
0.2274
Epoch 154/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7934 - accuracy:
0.2523
Epoch 155/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7926 - accuracy:
0.2343
Epoch 156/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7979 - accuracy:
0.2288
Epoch 157/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7959 - accuracy:
0.2385
Epoch 158/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8003 - accuracy:
0.2215
Epoch 159/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7922 - accuracy:
0.2546
Epoch 160/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 1.7965 - accuracy:
0.2390
Epoch 161/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7939 - accuracy:
0.2376
Epoch 162/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7957 - accuracy:
0.2408
Epoch 163/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7972 - accuracy:
0.2330
Epoch 164/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7987 - accuracy:
0.2325
Epoch 165/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7924 - accuracy:
0.2348
Epoch 166/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2228
Epoch 167/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7941 - accuracy:
0.2390
Epoch 168/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7915 - accuracy:
0.2500
Epoch 169/200
68/68 [==============================] - 0s 3ms/step - loss: 1.8047 - accuracy:
0.2210
Epoch 170/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7925 - accuracy:
0.2371
Epoch 171/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7916 - accuracy:
0.2403
Epoch 172/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7964 - accuracy:
0.2219
Epoch 173/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2210
Epoch 174/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7946 - accuracy:
0.2205
Epoch 175/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7979 - accuracy:
0.2297
Epoch 176/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 1.7957 - accuracy:
0.2261
Epoch 177/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7963 - accuracy:
0.2440
Epoch 178/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7958 - accuracy:
0.2343
Epoch 179/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7986 - accuracy:
0.2320
Epoch 180/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7941 - accuracy:
0.2403
Epoch 181/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7945 - accuracy:
0.2353
Epoch 182/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7931 - accuracy:
0.2357
Epoch 183/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7970 - accuracy:
0.2366
Epoch 184/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8001 - accuracy:
0.2307
Epoch 185/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8000 - accuracy:
0.2270
Epoch 186/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7961 - accuracy:
0.2445
Epoch 187/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7921 - accuracy:
0.2357
Epoch 188/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7977 - accuracy:
0.2297
Epoch 189/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7964 - accuracy:
0.2371
Epoch 190/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7923 - accuracy:
0.2422
Epoch 191/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7966 - accuracy:
0.2376
Epoch 192/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2256
Epoch 193/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7921 - accuracy:
0.2311
Epoch 194/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7983 - accuracy:
0.2284
Epoch 195/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7955 - accuracy:
0.2436
Epoch 196/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7968 - accuracy:
0.2159
Epoch 197/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2270
Epoch 198/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7946 - accuracy:
0.2371
Epoch 199/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7968 - accuracy:
0.2320
Epoch 200/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7943 - accuracy:
0.2325
17/17 [==============================] - 0s 1ms/step
Epoch 1/200
68/68 [==============================] - 1s 2ms/step - loss: 2.5244 - accuracy:
0.2301
Epoch 2/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8238 - accuracy:
0.2402
Epoch 3/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8257 - accuracy:
0.2186
Epoch 4/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2398
Epoch 5/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8070 - accuracy:
0.2301
Epoch 6/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7960 - accuracy:
0.2411
Epoch 7/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7939 - accuracy:
0.2388
```

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Epoch 8/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7982 - accuracy:
0.2444
Epoch 9/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7973 - accuracy:
0.2214
Epoch 10/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7937 - accuracy:
0.2338
Epoch 11/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2333
Epoch 12/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7946 - accuracy:
0.2356
Epoch 13/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7941 - accuracy:
0.2421
Epoch 14/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7977 - accuracy:
0.2315
Epoch 15/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7972 - accuracy:
0.2453
Epoch 16/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8676 - accuracy:
0.2273
Epoch 17/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7984 - accuracy:
0.2379
Epoch 18/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8024 - accuracy:
0.2287
Epoch 19/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7985 - accuracy:
0.2384
Epoch 20/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2416
Epoch 21/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7961 - accuracy:
0.2301
Epoch 22/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7982 - accuracy:
0.2388
Epoch 23/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7945 - accuracy:
0.2453
```

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Epoch 24/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7984 - accuracy:
0.2356
Epoch 25/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7962 - accuracy:
0.2315
Epoch 26/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7985 - accuracy:
0.2255
Epoch 27/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7945 - accuracy:
0.2375
Epoch 28/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8015 - accuracy:
0.2154
Epoch 29/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7977 - accuracy:
0.2292
Epoch 30/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7974 - accuracy:
0.2416
Epoch 31/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2402
Epoch 32/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7993 - accuracy:
0.2264
Epoch 33/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7965 - accuracy:
0.2352
Epoch 34/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7949 - accuracy:
0.2398
Epoch 35/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7981 - accuracy:
0.2310
Epoch 36/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2453
Epoch 37/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7971 - accuracy:
0.2250
Epoch 38/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7987 - accuracy:
0.2195
Epoch 39/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7920 - accuracy:
0.2448
```

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Epoch 40/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7904 - accuracy:
0.2278
Epoch 41/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8007 - accuracy:
0.2540
Epoch 42/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2342
Epoch 43/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7961 - accuracy:
0.2370
Epoch 44/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7956 - accuracy:
0.2439
Epoch 45/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2526
Epoch 46/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7949 - accuracy:
0.2375
Epoch 47/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7953 - accuracy:
0.2329
Epoch 48/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7979 - accuracy:
0.2388
Epoch 49/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7933 - accuracy:
0.2287
Epoch 50/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7925 - accuracy:
0.2448
Epoch 51/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7991 - accuracy:
0.2421
Epoch 52/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7947 - accuracy:
0.2402
Epoch 53/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7950 - accuracy:
0.2342
Epoch 54/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7980 - accuracy:
0.2430
Epoch 55/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7987 - accuracy:
0.2425
```

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Epoch 56/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7936 - accuracy:
0.2315
Epoch 57/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7974 - accuracy:
0.2232
Epoch 58/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7981 - accuracy:
0.2319
Epoch 59/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7944 - accuracy:
0.2296
Epoch 60/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7944 - accuracy:
0.2416
Epoch 61/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7942 - accuracy:
0.2347
Epoch 62/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7971 - accuracy:
0.2430
Epoch 63/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7959 - accuracy:
0.2264
Epoch 64/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7939 - accuracy:
0.2453
Epoch 65/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7959 - accuracy:
0.2379
Epoch 66/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7964 - accuracy:
0.2375
Epoch 67/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7985 - accuracy:
0.2379
Epoch 68/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7974 - accuracy:
0.2292
Epoch 69/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2296
Epoch 70/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7936 - accuracy:
0.2434
Epoch 71/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7970 - accuracy:
0.2301
```

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Epoch 72/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8313 - accuracy:
0.2462
Epoch 73/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8007 - accuracy:
0.2145
Epoch 74/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2439
Epoch 75/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7940 - accuracy:
0.2356
Epoch 76/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7924 - accuracy:
0.2333
Epoch 77/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7942 - accuracy:
0.2545
Epoch 78/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7964 - accuracy:
0.2384
Epoch 79/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2278
Epoch 80/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7958 - accuracy:
0.2384
Epoch 81/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2416
Epoch 82/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7940 - accuracy:
0.2310
Epoch 83/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7990 - accuracy:
0.2329
Epoch 84/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7970 - accuracy:
0.2365
Epoch 85/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7947 - accuracy:
0.2356
Epoch 86/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7966 - accuracy:
0.2324
Epoch 87/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7959 - accuracy:
0.2375
```

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Epoch 88/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7980 - accuracy:
0.2306
Epoch 89/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8047 - accuracy:
0.2467
Epoch 90/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7932 - accuracy:
0.2536
Epoch 91/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7984 - accuracy:
0.2292
Epoch 92/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7984 - accuracy:
0.2232
Epoch 93/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7962 - accuracy:
0.2416
Epoch 94/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7988 - accuracy:
0.2310
Epoch 95/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7956 - accuracy:
0.2402
Epoch 96/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7918 - accuracy:
0.2356
Epoch 97/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7995 - accuracy:
0.2278
Epoch 98/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7929 - accuracy:
0.2416
Epoch 99/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7953 - accuracy:
0.2375
Epoch 100/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7987 - accuracy:
0.2269
Epoch 101/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7976 - accuracy:
0.2416
Epoch 102/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2439
Epoch 103/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7933 - accuracy:
0.2517
```

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Epoch 104/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2273
Epoch 105/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8225 - accuracy:
0.2232
Epoch 106/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7945 - accuracy:
0.2356
Epoch 107/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7969 - accuracy:
0.2338
Epoch 108/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7962 - accuracy:
0.2338
Epoch 109/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7936 - accuracy:
0.2402
Epoch 110/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8009 - accuracy:
0.2287
Epoch 111/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7920 - accuracy:
0.2283
Epoch 112/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2416
Epoch 113/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7901 - accuracy:
0.2430
Epoch 114/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7984 - accuracy:
0.2209
Epoch 115/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7985 - accuracy:
0.2352
Epoch 116/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7945 - accuracy:
0.2398
Epoch 117/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7977 - accuracy:
0.2273
Epoch 118/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7934 - accuracy:
0.2439
Epoch 119/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8007 - accuracy:
0.2301
```

```
Epoch 120/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8026 - accuracy:
0.2356
Epoch 121/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2347
Epoch 122/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7986 - accuracy:
0.2121
Epoch 123/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8020 - accuracy:
0.2283
Epoch 124/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2283
Epoch 125/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7962 - accuracy:
0.2467
Epoch 126/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8007 - accuracy:
0.2398
Epoch 127/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7930 - accuracy:
0.2384
Epoch 128/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7990 - accuracy:
0.2448
Epoch 129/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7977 - accuracy:
0.2402
Epoch 130/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7973 - accuracy:
0.2370
Epoch 131/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7917 - accuracy:
0.2457
Epoch 132/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7985 - accuracy:
0.2306
Epoch 133/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7939 - accuracy:
0.2526
Epoch 134/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7977 - accuracy:
0.2324
Epoch 135/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7973 - accuracy:
0.2384
```

```
Epoch 136/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7949 - accuracy:
0.2333
Epoch 137/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7943 - accuracy:
0.2319
Epoch 138/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7973 - accuracy:
0.2283
Epoch 139/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7999 - accuracy:
0.2278
Epoch 140/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7933 - accuracy:
0.2407
Epoch 141/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7978 - accuracy:
0.2356
Epoch 142/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7989 - accuracy:
0.2352
Epoch 143/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7950 - accuracy:
0.2416
Epoch 144/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7949 - accuracy:
0.2315
Epoch 145/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7964 - accuracy:
0.2356
Epoch 146/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7973 - accuracy:
0.2342
Epoch 147/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7921 - accuracy:
0.2333
Epoch 148/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2365
Epoch 149/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7976 - accuracy:
0.2310
Epoch 150/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7978 - accuracy:
0.2370
Epoch 151/200
68/68 [==============================] - 0s 3ms/step - loss: 1.8009 - accuracy:
0.2296
```

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Epoch 152/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2296
Epoch 153/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7970 - accuracy:
0.2246
Epoch 154/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2448
Epoch 155/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7999 - accuracy:
0.2315
Epoch 156/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7943 - accuracy:
0.2554
Epoch 157/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7948 - accuracy:
0.2342
Epoch 158/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7988 - accuracy:
0.2411
Epoch 159/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7972 - accuracy:
0.2365
Epoch 160/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7965 - accuracy:
0.2439
Epoch 161/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7969 - accuracy:
0.2407
Epoch 162/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7939 - accuracy:
0.2421
Epoch 163/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7981 - accuracy:
0.2430
Epoch 164/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7999 - accuracy:
0.2453
Epoch 165/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2177
Epoch 166/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7999 - accuracy:
0.2480
Epoch 167/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2315
```

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Epoch 168/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7964 - accuracy:
0.2333
Epoch 169/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7974 - accuracy:
0.2361
Epoch 170/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7953 - accuracy:
0.2342
Epoch 171/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2324
Epoch 172/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7973 - accuracy:
0.2398
Epoch 173/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7983 - accuracy:
0.2260
Epoch 174/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2269
Epoch 175/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2393
Epoch 176/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7987 - accuracy:
0.2315
Epoch 177/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7972 - accuracy:
0.2365
Epoch 178/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7941 - accuracy:
0.2356
Epoch 179/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7962 - accuracy:
0.2250
Epoch 180/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7973 - accuracy:
0.2273
Epoch 181/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7966 - accuracy:
0.2448
Epoch 182/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7966 - accuracy:
0.2457
Epoch 183/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7947 - accuracy:
0.2388
```

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Epoch 184/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7955 - accuracy:
0.2269
Epoch 185/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7979 - accuracy:
0.2457
Epoch 186/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7931 - accuracy:
0.2416
Epoch 187/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8000 - accuracy:
0.2338
Epoch 188/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2204
Epoch 189/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7944 - accuracy:
0.2287
Epoch 190/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7923 - accuracy:
0.2411
Epoch 191/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7983 - accuracy:
0.2310
Epoch 192/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7953 - accuracy:
0.2411
Epoch 193/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7988 - accuracy:
0.2352
Epoch 194/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7991 - accuracy:
0.2301
Epoch 195/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7949 - accuracy:
0.2370
Epoch 196/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7962 - accuracy:
0.2200
Epoch 197/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2292
Epoch 198/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7947 - accuracy:
0.2241
Epoch 199/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7960 - accuracy:
0.2347
```

```
Epoch 200/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7992 - accuracy:
0.2237
17/17 [==============================] - 0s 2ms/step
Epoch 1/200
68/68 [==============================] - 0s 2ms/step - loss: 2.2274 - accuracy:
0.2388
Epoch 2/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8034 - accuracy:
0.2352
Epoch 3/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2467
Epoch 4/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7982 - accuracy:
0.2388
Epoch 5/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8018 - accuracy:
0.2365
Epoch 6/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7942 - accuracy:
0.2292
Epoch 7/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7970 - accuracy:
0.2411
Epoch 8/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7966 - accuracy:
0.2296
Epoch 9/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7992 - accuracy:
0.2421
Epoch 10/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8029 - accuracy:
0.2402
Epoch 11/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7959 - accuracy:
0.2356
Epoch 12/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7946 - accuracy:
0.2269
Epoch 13/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2237
Epoch 14/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7956 - accuracy:
0.2296
Epoch 15/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8101 - accuracy:
```

```
0.2434
Epoch 16/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7958 - accuracy:
0.2273
Epoch 17/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8002 - accuracy:
0.2269
Epoch 18/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7969 - accuracy:
0.2241
Epoch 19/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7934 - accuracy:
0.2370
Epoch 20/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2379
Epoch 21/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7976 - accuracy:
0.2324
Epoch 22/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7956 - accuracy:
0.2255
Epoch 23/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7979 - accuracy:
0.2103
Epoch 24/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8140 - accuracy:
0.2310
Epoch 25/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2342
Epoch 26/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8005 - accuracy:
0.2181
Epoch 27/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8007 - accuracy:
0.2338
Epoch 28/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8023 - accuracy:
0.2168
Epoch 29/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7969 - accuracy:
0.2485
Epoch 30/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7945 - accuracy:
0.2508
Epoch 31/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8026 - accuracy:
```

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0.2425
Epoch 32/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7986 - accuracy:
0.2434
Epoch 33/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7971 - accuracy:
0.2347
Epoch 34/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8071 - accuracy:
0.2338
Epoch 35/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8600 - accuracy:
0.2250
Epoch 36/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7942 - accuracy:
0.2453
Epoch 37/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8912 - accuracy:
0.2490
Epoch 38/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8034 - accuracy:
0.2310
Epoch 39/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7932 - accuracy:
0.2444
Epoch 40/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7969 - accuracy:
0.2398
Epoch 41/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7919 - accuracy:
0.2246
Epoch 42/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7933 - accuracy:
0.2476
Epoch 43/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8034 - accuracy:
0.2306
Epoch 44/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7992 - accuracy:
0.2232
Epoch 45/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7981 - accuracy:
0.2315
Epoch 46/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7979 - accuracy:
0.2402
Epoch 47/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
```

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0.2365
Epoch 48/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8023 - accuracy:
0.2365
Epoch 49/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7974 - accuracy:
0.2338
Epoch 50/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7943 - accuracy:
0.2324
Epoch 51/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8029 - accuracy:
0.2250
Epoch 52/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7946 - accuracy:
0.2384
Epoch 53/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7966 - accuracy:
0.2246
Epoch 54/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7936 - accuracy:
0.2388
Epoch 55/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7958 - accuracy:
0.2333
Epoch 56/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7984 - accuracy:
0.2264
Epoch 57/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8027 - accuracy:
0.2292
Epoch 58/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7960 - accuracy:
0.2264
Epoch 59/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7942 - accuracy:
0.2319
Epoch 60/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7965 - accuracy:
0.2310
Epoch 61/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7977 - accuracy:
0.2379
Epoch 62/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7971 - accuracy:
0.2398
Epoch 63/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7956 - accuracy:
```

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0.2333
Epoch 64/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8072 - accuracy:
0.2250
Epoch 65/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7960 - accuracy:
0.2370
Epoch 66/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7970 - accuracy:
0.2457
Epoch 67/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7967 - accuracy:
0.2301
Epoch 68/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7960 - accuracy:
0.2393
Epoch 69/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7971 - accuracy:
0.2329
Epoch 70/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7968 - accuracy:
0.2191
Epoch 71/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7958 - accuracy:
0.2287
Epoch 72/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2250
Epoch 73/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7945 - accuracy:
0.2342
Epoch 74/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7981 - accuracy:
0.2232
Epoch 75/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7982 - accuracy:
0.2246
Epoch 76/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7982 - accuracy:
0.2499
Epoch 77/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7965 - accuracy:
0.2333
Epoch 78/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7997 - accuracy:
0.2361
Epoch 79/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7942 - accuracy:
```

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0.2283
Epoch 80/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7948 - accuracy:
0.2352
Epoch 81/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7974 - accuracy:
0.2292
Epoch 82/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7988 - accuracy:
0.2388
Epoch 83/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7987 - accuracy:
0.2421
Epoch 84/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7978 - accuracy:
0.2223
Epoch 85/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7946 - accuracy:
0.2264
Epoch 86/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7944 - accuracy:
0.2379
Epoch 87/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8013 - accuracy:
0.2296
Epoch 88/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7931 - accuracy:
0.2273
Epoch 89/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8000 - accuracy:
0.2365
Epoch 90/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7993 - accuracy:
0.2338
Epoch 91/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8009 - accuracy:
0.2186
Epoch 92/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7991 - accuracy:
0.2227
Epoch 93/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7945 - accuracy:
0.2315
Epoch 94/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2393
Epoch 95/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7979 - accuracy:
```

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0.2232
Epoch 96/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7936 - accuracy:
0.2260
Epoch 97/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7995 - accuracy:
0.2393
Epoch 98/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7976 - accuracy:
0.2457
Epoch 99/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7984 - accuracy:
0.2306
Epoch 100/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7916 - accuracy:
0.2425
Epoch 101/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8001 - accuracy:
0.2324
Epoch 102/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8013 - accuracy:
0.2471
Epoch 103/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7930 - accuracy:
0.2388
Epoch 104/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2347
Epoch 105/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2172
Epoch 106/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7983 - accuracy:
0.2324
Epoch 107/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7981 - accuracy:
0.2347
Epoch 108/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7946 - accuracy:
0.2407
Epoch 109/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2292
Epoch 110/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7965 - accuracy:
0.2232
Epoch 111/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7934 - accuracy:
```

```
0.2398
Epoch 112/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7964 - accuracy:
0.2384
Epoch 113/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2476
Epoch 114/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7979 - accuracy:
0.2315
Epoch 115/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7962 - accuracy:
0.2379
Epoch 116/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7956 - accuracy:
0.2393
Epoch 117/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7997 - accuracy:
0.2209
Epoch 118/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7976 - accuracy:
0.2480
Epoch 119/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7968 - accuracy:
0.2319
Epoch 120/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7992 - accuracy:
0.2209
Epoch 121/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2255
Epoch 122/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2338
Epoch 123/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7947 - accuracy:
0.2476
Epoch 124/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8024 - accuracy:
0.2379
Epoch 125/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7995 - accuracy:
0.2310
Epoch 126/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7981 - accuracy:
0.2209
Epoch 127/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7934 - accuracy:
```

```
0.2260
Epoch 128/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7956 - accuracy:
0.2407
Epoch 129/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7971 - accuracy:
0.2333
Epoch 130/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7976 - accuracy:
0.2338
Epoch 131/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7934 - accuracy:
0.2485
Epoch 132/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7976 - accuracy:
0.2402
Epoch 133/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7923 - accuracy:
0.2356
Epoch 134/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7976 - accuracy:
0.2338
Epoch 135/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7959 - accuracy:
0.2434
Epoch 136/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7980 - accuracy:
0.2457
Epoch 137/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7956 - accuracy:
0.2347
Epoch 138/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7981 - accuracy:
0.2310
Epoch 139/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7985 - accuracy:
0.2361
Epoch 140/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7962 - accuracy:
0.2237
Epoch 141/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8004 - accuracy:
0.2163
Epoch 142/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7968 - accuracy:
0.2361
Epoch 143/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7958 - accuracy:
```

```
0.2425
Epoch 144/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7949 - accuracy:
0.2319
Epoch 145/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7992 - accuracy:
0.2407
Epoch 146/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2342
Epoch 147/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7990 - accuracy:
0.2204
Epoch 148/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7940 - accuracy:
0.2338
Epoch 149/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7947 - accuracy:
0.2393
Epoch 150/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7959 - accuracy:
0.2370
Epoch 151/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7944 - accuracy:
0.2375
Epoch 152/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7942 - accuracy:
0.2255
Epoch 153/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7988 - accuracy:
0.2375
Epoch 154/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7986 - accuracy:
0.2448
Epoch 155/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7955 - accuracy:
0.2361
Epoch 156/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7988 - accuracy:
0.2338
Epoch 157/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7962 - accuracy:
0.2425
Epoch 158/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8035 - accuracy:
0.2315
Epoch 159/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7988 - accuracy:
```

```
0.2338
Epoch 160/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7958 - accuracy:
0.2365
Epoch 161/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7991 - accuracy:
0.2260
Epoch 162/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7989 - accuracy:
0.2444
Epoch 163/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7982 - accuracy:
0.2296
Epoch 164/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7979 - accuracy:
0.2287
Epoch 165/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2338
Epoch 166/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7966 - accuracy:
0.2283
Epoch 167/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8013 - accuracy:
0.2191
Epoch 168/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2379
Epoch 169/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2315
Epoch 170/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8027 - accuracy:
0.2204
Epoch 171/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7987 - accuracy:
0.2407
Epoch 172/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7923 - accuracy:
0.2517
Epoch 173/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8003 - accuracy:
0.2352
Epoch 174/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7986 - accuracy:
0.2218
Epoch 175/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7974 - accuracy:
```

```
0.2135
Epoch 176/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7918 - accuracy:
0.2375
Epoch 177/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7984 - accuracy:
0.2250
Epoch 178/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8010 - accuracy:
0.2324
Epoch 179/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7965 - accuracy:
0.2315
Epoch 180/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7931 - accuracy:
0.2338
Epoch 181/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7995 - accuracy:
0.2425
Epoch 182/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7973 - accuracy:
0.2384
Epoch 183/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7980 - accuracy:
0.2342
Epoch 184/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7985 - accuracy:
0.2430
Epoch 185/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7979 - accuracy:
0.2342
Epoch 186/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7969 - accuracy:
0.2352
Epoch 187/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2407
Epoch 188/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7955 - accuracy:
0.2260
Epoch 189/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8000 - accuracy:
0.2310
Epoch 190/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7953 - accuracy:
0.2384
Epoch 191/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7988 - accuracy:
```

```
0.2352
Epoch 192/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7948 - accuracy:
0.2347
Epoch 193/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7984 - accuracy:
0.2352
Epoch 194/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7980 - accuracy:
0.2333
Epoch 195/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7987 - accuracy:
0.2365
Epoch 196/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8005 - accuracy:
0.2287
Epoch 197/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7980 - accuracy:
0.2347
Epoch 198/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2342
Epoch 199/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7937 - accuracy:
0.2439
Epoch 200/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7966 - accuracy:
0.2338
17/17 [==============================] - 0s 1ms/step
Epoch 1/200
68/68 [==============================] - 1s 2ms/step - loss: 2.2682 - accuracy:
0.2646
Epoch 2/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8254 - accuracy:
0.2430
Epoch 3/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7925 - accuracy:
0.2444
Epoch 4/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7921 - accuracy:
0.2296
Epoch 5/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7936 - accuracy:
0.2292
Epoch 6/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7950 - accuracy:
0.2352
Epoch 7/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 1.8128 - accuracy:
0.2425
Epoch 8/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8068 - accuracy:
0.2319
Epoch 9/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7964 - accuracy:
0.2204
Epoch 10/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7950 - accuracy:
0.2329
Epoch 11/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7927 - accuracy:
0.2471
Epoch 12/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2430
Epoch 13/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7990 - accuracy:
0.2209
Epoch 14/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8013 - accuracy:
0.2241
Epoch 15/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7934 - accuracy:
0.2324
Epoch 16/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8010 - accuracy:
0.2172
Epoch 17/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8155 - accuracy:
0.2448
Epoch 18/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7970 - accuracy:
0.2402
Epoch 19/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7939 - accuracy:
0.2310
Epoch 20/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7959 - accuracy:
0.2301
Epoch 21/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2379
Epoch 22/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7909 - accuracy:
0.2264
Epoch 23/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 1.8000 - accuracy:
0.2301
Epoch 24/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7919 - accuracy:
0.2480
Epoch 25/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2398
Epoch 26/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7973 - accuracy:
0.2306
Epoch 27/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8013 - accuracy:
0.2301
Epoch 28/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7958 - accuracy:
0.2416
Epoch 29/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7982 - accuracy:
0.2278
Epoch 30/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7949 - accuracy:
0.2361
Epoch 31/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7962 - accuracy:
0.2342
Epoch 32/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7981 - accuracy:
0.2485
Epoch 33/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2490
Epoch 34/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7937 - accuracy:
0.2333
Epoch 35/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7939 - accuracy:
0.2365
Epoch 36/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7968 - accuracy:
0.2250
Epoch 37/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8016 - accuracy:
0.2296
Epoch 38/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2379
Epoch 39/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 1.7926 - accuracy:
0.2416
Epoch 40/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7929 - accuracy:
0.2388
Epoch 41/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7945 - accuracy:
0.2310
Epoch 42/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7930 - accuracy:
0.2301
Epoch 43/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8010 - accuracy:
0.2232
Epoch 44/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7977 - accuracy:
0.2264
Epoch 45/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7914 - accuracy:
0.2393
Epoch 46/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8033 - accuracy:
0.2324
Epoch 47/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7931 - accuracy:
0.2439
Epoch 48/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7982 - accuracy:
0.2365
Epoch 49/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7953 - accuracy:
0.2398
Epoch 50/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7988 - accuracy:
0.2356
Epoch 51/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8020 - accuracy:
0.2158
Epoch 52/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7966 - accuracy:
0.2273
Epoch 53/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7970 - accuracy:
0.2342
Epoch 54/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7960 - accuracy:
0.2329
Epoch 55/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 1.7942 - accuracy:
0.2296
Epoch 56/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7970 - accuracy:
0.2411
Epoch 57/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7944 - accuracy:
0.2342
Epoch 58/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7962 - accuracy:
0.2278
Epoch 59/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7976 - accuracy:
0.2255
Epoch 60/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2278
Epoch 61/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7990 - accuracy:
0.2227
Epoch 62/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2333
Epoch 63/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7985 - accuracy:
0.2241
Epoch 64/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7942 - accuracy:
0.2324
Epoch 65/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7917 - accuracy:
0.2223
Epoch 66/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7962 - accuracy:
0.2287
Epoch 67/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2273
Epoch 68/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2384
Epoch 69/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7917 - accuracy:
0.2434
Epoch 70/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7943 - accuracy:
0.2338
Epoch 71/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 1.7953 - accuracy:
0.2269
Epoch 72/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7945 - accuracy:
0.2319
Epoch 73/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8038 - accuracy:
0.2140
Epoch 74/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7994 - accuracy:
0.2361
Epoch 75/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7930 - accuracy:
0.2411
Epoch 76/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7935 - accuracy:
0.2278
Epoch 77/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7970 - accuracy:
0.2352
Epoch 78/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7944 - accuracy:
0.2384
Epoch 79/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7971 - accuracy:
0.2333
Epoch 80/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2453
Epoch 81/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7945 - accuracy:
0.2333
Epoch 82/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7986 - accuracy:
0.2319
Epoch 83/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7921 - accuracy:
0.2287
Epoch 84/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8006 - accuracy:
0.2342
Epoch 85/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7957 - accuracy:
0.2200
Epoch 86/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7984 - accuracy:
0.2421
Epoch 87/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 1.8026 - accuracy:
0.2329
Epoch 88/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7967 - accuracy:
0.2388
Epoch 89/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7990 - accuracy:
0.2407
Epoch 90/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7981 - accuracy:
0.2361
Epoch 91/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7935 - accuracy:
0.2384
Epoch 92/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7966 - accuracy:
0.2324
Epoch 93/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7900 - accuracy:
0.2402
Epoch 94/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7949 - accuracy:
0.2278
Epoch 95/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7937 - accuracy:
0.2490
Epoch 96/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7959 - accuracy:
0.2329
Epoch 97/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8005 - accuracy:
0.2232
Epoch 98/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7989 - accuracy:
0.2352
Epoch 99/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7999 - accuracy:
0.2402
Epoch 100/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7939 - accuracy:
0.2329
Epoch 101/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7965 - accuracy:
0.2269
Epoch 102/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2186
Epoch 103/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 1.7969 - accuracy:
0.2269
Epoch 104/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7962 - accuracy:
0.2241
Epoch 105/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7942 - accuracy:
0.2306
Epoch 106/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7964 - accuracy:
0.2296
Epoch 107/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7978 - accuracy:
0.2439
Epoch 108/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7941 - accuracy:
0.2333
Epoch 109/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7942 - accuracy:
0.2191
Epoch 110/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2287
Epoch 111/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7978 - accuracy:
0.2301
Epoch 112/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7983 - accuracy:
0.2227
Epoch 113/200
68/68 [==============================] - 0s 2ms/step - loss: 1.9245 - accuracy:
0.2421
Epoch 114/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7997 - accuracy:
0.2310
Epoch 115/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7935 - accuracy:
0.2375
Epoch 116/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7960 - accuracy:
0.2315
Epoch 117/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7986 - accuracy:
0.2375
Epoch 118/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7976 - accuracy:
0.2490
Epoch 119/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2384
Epoch 120/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7955 - accuracy:
0.2329
Epoch 121/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2310
Epoch 122/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7978 - accuracy:
0.2434
Epoch 123/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7994 - accuracy:
0.2273
Epoch 124/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7980 - accuracy:
0.2342
Epoch 125/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2379
Epoch 126/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7929 - accuracy:
0.2310
Epoch 127/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7956 - accuracy:
0.2416
Epoch 128/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7926 - accuracy:
0.2255
Epoch 129/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7943 - accuracy:
0.2356
Epoch 130/200
68/68 [==============================] - 0s 3ms/step - loss: 1.8003 - accuracy:
0.2214
Epoch 131/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7942 - accuracy:
0.2370
Epoch 132/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7950 - accuracy:
0.2306
Epoch 133/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8015 - accuracy:
0.2370
Epoch 134/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7947 - accuracy:
0.2232
Epoch 135/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 1.7941 - accuracy:
0.2347
Epoch 136/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7962 - accuracy:
0.2402
Epoch 137/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7960 - accuracy:
0.2310
Epoch 138/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2283
Epoch 139/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7923 - accuracy:
0.2531
Epoch 140/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7959 - accuracy:
0.2356
Epoch 141/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7960 - accuracy:
0.2283
Epoch 142/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7915 - accuracy:
0.2255
Epoch 143/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2296
Epoch 144/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7995 - accuracy:
0.2223
Epoch 145/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8010 - accuracy:
0.2269
Epoch 146/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7987 - accuracy:
0.2223
Epoch 147/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7933 - accuracy:
0.2237
Epoch 148/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7948 - accuracy:
0.2333
Epoch 149/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8011 - accuracy:
0.2352
Epoch 150/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7961 - accuracy:
0.2292
Epoch 151/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 1.7999 - accuracy:
0.2333
Epoch 152/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7977 - accuracy:
0.2329
Epoch 153/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7940 - accuracy:
0.2333
Epoch 154/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7906 - accuracy:
0.2411
Epoch 155/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7929 - accuracy:
0.2306
Epoch 156/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7948 - accuracy:
0.2375
Epoch 157/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7981 - accuracy:
0.2365
Epoch 158/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7997 - accuracy:
0.2306
Epoch 159/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7927 - accuracy:
0.2430
Epoch 160/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2246
Epoch 161/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7981 - accuracy:
0.2352
Epoch 162/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7929 - accuracy:
0.2439
Epoch 163/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7947 - accuracy:
0.2352
Epoch 164/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2411
Epoch 165/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7960 - accuracy:
0.2393
Epoch 166/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2485
Epoch 167/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 1.7949 - accuracy:
0.2398
Epoch 168/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7977 - accuracy:
0.2264
Epoch 169/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7971 - accuracy:
0.2333
Epoch 170/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7916 - accuracy:
0.2480
Epoch 171/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7939 - accuracy:
0.2319
Epoch 172/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7928 - accuracy:
0.2306
Epoch 173/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7998 - accuracy:
0.2338
Epoch 174/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7968 - accuracy:
0.2476
Epoch 175/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7939 - accuracy:
0.2310
Epoch 176/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7927 - accuracy:
0.2388
Epoch 177/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7999 - accuracy:
0.2223
Epoch 178/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7955 - accuracy:
0.2379
Epoch 179/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7966 - accuracy:
0.2296
Epoch 180/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7947 - accuracy:
0.2494
Epoch 181/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7976 - accuracy:
0.2319
Epoch 182/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7962 - accuracy:
0.2292
Epoch 183/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 1.7976 - accuracy:
0.2227
Epoch 184/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7918 - accuracy:
0.2370
Epoch 185/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7969 - accuracy:
0.2126
Epoch 186/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7966 - accuracy:
0.2338
Epoch 187/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7955 - accuracy:
0.2324
Epoch 188/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7931 - accuracy:
0.2444
Epoch 189/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7926 - accuracy:
0.2333
Epoch 190/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7962 - accuracy:
0.2407
Epoch 191/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2411
Epoch 192/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7961 - accuracy:
0.2333
Epoch 193/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7984 - accuracy:
0.2218
Epoch 194/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8064 - accuracy:
0.2347
Epoch 195/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7941 - accuracy:
0.2375
Epoch 196/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7942 - accuracy:
0.2379
Epoch 197/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7929 - accuracy:
0.2398
Epoch 198/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8004 - accuracy:
0.2310
Epoch 199/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2338
Epoch 200/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7964 - accuracy:
0.2342
17/17 [==============================] - 0s 2ms/step
Epoch 1/200
68/68 [==============================] - 1s 2ms/step - loss: 2.1492 - accuracy:
0.2559
Epoch 2/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8619 - accuracy:
0.2531
Epoch 3/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7966 - accuracy:
0.2306
Epoch 4/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2352
Epoch 5/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7915 - accuracy:
0.2370
Epoch 6/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7918 - accuracy:
0.2310
Epoch 7/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8054 - accuracy:
0.2260
Epoch 8/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7957 - accuracy:
0.2388
Epoch 9/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7968 - accuracy:
0.2356
Epoch 10/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7990 - accuracy:
0.2149
Epoch 11/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8062 - accuracy:
0.2232
Epoch 12/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7938 - accuracy:
0.2292
Epoch 13/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7972 - accuracy:
0.2232
Epoch 14/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7958 - accuracy:
0.2342
```

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Epoch 15/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7941 - accuracy:
0.2287
Epoch 16/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2434
Epoch 17/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7982 - accuracy:
0.2338
Epoch 18/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7939 - accuracy:
0.2375
Epoch 19/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2444
Epoch 20/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7968 - accuracy:
0.2333
Epoch 21/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7939 - accuracy:
0.2402
Epoch 22/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7956 - accuracy:
0.2388
Epoch 23/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7935 - accuracy:
0.2283
Epoch 24/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7984 - accuracy:
0.2315
Epoch 25/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7937 - accuracy:
0.2292
Epoch 26/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7979 - accuracy:
0.2301
Epoch 27/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7961 - accuracy:
0.2223
Epoch 28/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7913 - accuracy:
0.2480
Epoch 29/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7941 - accuracy:
0.2260
Epoch 30/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7950 - accuracy:
0.2365
```

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Epoch 31/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2191
Epoch 32/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7941 - accuracy:
0.2246
Epoch 33/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2283
Epoch 34/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7977 - accuracy:
0.2310
Epoch 35/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7941 - accuracy:
0.2425
Epoch 36/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7927 - accuracy:
0.2246
Epoch 37/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7943 - accuracy:
0.2365
Epoch 38/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7937 - accuracy:
0.2375
Epoch 39/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7940 - accuracy:
0.2365
Epoch 40/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7958 - accuracy:
0.2264
Epoch 41/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8003 - accuracy:
0.2306
Epoch 42/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2310
Epoch 43/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7936 - accuracy:
0.2333
Epoch 44/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2375
Epoch 45/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7991 - accuracy:
0.2145
Epoch 46/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2338
```

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Epoch 47/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7959 - accuracy:
0.2416
Epoch 48/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7939 - accuracy:
0.2227
Epoch 49/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2356
Epoch 50/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2319
Epoch 51/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2296
Epoch 52/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2356
Epoch 53/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7981 - accuracy:
0.2324
Epoch 54/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7959 - accuracy:
0.2365
Epoch 55/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7937 - accuracy:
0.2411
Epoch 56/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7933 - accuracy:
0.2379
Epoch 57/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7981 - accuracy:
0.2296
Epoch 58/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2384
Epoch 59/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7953 - accuracy:
0.2306
Epoch 60/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7986 - accuracy:
0.2131
Epoch 61/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7965 - accuracy:
0.2260
Epoch 62/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7935 - accuracy:
0.2453
```

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Epoch 63/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7995 - accuracy:
0.2306
Epoch 64/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7995 - accuracy:
0.2237
Epoch 65/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7903 - accuracy:
0.2306
Epoch 66/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7998 - accuracy:
0.2310
Epoch 67/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7971 - accuracy:
0.2356
Epoch 68/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7940 - accuracy:
0.2319
Epoch 69/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7933 - accuracy:
0.2324
Epoch 70/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2315
Epoch 71/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7988 - accuracy:
0.2287
Epoch 72/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2457
Epoch 73/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2384
Epoch 74/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7950 - accuracy:
0.2430
Epoch 75/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7935 - accuracy:
0.2342
Epoch 76/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7947 - accuracy:
0.2356
Epoch 77/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7914 - accuracy:
0.2310
Epoch 78/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2434
```

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Epoch 79/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7961 - accuracy:
0.2283
Epoch 80/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7964 - accuracy:
0.2434
Epoch 81/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7946 - accuracy:
0.2370
Epoch 82/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7929 - accuracy:
0.2411
Epoch 83/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2480
Epoch 84/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7936 - accuracy:
0.2315
Epoch 85/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7944 - accuracy:
0.2430
Epoch 86/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7956 - accuracy:
0.2168
Epoch 87/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7982 - accuracy:
0.2273
Epoch 88/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7964 - accuracy:
0.2416
Epoch 89/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7950 - accuracy:
0.2342
Epoch 90/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7940 - accuracy:
0.2255
Epoch 91/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2218
Epoch 92/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7897 - accuracy:
0.2384
Epoch 93/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2338
Epoch 94/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7979 - accuracy:
0.2315
```

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Epoch 95/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7989 - accuracy:
0.2333
Epoch 96/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7889 - accuracy:
0.2402
Epoch 97/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7990 - accuracy:
0.2168
Epoch 98/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7979 - accuracy:
0.2448
Epoch 99/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7952 - accuracy:
0.2283
Epoch 100/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7917 - accuracy:
0.2388
Epoch 101/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7965 - accuracy:
0.2540
Epoch 102/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8021 - accuracy:
0.2310
Epoch 103/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7942 - accuracy:
0.2342
Epoch 104/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7948 - accuracy:
0.2204
Epoch 105/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7955 - accuracy:
0.2342
Epoch 106/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2269
Epoch 107/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7960 - accuracy:
0.2342
Epoch 108/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7949 - accuracy:
0.2301
Epoch 109/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7955 - accuracy:
0.2342
Epoch 110/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7980 - accuracy:
0.2352
```

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Epoch 111/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7985 - accuracy:
0.2333
Epoch 112/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7972 - accuracy:
0.2333
Epoch 113/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7960 - accuracy:
0.2338
Epoch 114/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2379
Epoch 115/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7908 - accuracy:
0.2490
Epoch 116/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7944 - accuracy:
0.2411
Epoch 117/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7953 - accuracy:
0.2186
Epoch 118/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7946 - accuracy:
0.2329
Epoch 119/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7964 - accuracy:
0.2273
Epoch 120/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7929 - accuracy:
0.2375
Epoch 121/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7953 - accuracy:
0.2375
Epoch 122/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7909 - accuracy:
0.2416
Epoch 123/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8002 - accuracy:
0.2421
Epoch 124/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7969 - accuracy:
0.2324
Epoch 125/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7925 - accuracy:
0.2237
Epoch 126/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7926 - accuracy:
0.2352
```

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Epoch 127/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7979 - accuracy:
0.2361
Epoch 128/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7957 - accuracy:
0.2269
Epoch 129/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2393
Epoch 130/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7953 - accuracy:
0.2186
Epoch 131/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7920 - accuracy:
0.2375
Epoch 132/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7986 - accuracy:
0.2246
Epoch 133/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8022 - accuracy:
0.2315
Epoch 134/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7990 - accuracy:
0.2356
Epoch 135/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7968 - accuracy:
0.2273
Epoch 136/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7942 - accuracy:
0.2375
Epoch 137/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7961 - accuracy:
0.2296
Epoch 138/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7937 - accuracy:
0.2398
Epoch 139/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7939 - accuracy:
0.2407
Epoch 140/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7958 - accuracy:
0.2292
Epoch 141/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7983 - accuracy:
0.2361
Epoch 142/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8033 - accuracy:
0.2324
```

```
Epoch 143/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2444
Epoch 144/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7932 - accuracy:
0.2402
Epoch 145/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7950 - accuracy:
0.2283
Epoch 146/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8010 - accuracy:
0.2296
Epoch 147/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8015 - accuracy:
0.2379
Epoch 148/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7971 - accuracy:
0.2434
Epoch 149/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8855 - accuracy:
0.2375
Epoch 150/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8095 - accuracy:
0.2526
Epoch 151/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7953 - accuracy:
0.2324
Epoch 152/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7920 - accuracy:
0.2269
Epoch 153/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7918 - accuracy:
0.2342
Epoch 154/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7975 - accuracy:
0.2287
Epoch 155/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7920 - accuracy:
0.2149
Epoch 156/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2315
Epoch 157/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7937 - accuracy:
0.2494
Epoch 158/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7934 - accuracy:
0.2379
```

```
Epoch 159/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7971 - accuracy:
0.2209
Epoch 160/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7956 - accuracy:
0.2324
Epoch 161/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7957 - accuracy:
0.2434
Epoch 162/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7944 - accuracy:
0.2365
Epoch 163/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2278
Epoch 164/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2384
Epoch 165/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7956 - accuracy:
0.2356
Epoch 166/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7915 - accuracy:
0.2370
Epoch 167/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7920 - accuracy:
0.2361
Epoch 168/200
68/68 [==============================] - 0s 2ms/step - loss: 1.8018 - accuracy:
0.2398
Epoch 169/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7957 - accuracy:
0.2273
Epoch 170/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7955 - accuracy:
0.2384
Epoch 171/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7964 - accuracy:
0.2329
Epoch 172/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7934 - accuracy:
0.2319
Epoch 173/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7944 - accuracy:
0.2379
Epoch 174/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7937 - accuracy:
0.2177
```

```
Epoch 175/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7951 - accuracy:
0.2287
Epoch 176/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7956 - accuracy:
0.2425
Epoch 177/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7943 - accuracy:
0.2375
Epoch 178/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7948 - accuracy:
0.2283
Epoch 179/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7996 - accuracy:
0.2195
Epoch 180/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7954 - accuracy:
0.2273
Epoch 181/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7948 - accuracy:
0.2462
Epoch 182/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7956 - accuracy:
0.2278
Epoch 183/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7937 - accuracy:
0.2356
Epoch 184/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7936 - accuracy:
0.2416
Epoch 185/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7926 - accuracy:
0.2255
Epoch 186/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7929 - accuracy:
0.2352
Epoch 187/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7950 - accuracy:
0.2444
Epoch 188/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7949 - accuracy:
0.2365
Epoch 189/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7945 - accuracy:
0.2283
Epoch 190/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2444
```

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Epoch 191/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7976 - accuracy:
0.2255
Epoch 192/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2388
Epoch 193/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7948 - accuracy:
0.2375
Epoch 194/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7934 - accuracy:
0.2246
Epoch 195/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7963 - accuracy:
0.2365
Epoch 196/200
68/68 [==============================] - 0s 3ms/step - loss: 1.7947 - accuracy:
0.2273
Epoch 197/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7961 - accuracy:
0.2241
Epoch 198/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7938 - accuracy:
0.2218
Epoch 199/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7949 - accuracy:
0.2306
Epoch 200/200
68/68 [==============================] - 0s 2ms/step - loss: 1.7995 - accuracy:
0.2209
17/17 [==============================] - 0s 1ms/step
Epoch 1/200
85/85 [==============================] - 1s 2ms/step - loss: 1.6805 - accuracy:
0.3225
Epoch 2/200
85/85 [==============================] - 0s 2ms/step - loss: 1.4563 - accuracy:
0.3785
Epoch 3/200
85/85 [==============================] - 0s 2ms/step - loss: 1.4135 - accuracy:
0.3844
Epoch 4/200
85/85 [==============================] - 0s 2ms/step - loss: 1.3825 - accuracy:
0.4043
Epoch 5/200
85/85 [==============================] - 0s 2ms/step - loss: 1.3544 - accuracy:
0.4061
Epoch 6/200
85/85 [==============================] - 0s 2ms/step - loss: 1.3391 - accuracy:
```

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0.4138
Epoch 7/200
85/85 [==============================] - 0s 2ms/step - loss: 1.3271 - accuracy:
0.4190
Epoch 8/200
85/85 [==============================] - 0s 2ms/step - loss: 1.2984 - accuracy:
0.4473
Epoch 9/200
85/85 [==============================] - 0s 2ms/step - loss: 1.3000 - accuracy:
0.4359
Epoch 10/200
85/85 [==============================] - 0s 2ms/step - loss: 1.3005 - accuracy:
0.4260
Epoch 11/200
85/85 [==============================] - 0s 2ms/step - loss: 1.2895 - accuracy:
0.4595
Epoch 12/200
85/85 [==============================] - 0s 2ms/step - loss: 1.2826 - accuracy:
0.4514
Epoch 13/200
85/85 [==============================] - 0s 2ms/step - loss: 1.2709 - accuracy:
0.4415
Epoch 14/200
85/85 [==============================] - 0s 2ms/step - loss: 1.2726 - accuracy:
0.4348
Epoch 15/200
85/85 [==============================] - 0s 2ms/step - loss: 1.2562 - accuracy:
0.4543
Epoch 16/200
85/85 [==============================] - 0s 2ms/step - loss: 1.2468 - accuracy:
0.4580
Epoch 17/200
85/85 [==============================] - 0s 3ms/step - loss: 1.2464 - accuracy:
0.4558
Epoch 18/200
85/85 [==============================] - 0s 2ms/step - loss: 1.2475 - accuracy:
0.4584
Epoch 19/200
85/85 [==============================] - 0s 2ms/step - loss: 1.2372 - accuracy:
0.4628
Epoch 20/200
85/85 [==============================] - 0s 2ms/step - loss: 1.2211 - accuracy:
0.4705
Epoch 21/200
85/85 [==============================] - 0s 2ms/step - loss: 1.2239 - accuracy:
0.4705
Epoch 22/200
85/85 [==============================] - 0s 2ms/step - loss: 1.2130 - accuracy:
```

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0.4797
Epoch 23/200
85/85 [==============================] - 0s 2ms/step - loss: 1.2161 - accuracy:
0.4658
Epoch 24/200
85/85 [==============================] - 0s 2ms/step - loss: 1.2004 - accuracy:
0.4853
Epoch 25/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1989 - accuracy:
0.4753
Epoch 26/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1750 - accuracy:
0.5059
Epoch 27/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1835 - accuracy:
0.4845
Epoch 28/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1759 - accuracy:
0.4901
Epoch 29/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1629 - accuracy:
0.4982
Epoch 30/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1738 - accuracy:
0.4901
Epoch 31/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1710 - accuracy:
0.4974
Epoch 32/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1706 - accuracy:
0.4941
Epoch 33/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1590 - accuracy:
0.5052
Epoch 34/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1454 - accuracy:
0.5217
Epoch 35/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1527 - accuracy:
0.5048
Epoch 36/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1580 - accuracy:
0.5088
Epoch 37/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1431 - accuracy:
0.5092
Epoch 38/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1342 - accuracy:
```

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0.5169
Epoch 39/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1290 - accuracy:
0.5140
Epoch 40/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1204 - accuracy:
0.5291
Epoch 41/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1146 - accuracy:
0.5147
Epoch 42/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1177 - accuracy:
0.5122
Epoch 43/200
85/85 [==============================] - 0s 2ms/step - loss: 1.1082 - accuracy:
0.5195
Epoch 44/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0994 - accuracy:
0.5361
Epoch 45/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0988 - accuracy:
0.5225
Epoch 46/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0861 - accuracy:
0.5416
Epoch 47/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0953 - accuracy:
0.5346
Epoch 48/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0850 - accuracy:
0.5365
Epoch 49/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0668 - accuracy:
0.5409
Epoch 50/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0696 - accuracy:
0.5423
Epoch 51/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0715 - accuracy:
0.5493
Epoch 52/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0673 - accuracy:
0.5519
Epoch 53/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0633 - accuracy:
0.5475
Epoch 54/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0547 - accuracy:
```

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0.5567
Epoch 55/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0559 - accuracy:
0.5482
Epoch 56/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0392 - accuracy:
0.5666
Epoch 57/200
85/85 [==============================] - 0s 3ms/step - loss: 1.0580 - accuracy:
0.5567
Epoch 58/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0370 - accuracy:
0.5659
Epoch 59/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0210 - accuracy:
0.5770
Epoch 60/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0216 - accuracy:
0.5637
Epoch 61/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0363 - accuracy:
0.5633
Epoch 62/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0067 - accuracy:
0.5740
Epoch 63/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0213 - accuracy:
0.5644
Epoch 64/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0127 - accuracy:
0.5692
Epoch 65/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0004 - accuracy:
0.5884
Epoch 66/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0122 - accuracy:
0.5784
Epoch 67/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0018 - accuracy:
0.5810
Epoch 68/200
85/85 [==============================] - 0s 2ms/step - loss: 1.0007 - accuracy:
0.5762
Epoch 69/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9832 - accuracy:
0.5928
Epoch 70/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9912 - accuracy:
```

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0.5784
Epoch 71/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9766 - accuracy:
0.5990
Epoch 72/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9978 - accuracy:
0.5884
Epoch 73/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9676 - accuracy:
0.5968
Epoch 74/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9791 - accuracy:
0.5891
Epoch 75/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9788 - accuracy:
0.5924
Epoch 76/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9585 - accuracy:
0.5902
Epoch 77/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9844 - accuracy:
0.5906
Epoch 78/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9681 - accuracy:
0.6038
Epoch 79/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9437 - accuracy:
0.5983
Epoch 80/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9472 - accuracy:
0.6001
Epoch 81/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9519 - accuracy:
0.6094
Epoch 82/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9495 - accuracy:
0.5943
Epoch 83/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9494 - accuracy:
0.6090
Epoch 84/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9443 - accuracy:
0.6178
Epoch 85/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9297 - accuracy:
0.6123
Epoch 86/200
85/85 [==============================] - 0s 3ms/step - loss: 0.9396 - accuracy:
```

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0.6031
Epoch 87/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9290 - accuracy:
0.6116
Epoch 88/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9243 - accuracy:
0.6160
Epoch 89/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9012 - accuracy:
0.6337
Epoch 90/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9159 - accuracy:
0.6233
Epoch 91/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9231 - accuracy:
0.6233
Epoch 92/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9166 - accuracy:
0.6226
Epoch 93/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9147 - accuracy:
0.6226
Epoch 94/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9140 - accuracy:
0.6160
Epoch 95/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9063 - accuracy:
0.6226
Epoch 96/200
85/85 [==============================] - 0s 2ms/step - loss: 0.9022 - accuracy:
0.6182
Epoch 97/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8908 - accuracy:
0.6204
Epoch 98/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8954 - accuracy:
0.6333
Epoch 99/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8956 - accuracy:
0.6381
Epoch 100/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8910 - accuracy:
0.6436
Epoch 101/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8895 - accuracy:
0.6270
Epoch 102/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8775 - accuracy:
```

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0.6366
Epoch 103/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8712 - accuracy:
0.6469
Epoch 104/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8724 - accuracy:
0.6414
Epoch 105/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8516 - accuracy:
0.6502
Epoch 106/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8638 - accuracy:
0.6381
Epoch 107/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8666 - accuracy:
0.6432
Epoch 108/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8563 - accuracy:
0.6443
Epoch 109/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8546 - accuracy:
0.6557
Epoch 110/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8570 - accuracy:
0.6484
Epoch 111/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8555 - accuracy:
0.6366
Epoch 112/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8527 - accuracy:
0.6521
Epoch 113/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8450 - accuracy:
0.6576
Epoch 114/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8457 - accuracy:
0.6546
Epoch 115/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8436 - accuracy:
0.6506
Epoch 116/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8460 - accuracy:
0.6502
Epoch 117/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8206 - accuracy:
0.6539
Epoch 118/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8538 - accuracy:
```

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0.6532
Epoch 119/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8359 - accuracy:
0.6554
Epoch 120/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8322 - accuracy:
0.6642
Epoch 121/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8250 - accuracy:
0.6550
Epoch 122/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8269 - accuracy:
0.6602
Epoch 123/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8027 - accuracy:
0.6657
Epoch 124/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8173 - accuracy:
0.6598
Epoch 125/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8294 - accuracy:
0.6642
Epoch 126/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8274 - accuracy:
0.6635
Epoch 127/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8111 - accuracy:
0.6730
Epoch 128/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8173 - accuracy:
0.6638
Epoch 129/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8240 - accuracy:
0.6605
Epoch 130/200
85/85 [==============================] - 0s 2ms/step - loss: 0.8052 - accuracy:
0.6719
Epoch 131/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7868 - accuracy:
0.6848
Epoch 132/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7941 - accuracy:
0.6841
Epoch 133/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7827 - accuracy:
0.6848
Epoch 134/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7961 - accuracy:
```

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0.6823
Epoch 135/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7861 - accuracy:
0.6808
Epoch 136/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7919 - accuracy:
0.6738
Epoch 137/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7962 - accuracy:
0.6708
Epoch 138/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7932 - accuracy:
0.6848
Epoch 139/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7778 - accuracy:
0.6870
Epoch 140/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7860 - accuracy:
0.6753
Epoch 141/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7850 - accuracy:
0.6870
Epoch 142/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7891 - accuracy:
0.6734
Epoch 143/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7645 - accuracy:
0.6881
Epoch 144/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7757 - accuracy:
0.6745
Epoch 145/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7644 - accuracy:
0.6863
Epoch 146/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7542 - accuracy:
0.6951
Epoch 147/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7691 - accuracy:
0.6918
Epoch 148/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7758 - accuracy:
0.6922
Epoch 149/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7750 - accuracy:
0.6944
Epoch 150/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7701 - accuracy:
```

```
0.6815
Epoch 151/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7473 - accuracy:
0.6915
Epoch 152/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7566 - accuracy:
0.6900
Epoch 153/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7499 - accuracy:
0.6944
Epoch 154/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7432 - accuracy:
0.7062
Epoch 155/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7610 - accuracy:
0.6922
Epoch 156/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7470 - accuracy:
0.6955
Epoch 157/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7283 - accuracy:
0.7099
Epoch 158/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7424 - accuracy:
0.6981
Epoch 159/200
85/85 [==============================] - 0s 3ms/step - loss: 0.7226 - accuracy:
0.7047
Epoch 160/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7347 - accuracy:
0.7132
Epoch 161/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7331 - accuracy:
0.7095
Epoch 162/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7302 - accuracy:
0.7088
Epoch 163/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7393 - accuracy:
0.6966
Epoch 164/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7257 - accuracy:
0.7058
Epoch 165/200
85/85 [==============================] - 0s 3ms/step - loss: 0.7184 - accuracy:
0.7054
Epoch 166/200
85/85 [==============================] - 0s 3ms/step - loss: 0.7115 - accuracy:
```

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0.7088
Epoch 167/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7313 - accuracy:
0.7043
Epoch 168/200
85/85 [==============================] - 0s 3ms/step - loss: 0.7349 - accuracy:
0.7021
Epoch 169/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7254 - accuracy:
0.7032
Epoch 170/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7120 - accuracy:
0.7172
Epoch 171/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7415 - accuracy:
0.7003
Epoch 172/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7370 - accuracy:
0.7021
Epoch 173/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7181 - accuracy:
0.7102
Epoch 174/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7006 - accuracy:
0.7117
Epoch 175/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7271 - accuracy:
0.6999
Epoch 176/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7291 - accuracy:
0.7069
Epoch 177/200
85/85 [==============================] - 0s 2ms/step - loss: 0.6890 - accuracy:
0.7316
Epoch 178/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7212 - accuracy:
0.7102
Epoch 179/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7105 - accuracy:
0.7172
Epoch 180/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7187 - accuracy:
0.7117
Epoch 181/200
85/85 [==============================] - 0s 2ms/step - loss: 0.6872 - accuracy:
0.7250
Epoch 182/200
85/85 [==============================] - 0s 2ms/step - loss: 0.6916 - accuracy:
```

```
0.7202
Epoch 183/200
85/85 [==============================] - 0s 2ms/step - loss: 0.6803 - accuracy:
0.7250
Epoch 184/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7139 - accuracy:
0.7128
Epoch 185/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7017 - accuracy:
0.7135
Epoch 186/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7069 - accuracy:
0.7228
Epoch 187/200
85/85 [==============================] - 0s 2ms/step - loss: 0.7012 - accuracy:
0.7176
Epoch 188/200
85/85 [==============================] - 0s 2ms/step - loss: 0.6905 - accuracy:
0.7158
Epoch 189/200
85/85 [==============================] - 0s 2ms/step - loss: 0.6916 - accuracy:
0.7187
Epoch 190/200
85/85 [==============================] - 0s 2ms/step - loss: 0.6957 - accuracy:
0.7250
Epoch 191/200
85/85 [==============================] - 0s 2ms/step - loss: 0.6832 - accuracy:
0.7309
Epoch 192/200
85/85 [==============================] - 0s 2ms/step - loss: 0.6937 - accuracy:
0.7169
Epoch 193/200
85/85 [==============================] - 0s 2ms/step - loss: 0.6814 - accuracy:
0.7246
Epoch 194/200
85/85 [==============================] - 0s 2ms/step - loss: 0.6776 - accuracy:
0.7371
Epoch 195/200
85/85 [==============================] - 0s 2ms/step - loss: 0.6645 - accuracy:
0.7353
Epoch 196/200
85/85 [==============================] - 0s 2ms/step - loss: 0.6848 - accuracy:
0.7242
Epoch 197/200
85/85 [==============================] - 0s 2ms/step - loss: 0.6790 - accuracy:
0.7338
Epoch 198/200
85/85 [==============================] - 0s 2ms/step - loss: 0.6804 - accuracy:
```

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0.7246
Epoch 199/200
85/85 [==============================] - 0s 2ms/step - loss: 0.6820 - accuracy:
0.7191
Epoch 200/200
85/85 [==============================] - 0s 2ms/step - loss: 0.6671 - accuracy:
0.7334
85/85 [==============================] - 0s 1ms/step
Epoch 1/200
68/68 [==============================] - 1s 2ms/step - loss: 1.7171 - accuracy:
0.3052
Epoch 2/200
68/68 [==============================] - 0s 2ms/step - loss: 1.4887 - accuracy:
0.3550
Epoch 3/200
68/68 [==============================] - 0s 2ms/step - loss: 1.4207 - accuracy:
0.3932
Epoch 4/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3752 - accuracy:
0.4139
Epoch 5/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3740 - accuracy:
0.4190
Epoch 6/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3521 - accuracy:
0.4309
Epoch 7/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3307 - accuracy:
0.4222
Epoch 8/200
68/68 [==============================] - 0s 3ms/step - loss: 1.3248 - accuracy:
0.4346
Epoch 9/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3242 - accuracy:
0.4208
Epoch 10/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3068 - accuracy:
0.4471
Epoch 11/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2941 - accuracy:
0.4420
Epoch 12/200
68/68 [==============================] - 0s 3ms/step - loss: 1.2911 - accuracy:
0.4268
Epoch 13/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2663 - accuracy:
0.4576
Epoch 14/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 1.2724 - accuracy:
0.4540
Epoch 15/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2585 - accuracy:
0.4645
Epoch 16/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2375 - accuracy:
0.4793
Epoch 17/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2408 - accuracy:
0.4586
Epoch 18/200
68/68 [==============================] - 0s 3ms/step - loss: 1.2371 - accuracy:
0.4765
Epoch 19/200
68/68 [==============================] - 0s 3ms/step - loss: 1.2317 - accuracy:
0.4816
Epoch 20/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2235 - accuracy:
0.4728
Epoch 21/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2072 - accuracy:
0.4954
Epoch 22/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2162 - accuracy:
0.4949
Epoch 23/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1992 - accuracy:
0.4945
Epoch 24/200
68/68 [==============================] - 0s 3ms/step - loss: 1.1950 - accuracy:
0.4936
Epoch 25/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2077 - accuracy:
0.4982
Epoch 26/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1808 - accuracy:
0.4995
Epoch 27/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1778 - accuracy:
0.5041
Epoch 28/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1750 - accuracy:
0.5000
Epoch 29/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1659 - accuracy:
0.5060
Epoch 30/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 1.1576 - accuracy:
0.5074
Epoch 31/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1490 - accuracy:
0.5110
Epoch 32/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1481 - accuracy:
0.5134
Epoch 33/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1383 - accuracy:
0.5345
Epoch 34/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1425 - accuracy:
0.5313
Epoch 35/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1353 - accuracy:
0.5308
Epoch 36/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1243 - accuracy:
0.5318
Epoch 37/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1226 - accuracy:
0.5267
Epoch 38/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1212 - accuracy:
0.5212
Epoch 39/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1014 - accuracy:
0.5442
Epoch 40/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1115 - accuracy:
0.5327
Epoch 41/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0967 - accuracy:
0.5534
Epoch 42/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1023 - accuracy:
0.5387
Epoch 43/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0991 - accuracy:
0.5599
Epoch 44/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0813 - accuracy:
0.5493
Epoch 45/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0825 - accuracy:
0.5520
Epoch 46/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 1.0916 - accuracy:
0.5497
Epoch 47/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0620 - accuracy:
0.5668
Epoch 48/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0529 - accuracy:
0.5640
Epoch 49/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0526 - accuracy:
0.5506
Epoch 50/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0603 - accuracy:
0.5488
Epoch 51/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0537 - accuracy:
0.5709
Epoch 52/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0377 - accuracy:
0.5806
Epoch 53/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0329 - accuracy:
0.5755
Epoch 54/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0412 - accuracy:
0.5737
Epoch 55/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0464 - accuracy:
0.5594
Epoch 56/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0291 - accuracy:
0.5912
Epoch 57/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0322 - accuracy:
0.5727
Epoch 58/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0215 - accuracy:
0.5824
Epoch 59/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0070 - accuracy:
0.5902
Epoch 60/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0171 - accuracy:
0.5686
Epoch 61/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0000 - accuracy:
0.5852
Epoch 62/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 1.0026 - accuracy:
0.5778
Epoch 63/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9992 - accuracy:
0.5760
Epoch 64/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9972 - accuracy:
0.5852
Epoch 65/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9910 - accuracy:
0.5948
Epoch 66/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9761 - accuracy:
0.6064
Epoch 67/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9593 - accuracy:
0.6054
Epoch 68/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9785 - accuracy:
0.5985
Epoch 69/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9672 - accuracy:
0.5994
Epoch 70/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9684 - accuracy:
0.6119
Epoch 71/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9675 - accuracy:
0.6013
Epoch 72/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9590 - accuracy:
0.5962
Epoch 73/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9498 - accuracy:
0.6096
Epoch 74/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9377 - accuracy:
0.6197
Epoch 75/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9338 - accuracy:
0.6156
Epoch 76/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9300 - accuracy:
0.6123
Epoch 77/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9455 - accuracy:
0.6160
Epoch 78/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 0.9190 - accuracy:
0.6123
Epoch 79/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9168 - accuracy:
0.6257
Epoch 80/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9150 - accuracy:
0.6225
Epoch 81/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9088 - accuracy:
0.6225
Epoch 82/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9086 - accuracy:
0.6248
Epoch 83/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9357 - accuracy:
0.6146
Epoch 84/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9200 - accuracy:
0.6312
Epoch 85/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8933 - accuracy:
0.6363
Epoch 86/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9031 - accuracy:
0.6354
Epoch 87/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8869 - accuracy:
0.6436
Epoch 88/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8874 - accuracy:
0.6390
Epoch 89/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8982 - accuracy:
0.6404
Epoch 90/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8787 - accuracy:
0.6317
Epoch 91/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8984 - accuracy:
0.6238
Epoch 92/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8903 - accuracy:
0.6266
Epoch 93/200
68/68 [==============================] - 0s 3ms/step - loss: 0.8686 - accuracy:
0.6547
Epoch 94/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 0.8905 - accuracy:
0.6363
Epoch 95/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8670 - accuracy:
0.6395
Epoch 96/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8560 - accuracy:
0.6363
Epoch 97/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8638 - accuracy:
0.6510
Epoch 98/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8795 - accuracy:
0.6404
Epoch 99/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8577 - accuracy:
0.6496
Epoch 100/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8579 - accuracy:
0.6593
Epoch 101/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8451 - accuracy:
0.6492
Epoch 102/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8329 - accuracy:
0.6653
Epoch 103/200
68/68 [==============================] - 0s 3ms/step - loss: 0.8641 - accuracy:
0.6450
Epoch 104/200
68/68 [==============================] - 0s 3ms/step - loss: 0.8418 - accuracy:
0.6625
Epoch 105/200
68/68 [==============================] - 0s 3ms/step - loss: 0.8323 - accuracy:
0.6561
Epoch 106/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8292 - accuracy:
0.6616
Epoch 107/200
68/68 [==============================] - 0s 3ms/step - loss: 0.8421 - accuracy:
0.6496
Epoch 108/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8254 - accuracy:
0.6745
Epoch 109/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8100 - accuracy:
0.6869
Epoch 110/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 0.8269 - accuracy:
0.6644
Epoch 111/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8190 - accuracy:
0.6685
Epoch 112/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8225 - accuracy:
0.6773
Epoch 113/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8078 - accuracy:
0.6763
Epoch 114/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8144 - accuracy:
0.6782
Epoch 115/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7858 - accuracy:
0.6823
Epoch 116/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8166 - accuracy:
0.6736
Epoch 117/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7691 - accuracy:
0.6851
Epoch 118/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7777 - accuracy:
0.6846
Epoch 119/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7778 - accuracy:
0.6901
Epoch 120/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8041 - accuracy:
0.6800
Epoch 121/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7800 - accuracy:
0.6915
Epoch 122/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7981 - accuracy:
0.6699
Epoch 123/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7615 - accuracy:
0.6966
Epoch 124/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7785 - accuracy:
0.6892
Epoch 125/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7729 - accuracy:
0.6828
Epoch 126/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 0.7696 - accuracy:
0.6888
Epoch 127/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7695 - accuracy:
0.6998
Epoch 128/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7569 - accuracy:
0.7003
Epoch 129/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7770 - accuracy:
0.6842
Epoch 130/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7622 - accuracy:
0.7030
Epoch 131/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7573 - accuracy:
0.6961
Epoch 132/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7715 - accuracy:
0.6911
Epoch 133/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7439 - accuracy:
0.7090
Epoch 134/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7616 - accuracy:
0.6943
Epoch 135/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7534 - accuracy:
0.7012
Epoch 136/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7429 - accuracy:
0.6948
Epoch 137/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7629 - accuracy:
0.6800
Epoch 138/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7607 - accuracy:
0.6971
Epoch 139/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7342 - accuracy:
0.7095
Epoch 140/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7487 - accuracy:
0.6874
Epoch 141/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7306 - accuracy:
0.7238
Epoch 142/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 0.7218 - accuracy:
0.7173
Epoch 143/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7108 - accuracy:
0.7155
Epoch 144/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7381 - accuracy:
0.7113
Epoch 145/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7496 - accuracy:
0.7081
Epoch 146/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7058 - accuracy:
0.7150
Epoch 147/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7330 - accuracy:
0.7058
Epoch 148/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7204 - accuracy:
0.7150
Epoch 149/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7263 - accuracy:
0.7063
Epoch 150/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7200 - accuracy:
0.7053
Epoch 151/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7117 - accuracy:
0.7224
Epoch 152/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7090 - accuracy:
0.7210
Epoch 153/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6938 - accuracy:
0.7302
Epoch 154/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6851 - accuracy:
0.7274
Epoch 155/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7040 - accuracy:
0.7215
Epoch 156/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7239 - accuracy:
0.7067
Epoch 157/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7074 - accuracy:
0.7044
Epoch 158/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 0.7039 - accuracy:
0.7233
Epoch 159/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6998 - accuracy:
0.7196
Epoch 160/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6818 - accuracy:
0.7334
Epoch 161/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7084 - accuracy:
0.7205
Epoch 162/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6942 - accuracy:
0.7201
Epoch 163/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6959 - accuracy:
0.7150
Epoch 164/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6846 - accuracy:
0.7293
Epoch 165/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7009 - accuracy:
0.7224
Epoch 166/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6766 - accuracy:
0.7325
Epoch 167/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6696 - accuracy:
0.7353
Epoch 168/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6710 - accuracy:
0.7353
Epoch 169/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6470 - accuracy:
0.7509
Epoch 170/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6806 - accuracy:
0.7293
Epoch 171/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6762 - accuracy:
0.7380
Epoch 172/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6623 - accuracy:
0.7385
Epoch 173/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6600 - accuracy:
0.7343
Epoch 174/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 0.6485 - accuracy:
0.7537
Epoch 175/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6565 - accuracy:
0.7468
Epoch 176/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6555 - accuracy:
0.7399
Epoch 177/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6470 - accuracy:
0.7413
Epoch 178/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6640 - accuracy:
0.7413
Epoch 179/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6472 - accuracy:
0.7551
Epoch 180/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6379 - accuracy:
0.7440
Epoch 181/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6559 - accuracy:
0.7445
Epoch 182/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6505 - accuracy:
0.7463
Epoch 183/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6415 - accuracy:
0.7380
Epoch 184/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6421 - accuracy:
0.7436
Epoch 185/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6494 - accuracy:
0.7353
Epoch 186/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6706 - accuracy:
0.7339
Epoch 187/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6400 - accuracy:
0.7546
Epoch 188/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6596 - accuracy:
0.7380
Epoch 189/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6292 - accuracy:
0.7624
Epoch 190/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 0.6183 - accuracy:
0.7606
Epoch 191/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6379 - accuracy:
0.7463
Epoch 192/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6248 - accuracy:
0.7514
Epoch 193/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6221 - accuracy:
0.7541
Epoch 194/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6359 - accuracy:
0.7454
Epoch 195/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6465 - accuracy:
0.7449
Epoch 196/200
68/68 [==============================] - 0s 3ms/step - loss: 0.5997 - accuracy:
0.7799
Epoch 197/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6413 - accuracy:
0.7468
Epoch 198/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6076 - accuracy:
0.7730
Epoch 199/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6369 - accuracy:
0.7463
Epoch 200/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6042 - accuracy:
0.7629
17/17 [==============================] - 0s 2ms/step
Epoch 1/200
68/68 [==============================] - 1s 2ms/step - loss: 1.7148 - accuracy:
0.3116
Epoch 2/200
68/68 [==============================] - 0s 3ms/step - loss: 1.4775 - accuracy:
0.3728
Epoch 3/200
68/68 [==============================] - 0s 2ms/step - loss: 1.4318 - accuracy:
0.3691
Epoch 4/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3953 - accuracy:
0.3884
Epoch 5/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3647 - accuracy:
0.4059
```

```
Epoch 6/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3441 - accuracy:
0.4040
Epoch 7/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3331 - accuracy:
0.4156
Epoch 8/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3106 - accuracy:
0.4192
Epoch 9/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3035 - accuracy:
0.4261
Epoch 10/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2923 - accuracy:
0.4284
Epoch 11/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3004 - accuracy:
0.4294
Epoch 12/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2764 - accuracy:
0.4367
Epoch 13/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2569 - accuracy:
0.4450
Epoch 14/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2526 - accuracy:
0.4464
Epoch 15/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2530 - accuracy:
0.4556
Epoch 16/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2502 - accuracy:
0.4648
Epoch 17/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2434 - accuracy:
0.4671
Epoch 18/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2377 - accuracy:
0.4699
Epoch 19/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2363 - accuracy:
0.4639
Epoch 20/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2107 - accuracy:
0.4694
Epoch 21/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2007 - accuracy:
0.4814
```

```
Epoch 22/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2075 - accuracy:
0.4814
Epoch 23/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1978 - accuracy:
0.4837
Epoch 24/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1882 - accuracy:
0.4809
Epoch 25/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1884 - accuracy:
0.4942
Epoch 26/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1818 - accuracy:
0.4864
Epoch 27/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1745 - accuracy:
0.4938
Epoch 28/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1549 - accuracy:
0.4998
Epoch 29/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1496 - accuracy:
0.5053
Epoch 30/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1529 - accuracy:
0.5205
Epoch 31/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1451 - accuracy:
0.5071
Epoch 32/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1226 - accuracy:
0.5320
Epoch 33/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1394 - accuracy:
0.5223
Epoch 34/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1303 - accuracy:
0.5177
Epoch 35/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1231 - accuracy:
0.5324
Epoch 36/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1106 - accuracy:
0.5136
Epoch 37/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1066 - accuracy:
0.5389
```

```
Epoch 38/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1003 - accuracy:
0.5357
Epoch 39/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1044 - accuracy:
0.5361
Epoch 40/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1005 - accuracy:
0.5324
Epoch 41/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0944 - accuracy:
0.5255
Epoch 42/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0860 - accuracy:
0.5366
Epoch 43/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0799 - accuracy:
0.5518
Epoch 44/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0739 - accuracy:
0.5439
Epoch 45/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0747 - accuracy:
0.5430
Epoch 46/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0821 - accuracy:
0.5486
Epoch 47/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0746 - accuracy:
0.5324
Epoch 48/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0479 - accuracy:
0.5614
Epoch 49/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0471 - accuracy:
0.5536
Epoch 50/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0287 - accuracy:
0.5656
Epoch 51/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0423 - accuracy:
0.5527
Epoch 52/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0350 - accuracy:
0.5522
Epoch 53/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0430 - accuracy:
0.5490
```

```
Epoch 54/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0220 - accuracy:
0.5780
Epoch 55/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0302 - accuracy:
0.5683
Epoch 56/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0105 - accuracy:
0.5771
Epoch 57/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9990 - accuracy:
0.5789
Epoch 58/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0004 - accuracy:
0.5808
Epoch 59/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9869 - accuracy:
0.5794
Epoch 60/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0024 - accuracy:
0.5817
Epoch 61/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0086 - accuracy:
0.5688
Epoch 62/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9836 - accuracy:
0.5849
Epoch 63/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9841 - accuracy:
0.5881
Epoch 64/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9764 - accuracy:
0.5955
Epoch 65/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9809 - accuracy:
0.5739
Epoch 66/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9704 - accuracy:
0.6006
Epoch 67/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9765 - accuracy:
0.5978
Epoch 68/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9837 - accuracy:
0.5840
Epoch 69/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9589 - accuracy:
0.5978
```

```
Epoch 70/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9474 - accuracy:
0.6019
Epoch 71/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9431 - accuracy:
0.6033
Epoch 72/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9318 - accuracy:
0.6157
Epoch 73/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9521 - accuracy:
0.5996
Epoch 74/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9484 - accuracy:
0.6033
Epoch 75/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9193 - accuracy:
0.6176
Epoch 76/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9283 - accuracy:
0.6029
Epoch 77/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9229 - accuracy:
0.6116
Epoch 78/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9183 - accuracy:
0.6231
Epoch 79/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9205 - accuracy:
0.6157
Epoch 80/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9199 - accuracy:
0.6121
Epoch 81/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9019 - accuracy:
0.6332
Epoch 82/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9123 - accuracy:
0.6185
Epoch 83/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9119 - accuracy:
0.6171
Epoch 84/200
68/68 [==============================] - 0s 3ms/step - loss: 0.9008 - accuracy:
0.6282
Epoch 85/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8944 - accuracy:
0.6236
```

```
Epoch 86/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8785 - accuracy:
0.6503
Epoch 87/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8800 - accuracy:
0.6392
Epoch 88/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8889 - accuracy:
0.6346
Epoch 89/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8730 - accuracy:
0.6549
Epoch 90/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8736 - accuracy:
0.6475
Epoch 91/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8656 - accuracy:
0.6424
Epoch 92/200
68/68 [==============================] - 0s 3ms/step - loss: 0.8795 - accuracy:
0.6300
Epoch 93/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8858 - accuracy:
0.6415
Epoch 94/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8772 - accuracy:
0.6461
Epoch 95/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8306 - accuracy:
0.6613
Epoch 96/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8563 - accuracy:
0.6526
Epoch 97/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8663 - accuracy:
0.6397
Epoch 98/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8502 - accuracy:
0.6539
Epoch 99/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8485 - accuracy:
0.6470
Epoch 100/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8649 - accuracy:
0.6484
Epoch 101/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8420 - accuracy:
0.6576
```

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Epoch 102/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8528 - accuracy:
0.6461
Epoch 103/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8426 - accuracy:
0.6493
Epoch 104/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8097 - accuracy:
0.6733
Epoch 105/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8272 - accuracy:
0.6733
Epoch 106/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8293 - accuracy:
0.6567
Epoch 107/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8277 - accuracy:
0.6696
Epoch 108/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8106 - accuracy:
0.6710
Epoch 109/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8056 - accuracy:
0.6737
Epoch 110/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7945 - accuracy:
0.6797
Epoch 111/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8134 - accuracy:
0.6737
Epoch 112/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8026 - accuracy:
0.6728
Epoch 113/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8041 - accuracy:
0.6696
Epoch 114/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8175 - accuracy:
0.6774
Epoch 115/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7986 - accuracy:
0.6861
Epoch 116/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8144 - accuracy:
0.6756
Epoch 117/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8056 - accuracy:
0.6622
```

```
Epoch 118/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8056 - accuracy:
0.6696
Epoch 119/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8194 - accuracy:
0.6723
Epoch 120/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7971 - accuracy:
0.6783
Epoch 121/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8015 - accuracy:
0.6834
Epoch 122/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7777 - accuracy:
0.6760
Epoch 123/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7880 - accuracy:
0.6838
Epoch 124/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7984 - accuracy:
0.6710
Epoch 125/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7587 - accuracy:
0.6875
Epoch 126/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7849 - accuracy:
0.6700
Epoch 127/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7703 - accuracy:
0.6866
Epoch 128/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7603 - accuracy:
0.6921
Epoch 129/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7638 - accuracy:
0.6986
Epoch 130/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7708 - accuracy:
0.6802
Epoch 131/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7509 - accuracy:
0.6967
Epoch 132/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7606 - accuracy:
0.6931
Epoch 133/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7639 - accuracy:
0.6898
```

```
Epoch 134/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7211 - accuracy:
0.7064
Epoch 135/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7688 - accuracy:
0.6917
Epoch 136/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7291 - accuracy:
0.7073
Epoch 137/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7608 - accuracy:
0.6958
Epoch 138/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7542 - accuracy:
0.7069
Epoch 139/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7432 - accuracy:
0.6954
Epoch 140/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7299 - accuracy:
0.7096
Epoch 141/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7270 - accuracy:
0.7087
Epoch 142/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7148 - accuracy:
0.7119
Epoch 143/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7333 - accuracy:
0.7101
Epoch 144/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7323 - accuracy:
0.7082
Epoch 145/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7343 - accuracy:
0.7000
Epoch 146/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7096 - accuracy:
0.7055
Epoch 147/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7212 - accuracy:
0.7151
Epoch 148/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7045 - accuracy:
0.7207
Epoch 149/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7232 - accuracy:
0.7119
```

```
Epoch 150/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7230 - accuracy:
0.7142
Epoch 151/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7001 - accuracy:
0.7179
Epoch 152/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7135 - accuracy:
0.7184
Epoch 153/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7468 - accuracy:
0.7046
Epoch 154/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6823 - accuracy:
0.7271
Epoch 155/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6995 - accuracy:
0.7289
Epoch 156/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7136 - accuracy:
0.7142
Epoch 157/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6788 - accuracy:
0.7211
Epoch 158/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6969 - accuracy:
0.7257
Epoch 159/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6843 - accuracy:
0.7202
Epoch 160/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6728 - accuracy:
0.7312
Epoch 161/200
68/68 [==============================] - 0s 3ms/step - loss: 0.6639 - accuracy:
0.7368
Epoch 162/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6681 - accuracy:
0.7428
Epoch 163/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6932 - accuracy:
0.7202
Epoch 164/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6859 - accuracy:
0.7266
Epoch 165/200
68/68 [==============================] - 0s 3ms/step - loss: 0.6779 - accuracy:
0.7349
```

```
Epoch 166/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6904 - accuracy:
0.7197
Epoch 167/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6524 - accuracy:
0.7451
Epoch 168/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6688 - accuracy:
0.7335
Epoch 169/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6725 - accuracy:
0.7335
Epoch 170/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7027 - accuracy:
0.7174
Epoch 171/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6758 - accuracy:
0.7340
Epoch 172/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6726 - accuracy:
0.7345
Epoch 173/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6571 - accuracy:
0.7340
Epoch 174/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6725 - accuracy:
0.7317
Epoch 175/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6629 - accuracy:
0.7497
Epoch 176/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6750 - accuracy:
0.7372
Epoch 177/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6766 - accuracy:
0.7358
Epoch 178/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6364 - accuracy:
0.7598
Epoch 179/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6843 - accuracy:
0.7230
Epoch 180/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6474 - accuracy:
0.7469
Epoch 181/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6468 - accuracy:
0.7317
```

```
Epoch 182/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6665 - accuracy:
0.7294
Epoch 183/200
68/68 [==============================] - 0s 3ms/step - loss: 0.6589 - accuracy:
0.7372
Epoch 184/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6360 - accuracy:
0.7441
Epoch 185/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6666 - accuracy:
0.7395
Epoch 186/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6583 - accuracy:
0.7418
Epoch 187/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6235 - accuracy:
0.7570
Epoch 188/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6207 - accuracy:
0.7644
Epoch 189/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6322 - accuracy:
0.7538
Epoch 190/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6383 - accuracy:
0.7556
Epoch 191/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6215 - accuracy:
0.7662
Epoch 192/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6375 - accuracy:
0.7533
Epoch 193/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6201 - accuracy:
0.7437
Epoch 194/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6280 - accuracy:
0.7575
Epoch 195/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6342 - accuracy:
0.7556
Epoch 196/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6320 - accuracy:
0.7432
Epoch 197/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6250 - accuracy:
0.7736
```

```
Epoch 198/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6343 - accuracy:
0.7432
Epoch 199/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6095 - accuracy:
0.7570
Epoch 200/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6181 - accuracy:
0.7561
17/17 [==============================] - 0s 2ms/step
Epoch 1/200
68/68 [==============================] - 1s 3ms/step - loss: 1.6902 - accuracy:
0.3148
Epoch 2/200
68/68 [==============================] - 0s 2ms/step - loss: 1.4637 - accuracy:
0.3801
Epoch 3/200
68/68 [==============================] - 0s 2ms/step - loss: 1.4108 - accuracy:
0.3847
Epoch 4/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3727 - accuracy:
0.3999
Epoch 5/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3557 - accuracy:
0.4087
Epoch 6/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3363 - accuracy:
0.4160
Epoch 7/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3202 - accuracy:
0.4271
Epoch 8/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3211 - accuracy:
0.4330
Epoch 9/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3171 - accuracy:
0.4266
Epoch 10/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2981 - accuracy:
0.4395
Epoch 11/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2897 - accuracy:
0.4413
Epoch 12/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2784 - accuracy:
0.4510
Epoch 13/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2735 - accuracy:
```

```
0.4491
Epoch 14/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2478 - accuracy:
0.4510
Epoch 15/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2482 - accuracy:
0.4749
Epoch 16/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2404 - accuracy:
0.4487
Epoch 17/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2478 - accuracy:
0.4565
Epoch 18/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2287 - accuracy:
0.4768
Epoch 19/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2180 - accuracy:
0.4795
Epoch 20/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2089 - accuracy:
0.4749
Epoch 21/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2165 - accuracy:
0.4758
Epoch 22/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2170 - accuracy:
0.4846
Epoch 23/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1919 - accuracy:
0.5002
Epoch 24/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1807 - accuracy:
0.5085
Epoch 25/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1919 - accuracy:
0.4910
Epoch 26/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1800 - accuracy:
0.5071
Epoch 27/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1765 - accuracy:
0.5044
Epoch 28/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1780 - accuracy:
0.4938
Epoch 29/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1560 - accuracy:
```

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0.5062
Epoch 30/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1522 - accuracy:
0.4993
Epoch 31/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1501 - accuracy:
0.5039
Epoch 32/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1538 - accuracy:
0.5081
Epoch 33/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1400 - accuracy:
0.5113
Epoch 34/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1379 - accuracy:
0.5283
Epoch 35/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1240 - accuracy:
0.5283
Epoch 36/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1123 - accuracy:
0.5398
Epoch 37/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1174 - accuracy:
0.5389
Epoch 38/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0974 - accuracy:
0.5334
Epoch 39/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1197 - accuracy:
0.5214
Epoch 40/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1088 - accuracy:
0.5297
Epoch 41/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1013 - accuracy:
0.5476
Epoch 42/200
68/68 [==============================] - 0s 3ms/step - loss: 1.1048 - accuracy:
0.5389
Epoch 43/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0927 - accuracy:
0.5338
Epoch 44/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0746 - accuracy:
0.5458
Epoch 45/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0719 - accuracy:
```

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0.5573
Epoch 46/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0784 - accuracy:
0.5426
Epoch 47/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0503 - accuracy:
0.5541
Epoch 48/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0617 - accuracy:
0.5582
Epoch 49/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0608 - accuracy:
0.5545
Epoch 50/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0528 - accuracy:
0.5559
Epoch 51/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0459 - accuracy:
0.5706
Epoch 52/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0277 - accuracy:
0.5720
Epoch 53/200
68/68 [==============================] - 0s 3ms/step - loss: 1.0549 - accuracy:
0.5555
Epoch 54/200
68/68 [==============================] - 0s 3ms/step - loss: 1.0285 - accuracy:
0.5716
Epoch 55/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0356 - accuracy:
0.5651
Epoch 56/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0160 - accuracy:
0.5794
Epoch 57/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0190 - accuracy:
0.5748
Epoch 58/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0090 - accuracy:
0.5803
Epoch 59/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0303 - accuracy:
0.5716
Epoch 60/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0047 - accuracy:
0.5771
Epoch 61/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9868 - accuracy:
```

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0.5757
Epoch 62/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0013 - accuracy:
0.5739
Epoch 63/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9785 - accuracy:
0.5987
Epoch 64/200
68/68 [==============================] - 0s 3ms/step - loss: 0.9797 - accuracy:
0.5987
Epoch 65/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9968 - accuracy:
0.5895
Epoch 66/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9719 - accuracy:
0.5987
Epoch 67/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9736 - accuracy:
0.6061
Epoch 68/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9666 - accuracy:
0.5904
Epoch 69/200
68/68 [==============================] - 0s 3ms/step - loss: 0.9905 - accuracy:
0.5808
Epoch 70/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9523 - accuracy:
0.6052
Epoch 71/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9373 - accuracy:
0.6185
Epoch 72/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9482 - accuracy:
0.6107
Epoch 73/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9339 - accuracy:
0.6295
Epoch 74/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9386 - accuracy:
0.6194
Epoch 75/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9249 - accuracy:
0.6295
Epoch 76/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9296 - accuracy:
0.6208
Epoch 77/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9400 - accuracy:
```

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0.6029
Epoch 78/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9312 - accuracy:
0.6263
Epoch 79/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9286 - accuracy:
0.6226
Epoch 80/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9255 - accuracy:
0.6162
Epoch 81/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9064 - accuracy:
0.6300
Epoch 82/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9109 - accuracy:
0.6364
Epoch 83/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9054 - accuracy:
0.6341
Epoch 84/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8885 - accuracy:
0.6438
Epoch 85/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8977 - accuracy:
0.6217
Epoch 86/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8855 - accuracy:
0.6291
Epoch 87/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9086 - accuracy:
0.6249
Epoch 88/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9087 - accuracy:
0.6291
Epoch 89/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8793 - accuracy:
0.6590
Epoch 90/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8771 - accuracy:
0.6438
Epoch 91/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8834 - accuracy:
0.6493
Epoch 92/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8662 - accuracy:
0.6457
Epoch 93/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8701 - accuracy:
```

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0.6489
Epoch 94/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8522 - accuracy:
0.6535
Epoch 95/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8573 - accuracy:
0.6604
Epoch 96/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8552 - accuracy:
0.6461
Epoch 97/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8586 - accuracy:
0.6553
Epoch 98/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8438 - accuracy:
0.6461
Epoch 99/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8365 - accuracy:
0.6636
Epoch 100/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8531 - accuracy:
0.6604
Epoch 101/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8422 - accuracy:
0.6434
Epoch 102/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8595 - accuracy:
0.6434
Epoch 103/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8284 - accuracy:
0.6590
Epoch 104/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8334 - accuracy:
0.6664
Epoch 105/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8394 - accuracy:
0.6503
Epoch 106/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8218 - accuracy:
0.6636
Epoch 107/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8034 - accuracy:
0.6811
Epoch 108/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8031 - accuracy:
0.6691
Epoch 109/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8281 - accuracy:
```

```
0.6664
Epoch 110/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8139 - accuracy:
0.6673
Epoch 111/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7974 - accuracy:
0.6636
Epoch 112/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8066 - accuracy:
0.6779
Epoch 113/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8143 - accuracy:
0.6710
Epoch 114/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7957 - accuracy:
0.6760
Epoch 115/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7914 - accuracy:
0.6783
Epoch 116/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8146 - accuracy:
0.6687
Epoch 117/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7924 - accuracy:
0.6668
Epoch 118/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7805 - accuracy:
0.6931
Epoch 119/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7839 - accuracy:
0.6931
Epoch 120/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7773 - accuracy:
0.6889
Epoch 121/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7762 - accuracy:
0.6825
Epoch 122/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7607 - accuracy:
0.7004
Epoch 123/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7601 - accuracy:
0.6981
Epoch 124/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7631 - accuracy:
0.7078
Epoch 125/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7619 - accuracy:
```

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0.7027
Epoch 126/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7750 - accuracy:
0.6908
Epoch 127/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7632 - accuracy:
0.7036
Epoch 128/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7747 - accuracy:
0.6825
Epoch 129/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7664 - accuracy:
0.7036
Epoch 130/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7526 - accuracy:
0.7046
Epoch 131/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7524 - accuracy:
0.6958
Epoch 132/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7430 - accuracy:
0.7105
Epoch 133/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7227 - accuracy:
0.7138
Epoch 134/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7451 - accuracy:
0.7059
Epoch 135/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7270 - accuracy:
0.6981
Epoch 136/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7443 - accuracy:
0.6972
Epoch 137/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7349 - accuracy:
0.7082
Epoch 138/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7386 - accuracy:
0.7147
Epoch 139/200
68/68 [==============================] - 0s 3ms/step - loss: 0.6984 - accuracy:
0.7184
Epoch 140/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7136 - accuracy:
0.7197
Epoch 141/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7241 - accuracy:
```

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0.7105
Epoch 142/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7019 - accuracy:
0.7207
Epoch 143/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7076 - accuracy:
0.7133
Epoch 144/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7311 - accuracy:
0.7036
Epoch 145/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7385 - accuracy:
0.7073
Epoch 146/200
68/68 [==============================] - 0s 3ms/step - loss: 0.7202 - accuracy:
0.7142
Epoch 147/200
68/68 [==============================] - 0s 3ms/step - loss: 0.7043 - accuracy:
0.7184
Epoch 148/200
68/68 [==============================] - 0s 3ms/step - loss: 0.7013 - accuracy:
0.7064
Epoch 149/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7246 - accuracy:
0.7023
Epoch 150/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7131 - accuracy:
0.7184
Epoch 151/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6890 - accuracy:
0.7308
Epoch 152/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6786 - accuracy:
0.7317
Epoch 153/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6890 - accuracy:
0.7230
Epoch 154/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7116 - accuracy:
0.7096
Epoch 155/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6956 - accuracy:
0.7220
Epoch 156/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6693 - accuracy:
0.7437
Epoch 157/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6945 - accuracy:
```

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0.7211
Epoch 158/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6939 - accuracy:
0.7391
Epoch 159/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6820 - accuracy:
0.7331
Epoch 160/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6747 - accuracy:
0.7239
Epoch 161/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6747 - accuracy:
0.7294
Epoch 162/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6747 - accuracy:
0.7455
Epoch 163/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6838 - accuracy:
0.7184
Epoch 164/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6693 - accuracy:
0.7349
Epoch 165/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6619 - accuracy:
0.7469
Epoch 166/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6663 - accuracy:
0.7372
Epoch 167/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6881 - accuracy:
0.7193
Epoch 168/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6736 - accuracy:
0.7418
Epoch 169/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6453 - accuracy:
0.7400
Epoch 170/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6414 - accuracy:
0.7506
Epoch 171/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6619 - accuracy:
0.7391
Epoch 172/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6549 - accuracy:
0.7501
Epoch 173/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6492 - accuracy:
```

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0.7561
Epoch 174/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6623 - accuracy:
0.7345
Epoch 175/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6531 - accuracy:
0.7395
Epoch 176/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6404 - accuracy:
0.7520
Epoch 177/200
68/68 [==============================] - 0s 3ms/step - loss: 0.6290 - accuracy:
0.7529
Epoch 178/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6274 - accuracy:
0.7556
Epoch 179/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6348 - accuracy:
0.7529
Epoch 180/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6233 - accuracy:
0.7561
Epoch 181/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6337 - accuracy:
0.7437
Epoch 182/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6515 - accuracy:
0.7414
Epoch 183/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6327 - accuracy:
0.7469
Epoch 184/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6213 - accuracy:
0.7543
Epoch 185/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6319 - accuracy:
0.7487
Epoch 186/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6405 - accuracy:
0.7483
Epoch 187/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6444 - accuracy:
0.7529
Epoch 188/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6421 - accuracy:
0.7538
Epoch 189/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6084 - accuracy:
```

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0.7538
Epoch 190/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6154 - accuracy:
0.7570
Epoch 191/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6143 - accuracy:
0.7575
Epoch 192/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6213 - accuracy:
0.7556
Epoch 193/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6133 - accuracy:
0.7520
Epoch 194/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6175 - accuracy:
0.7625
Epoch 195/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6020 - accuracy:
0.7625
Epoch 196/200
68/68 [==============================] - 0s 2ms/step - loss: 0.5948 - accuracy:
0.7685
Epoch 197/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6064 - accuracy:
0.7579
Epoch 198/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6279 - accuracy:
0.7487
Epoch 199/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6292 - accuracy:
0.7547
Epoch 200/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6172 - accuracy:
0.7616
17/17 [==============================] - 0s 1ms/step
Epoch 1/200
68/68 [==============================] - 1s 2ms/step - loss: 1.7072 - accuracy:
0.2968
Epoch 2/200
68/68 [==============================] - 0s 3ms/step - loss: 1.4675 - accuracy:
0.3654
Epoch 3/200
68/68 [==============================] - 0s 2ms/step - loss: 1.4087 - accuracy:
0.3935
Epoch 4/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3886 - accuracy:
0.4054
Epoch 5/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 1.3485 - accuracy:
0.4188
Epoch 6/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3394 - accuracy:
0.4169
Epoch 7/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3204 - accuracy:
0.4307
Epoch 8/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3216 - accuracy:
0.4110
Epoch 9/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3045 - accuracy:
0.4330
Epoch 10/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2958 - accuracy:
0.4413
Epoch 11/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2773 - accuracy:
0.4381
Epoch 12/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2763 - accuracy:
0.4450
Epoch 13/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2636 - accuracy:
0.4514
Epoch 14/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2514 - accuracy:
0.4574
Epoch 15/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2502 - accuracy:
0.4524
Epoch 16/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2459 - accuracy:
0.4685
Epoch 17/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2344 - accuracy:
0.4666
Epoch 18/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2369 - accuracy:
0.4643
Epoch 19/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2185 - accuracy:
0.4823
Epoch 20/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2134 - accuracy:
0.4827
Epoch 21/200
```

```
68/68 [==============================] - 0s 3ms/step - loss: 1.2085 - accuracy:
0.4938
Epoch 22/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1988 - accuracy:
0.4850
Epoch 23/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1963 - accuracy:
0.4841
Epoch 24/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1905 - accuracy:
0.5012
Epoch 25/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1853 - accuracy:
0.4869
Epoch 26/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1761 - accuracy:
0.4984
Epoch 27/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1696 - accuracy:
0.5048
Epoch 28/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1663 - accuracy:
0.4988
Epoch 29/200
68/68 [==============================] - 0s 3ms/step - loss: 1.1592 - accuracy:
0.5030
Epoch 30/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1446 - accuracy:
0.5113
Epoch 31/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1585 - accuracy:
0.5067
Epoch 32/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1325 - accuracy:
0.5145
Epoch 33/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1424 - accuracy:
0.5154
Epoch 34/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1361 - accuracy:
0.5269
Epoch 35/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1319 - accuracy:
0.5196
Epoch 36/200
68/68 [==============================] - 0s 3ms/step - loss: 1.1170 - accuracy:
0.5255
Epoch 37/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 1.1161 - accuracy:
0.5246
Epoch 38/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1223 - accuracy:
0.5200
Epoch 39/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1091 - accuracy:
0.5407
Epoch 40/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0909 - accuracy:
0.5430
Epoch 41/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0926 - accuracy:
0.5338
Epoch 42/200
68/68 [==============================] - 0s 3ms/step - loss: 1.0846 - accuracy:
0.5536
Epoch 43/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0768 - accuracy:
0.5430
Epoch 44/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0820 - accuracy:
0.5393
Epoch 45/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0705 - accuracy:
0.5518
Epoch 46/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0591 - accuracy:
0.5421
Epoch 47/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0619 - accuracy:
0.5550
Epoch 48/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0680 - accuracy:
0.5495
Epoch 49/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0482 - accuracy:
0.5582
Epoch 50/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0464 - accuracy:
0.5601
Epoch 51/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0391 - accuracy:
0.5628
Epoch 52/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0417 - accuracy:
0.5564
Epoch 53/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 1.0221 - accuracy:
0.5679
Epoch 54/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0314 - accuracy:
0.5789
Epoch 55/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0323 - accuracy:
0.5679
Epoch 56/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0234 - accuracy:
0.5633
Epoch 57/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0202 - accuracy:
0.5835
Epoch 58/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0165 - accuracy:
0.5821
Epoch 59/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0254 - accuracy:
0.5739
Epoch 60/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9918 - accuracy:
0.6029
Epoch 61/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9934 - accuracy:
0.6033
Epoch 62/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9965 - accuracy:
0.5886
Epoch 63/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9815 - accuracy:
0.5895
Epoch 64/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0026 - accuracy:
0.5780
Epoch 65/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9846 - accuracy:
0.5923
Epoch 66/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9724 - accuracy:
0.5946
Epoch 67/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9851 - accuracy:
0.5955
Epoch 68/200
68/68 [==============================] - 0s 3ms/step - loss: 0.9531 - accuracy:
0.6033
Epoch 69/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 0.9769 - accuracy:
0.5955
Epoch 70/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9697 - accuracy:
0.6056
Epoch 71/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9419 - accuracy:
0.6088
Epoch 72/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9525 - accuracy:
0.6102
Epoch 73/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9418 - accuracy:
0.6162
Epoch 74/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9406 - accuracy:
0.6139
Epoch 75/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9390 - accuracy:
0.6084
Epoch 76/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9330 - accuracy:
0.6093
Epoch 77/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9195 - accuracy:
0.6180
Epoch 78/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9128 - accuracy:
0.6309
Epoch 79/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9308 - accuracy:
0.6203
Epoch 80/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8987 - accuracy:
0.6300
Epoch 81/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9130 - accuracy:
0.6194
Epoch 82/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9237 - accuracy:
0.6222
Epoch 83/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9142 - accuracy:
0.6180
Epoch 84/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8957 - accuracy:
0.6314
Epoch 85/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 0.8995 - accuracy:
0.6337
Epoch 86/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9058 - accuracy:
0.6272
Epoch 87/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8842 - accuracy:
0.6475
Epoch 88/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8836 - accuracy:
0.6489
Epoch 89/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8809 - accuracy:
0.6443
Epoch 90/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8672 - accuracy:
0.6558
Epoch 91/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8791 - accuracy:
0.6378
Epoch 92/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8641 - accuracy:
0.6549
Epoch 93/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8594 - accuracy:
0.6475
Epoch 94/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8677 - accuracy:
0.6572
Epoch 95/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8670 - accuracy:
0.6475
Epoch 96/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8529 - accuracy:
0.6521
Epoch 97/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8677 - accuracy:
0.6420
Epoch 98/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8491 - accuracy:
0.6654
Epoch 99/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8322 - accuracy:
0.6733
Epoch 100/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8267 - accuracy:
0.6742
Epoch 101/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 0.8302 - accuracy:
0.6728
Epoch 102/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8431 - accuracy:
0.6613
Epoch 103/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8163 - accuracy:
0.6811
Epoch 104/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8575 - accuracy:
0.6581
Epoch 105/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8326 - accuracy:
0.6581
Epoch 106/200
68/68 [==============================] - 0s 3ms/step - loss: 0.8158 - accuracy:
0.6792
Epoch 107/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8187 - accuracy:
0.6792
Epoch 108/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8229 - accuracy:
0.6723
Epoch 109/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8184 - accuracy:
0.6728
Epoch 110/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8165 - accuracy:
0.6760
Epoch 111/200
68/68 [==============================] - 0s 3ms/step - loss: 0.8300 - accuracy:
0.6576
Epoch 112/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8105 - accuracy:
0.6737
Epoch 113/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8063 - accuracy:
0.6756
Epoch 114/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7907 - accuracy:
0.6880
Epoch 115/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7994 - accuracy:
0.6861
Epoch 116/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8027 - accuracy:
0.6677
Epoch 117/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 0.7862 - accuracy:
0.6779
Epoch 118/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7872 - accuracy:
0.6779
Epoch 119/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7880 - accuracy:
0.6829
Epoch 120/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7618 - accuracy:
0.6884
Epoch 121/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7698 - accuracy:
0.6908
Epoch 122/200
68/68 [==============================] - 0s 3ms/step - loss: 0.7704 - accuracy:
0.6912
Epoch 123/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7783 - accuracy:
0.6769
Epoch 124/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7714 - accuracy:
0.6857
Epoch 125/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7618 - accuracy:
0.6917
Epoch 126/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7725 - accuracy:
0.6972
Epoch 127/200
68/68 [==============================] - 0s 3ms/step - loss: 0.7906 - accuracy:
0.6995
Epoch 128/200
68/68 [==============================] - 0s 3ms/step - loss: 0.7560 - accuracy:
0.6940
Epoch 129/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7552 - accuracy:
0.6986
Epoch 130/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7515 - accuracy:
0.6986
Epoch 131/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7453 - accuracy:
0.7124
Epoch 132/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7544 - accuracy:
0.6967
Epoch 133/200
```

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68/68 [==============================] - 0s 3ms/step - loss: 0.7405 - accuracy:
0.7101
Epoch 134/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7604 - accuracy:
0.7092
Epoch 135/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7402 - accuracy:
0.7041
Epoch 136/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7347 - accuracy:
0.6926
Epoch 137/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7260 - accuracy:
0.7170
Epoch 138/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7323 - accuracy:
0.7188
Epoch 139/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7289 - accuracy:
0.7013
Epoch 140/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7307 - accuracy:
0.7128
Epoch 141/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7188 - accuracy:
0.7179
Epoch 142/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7113 - accuracy:
0.7128
Epoch 143/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7183 - accuracy:
0.7161
Epoch 144/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7030 - accuracy:
0.7188
Epoch 145/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7261 - accuracy:
0.7207
Epoch 146/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7084 - accuracy:
0.7156
Epoch 147/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7017 - accuracy:
0.7303
Epoch 148/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7177 - accuracy:
0.7138
Epoch 149/200
```

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68/68 [==============================] - 0s 2ms/step - loss: 0.7058 - accuracy:
0.7216
Epoch 150/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7056 - accuracy:
0.7197
Epoch 151/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7253 - accuracy:
0.7202
Epoch 152/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6869 - accuracy:
0.7280
Epoch 153/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7196 - accuracy:
0.7119
Epoch 154/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6790 - accuracy:
0.7289
Epoch 155/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6997 - accuracy:
0.7239
Epoch 156/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6939 - accuracy:
0.7257
Epoch 157/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6896 - accuracy:
0.7285
Epoch 158/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6754 - accuracy:
0.7312
Epoch 159/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6599 - accuracy:
0.7391
Epoch 160/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6742 - accuracy:
0.7289
Epoch 161/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6838 - accuracy:
0.7262
Epoch 162/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6718 - accuracy:
0.7391
Epoch 163/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6980 - accuracy:
0.7303
Epoch 164/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6867 - accuracy:
0.7386
Epoch 165/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 0.6714 - accuracy:
0.7340
Epoch 166/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6682 - accuracy:
0.7294
Epoch 167/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6899 - accuracy:
0.7147
Epoch 168/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6704 - accuracy:
0.7368
Epoch 169/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6597 - accuracy:
0.7409
Epoch 170/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6704 - accuracy:
0.7487
Epoch 171/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6662 - accuracy:
0.7515
Epoch 172/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6507 - accuracy:
0.7395
Epoch 173/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6422 - accuracy:
0.7497
Epoch 174/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6459 - accuracy:
0.7487
Epoch 175/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6476 - accuracy:
0.7395
Epoch 176/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6753 - accuracy:
0.7400
Epoch 177/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6543 - accuracy:
0.7299
Epoch 178/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6286 - accuracy:
0.7538
Epoch 179/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6414 - accuracy:
0.7437
Epoch 180/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6601 - accuracy:
0.7497
Epoch 181/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 0.6419 - accuracy:
0.7483
Epoch 182/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6384 - accuracy:
0.7561
Epoch 183/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6472 - accuracy:
0.7432
Epoch 184/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6376 - accuracy:
0.7520
Epoch 185/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6201 - accuracy:
0.7593
Epoch 186/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6384 - accuracy:
0.7437
Epoch 187/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6561 - accuracy:
0.7349
Epoch 188/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6247 - accuracy:
0.7552
Epoch 189/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6290 - accuracy:
0.7501
Epoch 190/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6108 - accuracy:
0.7630
Epoch 191/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6244 - accuracy:
0.7579
Epoch 192/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6274 - accuracy:
0.7515
Epoch 193/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6135 - accuracy:
0.7713
Epoch 194/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6030 - accuracy:
0.7690
Epoch 195/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6340 - accuracy:
0.7409
Epoch 196/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6171 - accuracy:
0.7533
Epoch 197/200
```

```
68/68 [==============================] - 0s 2ms/step - loss: 0.6239 - accuracy:
0.7598
Epoch 198/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6081 - accuracy:
0.7658
Epoch 199/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6203 - accuracy:
0.7547
Epoch 200/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6097 - accuracy:
0.7653
17/17 [==============================] - 0s 1ms/step
Epoch 1/200
68/68 [==============================] - 1s 2ms/step - loss: 1.7134 - accuracy:
0.3125
Epoch 2/200
68/68 [==============================] - 0s 2ms/step - loss: 1.4891 - accuracy:
0.3783
Epoch 3/200
68/68 [==============================] - 0s 2ms/step - loss: 1.4291 - accuracy:
0.3797
Epoch 4/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3943 - accuracy:
0.3962
Epoch 5/200
68/68 [==============================] - 0s 3ms/step - loss: 1.3666 - accuracy:
0.4073
Epoch 6/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3443 - accuracy:
0.4114
Epoch 7/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3429 - accuracy:
0.4119
Epoch 8/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3142 - accuracy:
0.4289
Epoch 9/200
68/68 [==============================] - 0s 2ms/step - loss: 1.3004 - accuracy:
0.4344
Epoch 10/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2955 - accuracy:
0.4321
Epoch 11/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2951 - accuracy:
0.4344
Epoch 12/200
68/68 [==============================] - 0s 3ms/step - loss: 1.2774 - accuracy:
0.4570
```

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Epoch 13/200
68/68 [==============================] - 0s 3ms/step - loss: 1.2720 - accuracy:
0.4344
Epoch 14/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2647 - accuracy:
0.4538
Epoch 15/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2485 - accuracy:
0.4561
Epoch 16/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2501 - accuracy:
0.4561
Epoch 17/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2457 - accuracy:
0.4689
Epoch 18/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2469 - accuracy:
0.4625
Epoch 19/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2439 - accuracy:
0.4611
Epoch 20/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2248 - accuracy:
0.4754
Epoch 21/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2130 - accuracy:
0.4754
Epoch 22/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2102 - accuracy:
0.4648
Epoch 23/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2031 - accuracy:
0.4735
Epoch 24/200
68/68 [==============================] - 0s 2ms/step - loss: 1.2045 - accuracy:
0.4883
Epoch 25/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1864 - accuracy:
0.4993
Epoch 26/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1739 - accuracy:
0.5113
Epoch 27/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1858 - accuracy:
0.5012
Epoch 28/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1679 - accuracy:
0.4988
```

```
Epoch 29/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1584 - accuracy:
0.5012
Epoch 30/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1623 - accuracy:
0.5007
Epoch 31/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1539 - accuracy:
0.5085
Epoch 32/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1574 - accuracy:
0.5085
Epoch 33/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1318 - accuracy:
0.5145
Epoch 34/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1395 - accuracy:
0.5062
Epoch 35/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1241 - accuracy:
0.5186
Epoch 36/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1030 - accuracy:
0.5407
Epoch 37/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1127 - accuracy:
0.5269
Epoch 38/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1123 - accuracy:
0.5297
Epoch 39/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0973 - accuracy:
0.5306
Epoch 40/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0989 - accuracy:
0.5366
Epoch 41/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1018 - accuracy:
0.5315
Epoch 42/200
68/68 [==============================] - 0s 2ms/step - loss: 1.1031 - accuracy:
0.5384
Epoch 43/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0896 - accuracy:
0.5421
Epoch 44/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0865 - accuracy:
0.5486
```

```
Epoch 45/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0678 - accuracy:
0.5582
Epoch 46/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0583 - accuracy:
0.5536
Epoch 47/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0572 - accuracy:
0.5499
Epoch 48/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0515 - accuracy:
0.5527
Epoch 49/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0510 - accuracy:
0.5587
Epoch 50/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0556 - accuracy:
0.5509
Epoch 51/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0594 - accuracy:
0.5587
Epoch 52/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0255 - accuracy:
0.5660
Epoch 53/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0178 - accuracy:
0.5835
Epoch 54/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0105 - accuracy:
0.5757
Epoch 55/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0248 - accuracy:
0.5734
Epoch 56/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0069 - accuracy:
0.5748
Epoch 57/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9964 - accuracy:
0.5785
Epoch 58/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0163 - accuracy:
0.5734
Epoch 59/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0046 - accuracy:
0.5808
Epoch 60/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9936 - accuracy:
0.5798
```

```
Epoch 61/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9902 - accuracy:
0.5817
Epoch 62/200
68/68 [==============================] - 0s 2ms/step - loss: 1.0042 - accuracy:
0.5771
Epoch 63/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9858 - accuracy:
0.5808
Epoch 64/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9785 - accuracy:
0.5923
Epoch 65/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9768 - accuracy:
0.5932
Epoch 66/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9648 - accuracy:
0.6010
Epoch 67/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9635 - accuracy:
0.5913
Epoch 68/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9688 - accuracy:
0.5932
Epoch 69/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9517 - accuracy:
0.6098
Epoch 70/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9613 - accuracy:
0.5973
Epoch 71/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9422 - accuracy:
0.6029
Epoch 72/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9487 - accuracy:
0.6024
Epoch 73/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9321 - accuracy:
0.6075
Epoch 74/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9470 - accuracy:
0.6148
Epoch 75/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9298 - accuracy:
0.6240
Epoch 76/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9320 - accuracy:
0.6102
```

```
Epoch 77/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9373 - accuracy:
0.6176
Epoch 78/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9244 - accuracy:
0.6263
Epoch 79/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9122 - accuracy:
0.6208
Epoch 80/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9262 - accuracy:
0.6065
Epoch 81/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9149 - accuracy:
0.6190
Epoch 82/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8938 - accuracy:
0.6397
Epoch 83/200
68/68 [==============================] - 0s 2ms/step - loss: 0.9195 - accuracy:
0.6125
Epoch 84/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8957 - accuracy:
0.6240
Epoch 85/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8747 - accuracy:
0.6410
Epoch 86/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8750 - accuracy:
0.6337
Epoch 87/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8689 - accuracy:
0.6424
Epoch 88/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8786 - accuracy:
0.6378
Epoch 89/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8684 - accuracy:
0.6507
Epoch 90/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8808 - accuracy:
0.6355
Epoch 91/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8861 - accuracy:
0.6222
Epoch 92/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8740 - accuracy:
0.6452
```

```
Epoch 93/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8710 - accuracy:
0.6484
Epoch 94/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8367 - accuracy:
0.6746
Epoch 95/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8656 - accuracy:
0.6410
Epoch 96/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8447 - accuracy:
0.6604
Epoch 97/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8542 - accuracy:
0.6507
Epoch 98/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8457 - accuracy:
0.6590
Epoch 99/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8246 - accuracy:
0.6599
Epoch 100/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8422 - accuracy:
0.6544
Epoch 101/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8293 - accuracy:
0.6627
Epoch 102/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8151 - accuracy:
0.6723
Epoch 103/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8063 - accuracy:
0.6792
Epoch 104/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8355 - accuracy:
0.6544
Epoch 105/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8096 - accuracy:
0.6645
Epoch 106/200
68/68 [==============================] - 0s 3ms/step - loss: 0.8300 - accuracy:
0.6604
Epoch 107/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8003 - accuracy:
0.6723
Epoch 108/200
68/68 [==============================] - 0s 3ms/step - loss: 0.8242 - accuracy:
0.6756
```

```
Epoch 109/200
68/68 [==============================] - 0s 3ms/step - loss: 0.8091 - accuracy:
0.6788
Epoch 110/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8087 - accuracy:
0.6746
Epoch 111/200
68/68 [==============================] - 0s 2ms/step - loss: 0.8103 - accuracy:
0.6774
Epoch 112/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7984 - accuracy:
0.6751
Epoch 113/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7995 - accuracy:
0.6792
Epoch 114/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7780 - accuracy:
0.6884
Epoch 115/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7677 - accuracy:
0.6829
Epoch 116/200
68/68 [==============================] - 0s 3ms/step - loss: 0.7847 - accuracy:
0.6756
Epoch 117/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7935 - accuracy:
0.6765
Epoch 118/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7572 - accuracy:
0.6963
Epoch 119/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7664 - accuracy:
0.6926
Epoch 120/200
68/68 [==============================] - 0s 3ms/step - loss: 0.7658 - accuracy:
0.6861
Epoch 121/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7860 - accuracy:
0.6820
Epoch 122/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7727 - accuracy:
0.6889
Epoch 123/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7751 - accuracy:
0.6742
Epoch 124/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7710 - accuracy:
0.6894
```

```
Epoch 125/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7672 - accuracy:
0.6967
Epoch 126/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7347 - accuracy:
0.6972
Epoch 127/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7531 - accuracy:
0.6954
Epoch 128/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7356 - accuracy:
0.7069
Epoch 129/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7539 - accuracy:
0.6963
Epoch 130/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7536 - accuracy:
0.6898
Epoch 131/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7568 - accuracy:
0.6963
Epoch 132/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7600 - accuracy:
0.6926
Epoch 133/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7421 - accuracy:
0.7000
Epoch 134/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7514 - accuracy:
0.6954
Epoch 135/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7266 - accuracy:
0.7013
Epoch 136/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7282 - accuracy:
0.7004
Epoch 137/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7208 - accuracy:
0.7188
Epoch 138/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7340 - accuracy:
0.7124
Epoch 139/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7322 - accuracy:
0.7055
Epoch 140/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7290 - accuracy:
0.7032
```

```
Epoch 141/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7140 - accuracy:
0.7156
Epoch 142/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7143 - accuracy:
0.7266
Epoch 143/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6971 - accuracy:
0.7230
Epoch 144/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7223 - accuracy:
0.7156
Epoch 145/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7288 - accuracy:
0.6981
Epoch 146/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7083 - accuracy:
0.7276
Epoch 147/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7134 - accuracy:
0.7087
Epoch 148/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7049 - accuracy:
0.7262
Epoch 149/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6950 - accuracy:
0.7220
Epoch 150/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6937 - accuracy:
0.7197
Epoch 151/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7005 - accuracy:
0.7312
Epoch 152/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6718 - accuracy:
0.7363
Epoch 153/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6887 - accuracy:
0.7202
Epoch 154/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6875 - accuracy:
0.7322
Epoch 155/200
68/68 [==============================] - 0s 2ms/step - loss: 0.7009 - accuracy:
0.7230
Epoch 156/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6805 - accuracy:
0.7294
```

```
Epoch 157/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6732 - accuracy:
0.7382
Epoch 158/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6859 - accuracy:
0.7326
Epoch 159/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6832 - accuracy:
0.7368
Epoch 160/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6882 - accuracy:
0.7184
Epoch 161/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6802 - accuracy:
0.7280
Epoch 162/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6480 - accuracy:
0.7474
Epoch 163/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6646 - accuracy:
0.7386
Epoch 164/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6612 - accuracy:
0.7377
Epoch 165/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6588 - accuracy:
0.7414
Epoch 166/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6810 - accuracy:
0.7312
Epoch 167/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6746 - accuracy:
0.7386
Epoch 168/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6651 - accuracy:
0.7345
Epoch 169/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6373 - accuracy:
0.7520
Epoch 170/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6609 - accuracy:
0.7349
Epoch 171/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6681 - accuracy:
0.7349
Epoch 172/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6694 - accuracy:
0.7386
```

```
Epoch 173/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6648 - accuracy:
0.7437
Epoch 174/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6491 - accuracy:
0.7533
Epoch 175/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6650 - accuracy:
0.7322
Epoch 176/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6411 - accuracy:
0.7469
Epoch 177/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6477 - accuracy:
0.7460
Epoch 178/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6573 - accuracy:
0.7483
Epoch 179/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6380 - accuracy:
0.7428
Epoch 180/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6401 - accuracy:
0.7625
Epoch 181/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6311 - accuracy:
0.7483
Epoch 182/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6340 - accuracy:
0.7460
Epoch 183/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6475 - accuracy:
0.7432
Epoch 184/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6192 - accuracy:
0.7621
Epoch 185/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6426 - accuracy:
0.7552
Epoch 186/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6415 - accuracy:
0.7451
Epoch 187/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6040 - accuracy:
0.7621
Epoch 188/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6435 - accuracy:
0.7469
```

```
Epoch 189/200
68/68 [==============================] - 0s 3ms/step - loss: 0.6144 - accuracy:
0.7520
Epoch 190/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6128 - accuracy:
0.7630
Epoch 191/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6178 - accuracy:
0.7635
Epoch 192/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6112 - accuracy:
0.7612
Epoch 193/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6266 - accuracy:
0.7478
Epoch 194/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6098 - accuracy:
0.7621
Epoch 195/200
68/68 [==============================] - 0s 2ms/step - loss: 0.5880 - accuracy:
0.7759
Epoch 196/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6252 - accuracy:
0.7566
Epoch 197/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6166 - accuracy:
0.7639
Epoch 198/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6108 - accuracy:
0.7635
Epoch 199/200
68/68 [==============================] - 0s 2ms/step - loss: 0.6016 - accuracy:
0.7676
Epoch 200/200
68/68 [==============================] - 0s 3ms/step - loss: 0.6040 - accuracy:
0.7722
17/17 [==============================] - 0s 1ms/step
Cross-Validation Scores:
[0.38769338 0.3581837  0.38846864 0.36907976 0.38542935]
Training F1 Score: 0.3777709634221348
95% CI: (0.36098846524415357, 0.394553461600116)
22/22 [==============================] - 0s 1ms/step
Test Set Evaluation:
              precision    recall  f1-score   support

           1       0.45      0.30      0.36        33
           2       0.26      0.34      0.29        70
           3       0.30      0.30      0.30       111
```

```
           4       0.36      0.36      0.36       162
           5       0.36      0.35      0.36       161
           6       0.47      0.44      0.45       124
           7       0.00      0.00      0.00         7
           8       0.92      1.00      0.96        11

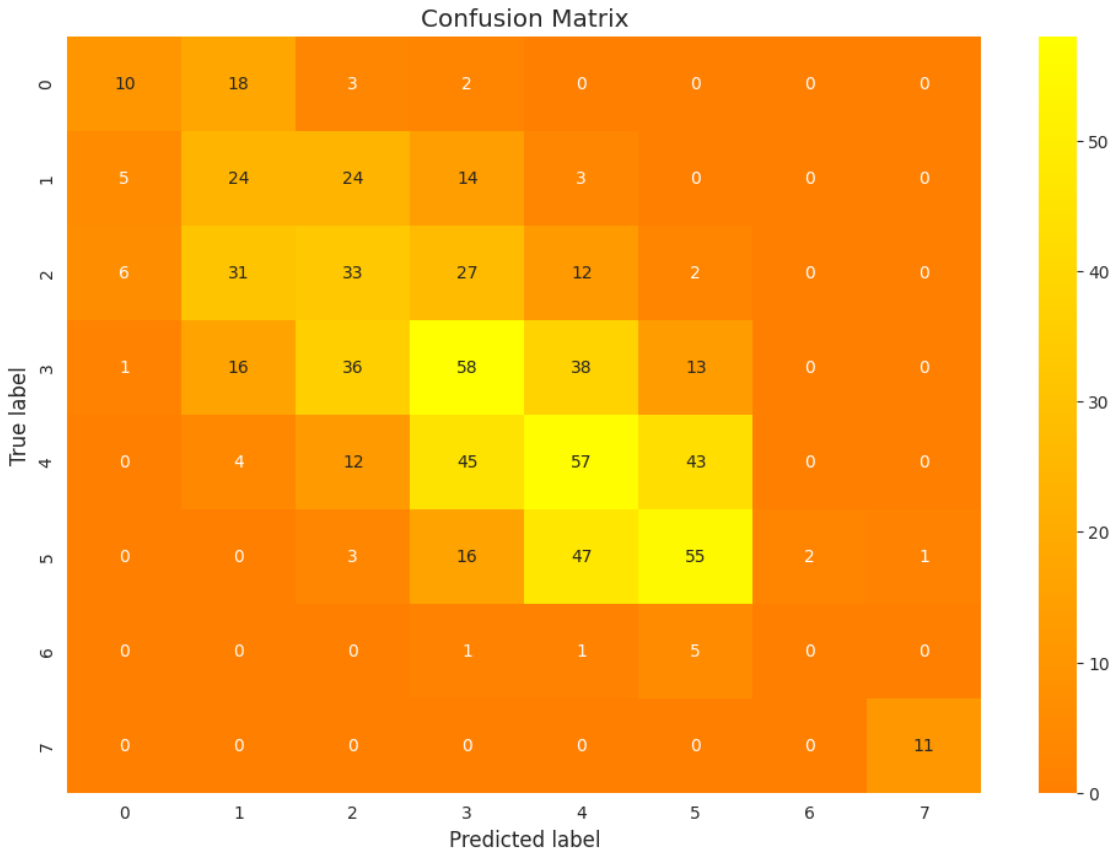
    accuracy                           0.37       679
   macro avg       0.39      0.39      0.39       679
weighted avg       0.37      0.37      0.37       679
```

The neural network using synthetic data has the best 95% confidence interval metrics when compared to other models on the training data, but the accuracy on testing data is not better.

[82]:
```
def draw_confusion_matrix(cm):
    plt.figure(figsize=(12,8))
    sns.heatmap(cm,annot=True,fmt="d", center=0, cmap='autumn')
    plt.title("Confusion Matrix")
    plt.ylabel('True label')
    plt.xlabel('Predicted label')
    plt.show()

y_test_model_rf = best_estimator.predict(test_set_prepared)
print('Test Set Evaluation:')
cm_rf = confusion_matrix(y_test, y_test_model_rf)
draw_confusion_matrix(cm_rf)
```

```
22/22 [==============================] - 0s 942us/step
Test Set Evaluation:
```



[83]:
```
def calculate_accuracy(true_labels, predicted_labels):
    total_predictions = len(true_labels)
    correct_predictions = 0

    for true_label, predicted_label in zip(true_labels, predicted_labels):
        if abs(predicted_label - true_label) <= 1:
            correct_predictions += 1

    accuracy = (correct_predictions / total_predictions) * 100
    return accuracy
calculate_accuracy(y_test, y_test_model_rf)
```

[83]: 83.79970544918999

[ ]: