Bank Churn Prediction

Description

Background and Context

Businesses like banks that provide service have to worry about the problem of 'Churn' i.e. customers leaving and joining another service provider. It is important to understand which aspects of the service influence a customer's decision in this regard. Management can concentrate efforts on the improvement of service, keeping in mind these priorities.

Objective

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

Data Description

The case study is from an open-source dataset from Kaggle. The dataset contains 10,000 sample points with 14 distinct features such as CustomerId, CreditScore, Geography, Gender, Age, Tenure, Balance, etc.

Data Dictionary

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

- **Excited:** It is a categorical variable that decides whether the customer left the bank within six months or not. It can take two values
  - 0=No (Customer did not leave the bank)
  - 1=Yes (Customer left the bank)

In [1]:
```python
from google.colab import drive
drive.mount('/content/drive')
```

Mounted at /content/drive

In [2]:
```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
sns.set()
from matplotlib import pyplot
from scipy import stats
from sklearn.model_selection import train_test_split
from sklearn import preprocessing
from sklearn.preprocessing import StandardScaler
from sklearn.metrics import explained_variance_score, mean_squared_error, r2_sco
from collections import Counter
from keras import callbacks
import tensorflow as tf
from tensorflow.keras.layers import Dense, Dropout,InputLayer
from tensorflow.keras.models import Sequential
from keras.layers import BatchNormalization
from tensorflow.keras import regularizers
from tensorflow.keras import backend
from random import shuffle
from keras.callbacks import ModelCheckpoint
from tensorflow.keras.optimizers import Adam
from tensorflow.keras.optimizers import RMSprop
import keras
import sys
from keras.models import Sequential
from keras.layers import Dense
import warnings
warnings.filterwarnings("ignore")
```

Reading the Dataset

In [3]:
```python
#Since data is in form of excel file we have to use pandas pd.read_excel to load
data = pd.read_csv('/content/drive/MyDrive/Churn.csv')
```

Print the first five rows of the data

In [5]:
```python
data.head()
```

Out[5]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance
0	1	15634602	Hargrave	619	France	Female	42	2	0.00

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

In [6]:
```python
#Information about the data
data.info()
```

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

In [7]:
```python
#Checking the shape of the data
data.shape
```

Out[7]: (10000, 14)

In [8]:
```python
#finding the null values
data.isnull().sum()
```

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

In [9]:
```python
#Checking the dtypes of the variables in the data
data.dtypes
```

Out[9]:
```
RowNumber            int64
CustomerId           int64
Surname             object
CreditScore          int64
Geography           object
Gender              object
Age                  int64
Tenure               int64
Balance            float64
NumOfProducts        int64
HasCrCard            int64
IsActiveMember       int64
EstimatedSalary    float64
Exited               int64
dtype: object
```

In [10]:
```python
#Checking the unique values in the data
data.nunique()
```

Out[10]:
```
RowNumber          10000
CustomerId         10000
Surname             2932
CreditScore          460
Geography              3
Gender                 2
Age                   70
Tenure                11
Balance             6382
NumOfProducts          4
HasCrCard              2
IsActiveMember         2
EstimatedSalary     9999
Exited                 2
dtype: int64
```

In [6]:
```python
# Drop the columns RowNumber , CustomerID and SurName since we have default seri
#data = data.drop(["RowNumber", "CustomerId", "Surname"], axis = 1)
```

In [12]:
```python
# Review the top rows of what is left of the data frame
data.head()
```

Out[12]:

	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiv
0	619	France	Female	42	2	0.00	1	1	
1	608	Spain	Female	41	1	83807.86	1	0	
2	502	France	Female	42	8	159660.80	3	1	
3	699	France	Female	39	1	0.00	2	0	
4	850	Spain	Female	43	2	125510.82	1	1	

Exploratory Data Analysis

Univariate Analysis

In [7]:
```python
# function to create labeled barplots


def labeled_barplot(data, feature, perc=False, n=None):
    """
    Barplot with percentage at the top

    data: dataframe
    feature: dataframe column
    perc: whether to display percentages instead of count (default is False)
    n: displays the top n category levels (default is None, i.e., display all le
    """

    total = len(data[feature])  # length of the column
    count = data[feature].nunique()
    if n is None:
        plt.figure(figsize=(count + 1, 5))
    else:
        plt.figure(figsize=(n + 1, 5))

    plt.xticks(rotation=90, fontsize=15)
    ax = sns.countplot(
        data=data,
        x=feature,
        palette="Paired",
        order=data[feature].value_counts().index[:n].sort_values(),
    )

    for p in ax.patches:
        if perc == True:
            label = "{:.1f}%".format(
                100 * p.get_height() / total
            )  # percentage of each class of the category
        else:
            label = p.get_height()  # count of each level of the category

        x = p.get_x() + p.get_width() / 2  # width of the plot
        y = p.get_height()  # height of the plot

        ax.annotate(
            label,
            (x, y),
            ha="center",
            va="center",
            size=12,
            xytext=(0, 5),
            textcoords="offset points",
        )  # annotate the percentage

    plt.show()  # show the plot
```

In [14]:
```python
labeled_barplot(data, "Geography", perc=True)
```
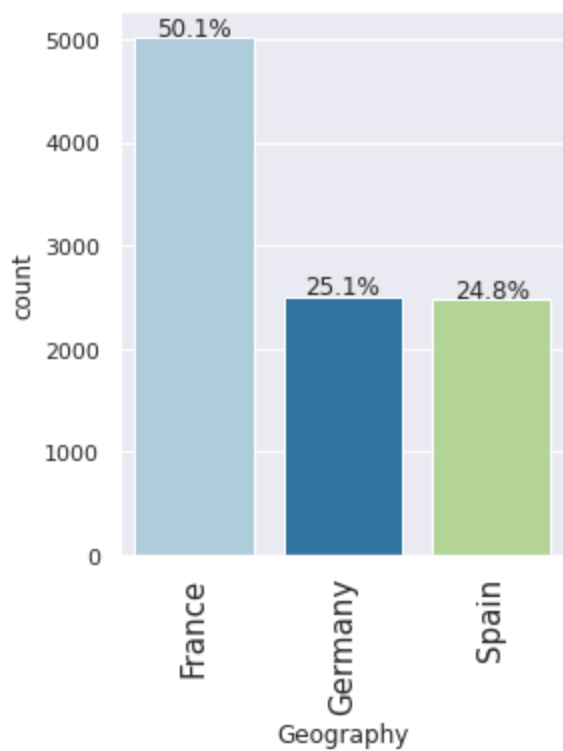
Observations:

- Most of the data is from France(50.1%).
- Comparatively lowest is Spain(24.8%).

In [15]:
```python
labeled_barplot(data, "Gender", perc=True)
```
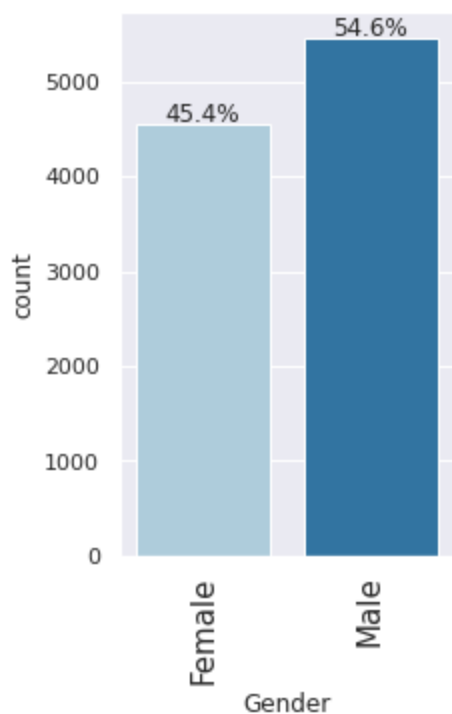

Observations:

- Most of the customers are male(54.6%) in the dataset.

In [16]:
```
labeled_barplot(data, "Tenure", perc=True)
```
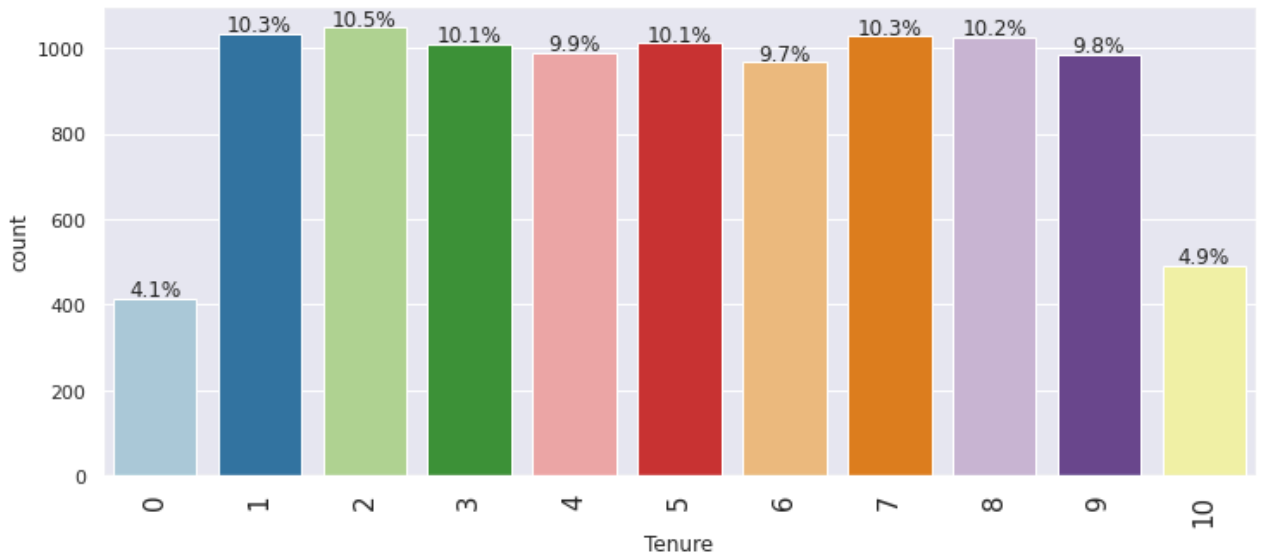

Observations:

- Looks like almost 1 year to 9 years of tenure customers are almost equal but more than 10 years of tenure customers and less than 1 year customers are very less.

In [17]:
```
labeled_barplot(data, "NumOfProducts", perc=True)
```
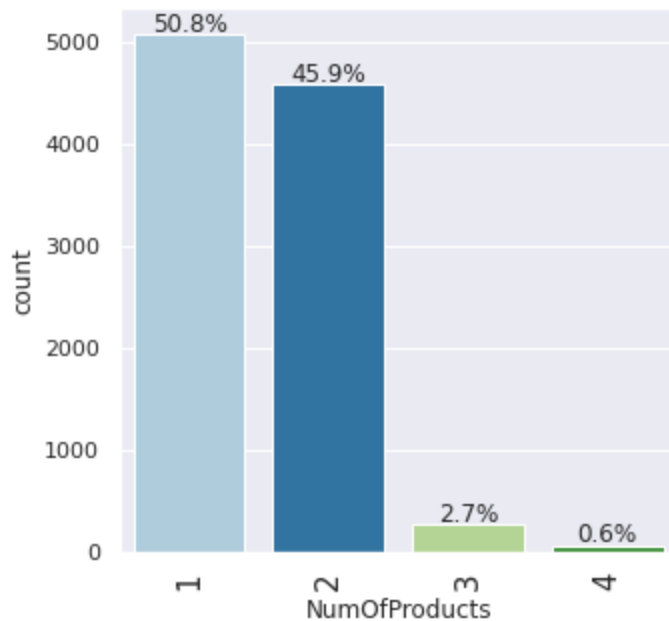

Observations:

- Most of the customers(50.8%) purchased 1 product through bank and second highest(45.9%) is 2 products.

In [18]:
```
labeled_barplot(data, "HasCrCard", perc=True)
```
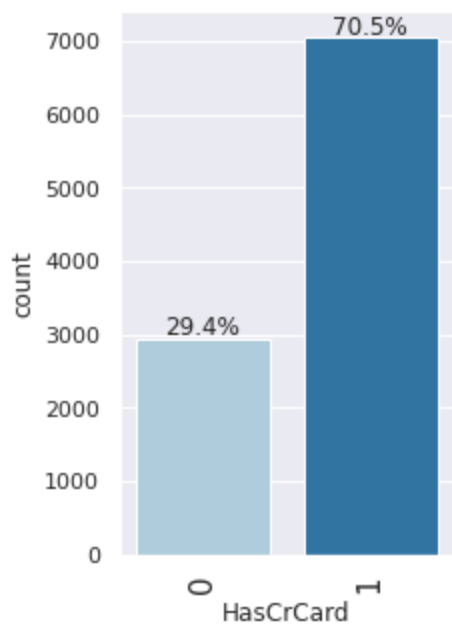
Observations:

- 70.5% of the customers has credit card.

In [19]:
```
labeled_barplot(data, "IsActiveMember", perc=True)
```
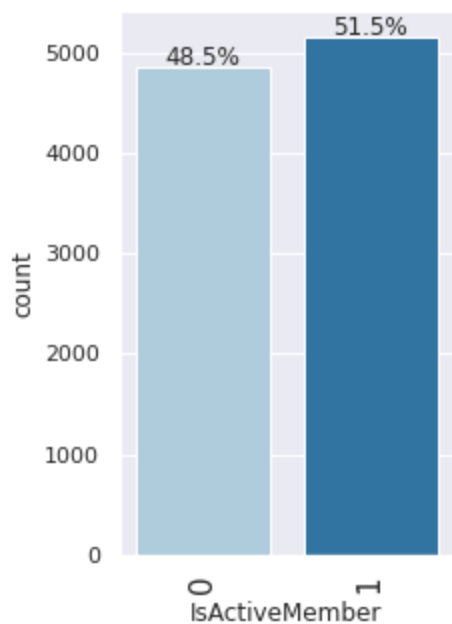

Observations:

- Active customers(51.5%) are higher than non active customers(48.5%)

In [20]:
```
labeled_barplot(data, "Exited", perc=True)
```
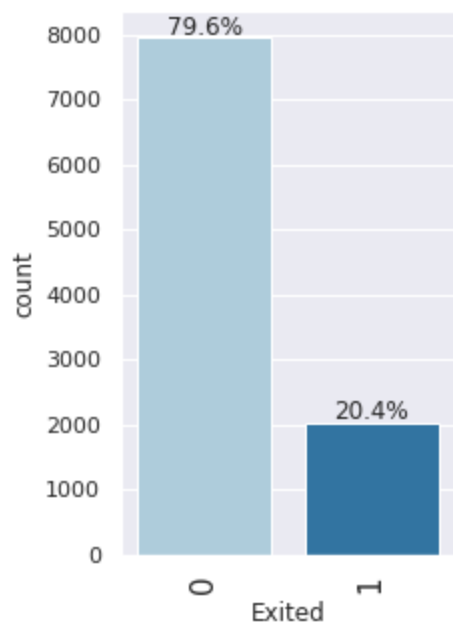
Observations:

- 79.6% of the customers didn't leave the bank.
- 20.4% of the customers left the bank.

Bivariate analysis

In [21]:
```python
plt.figure(figsize=(15, 7))
sns.heatmap(
    data.corr(), annot=True, vmin=-1, vmax=1, fmt=".2f", cmap="Spectral"
)
plt.show()
```
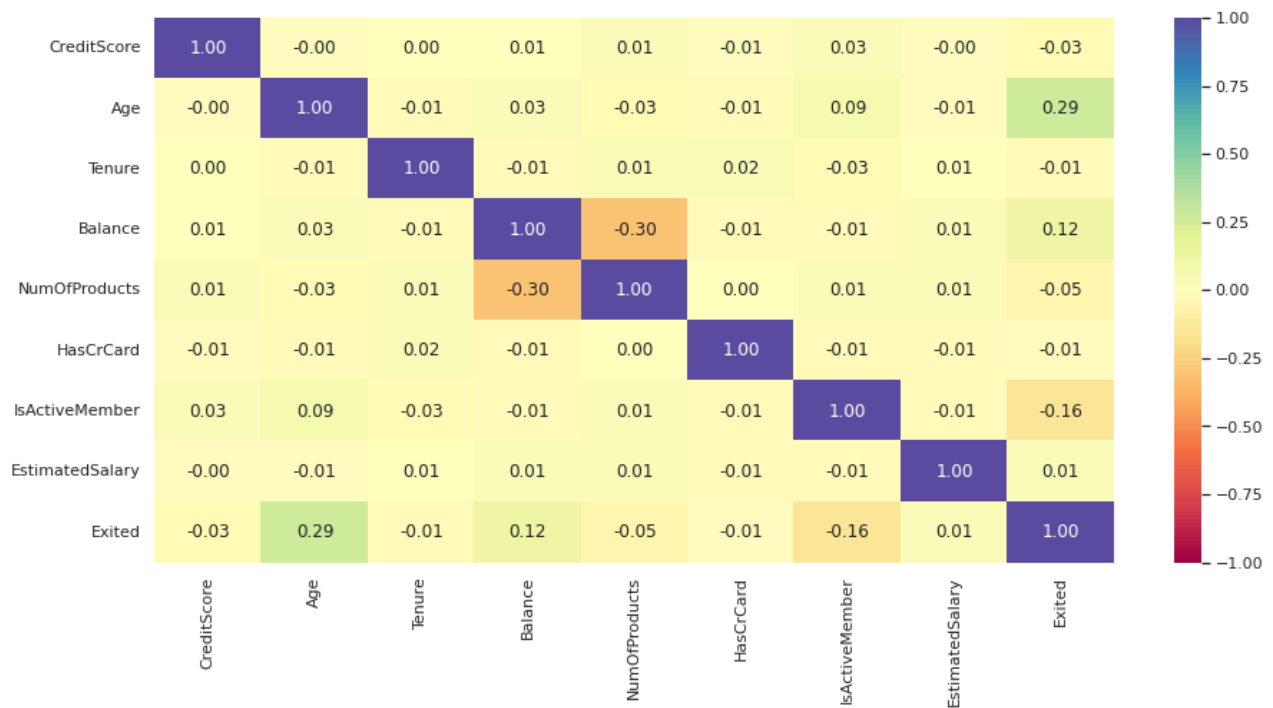

Observations:

- Dependent variable Exited shows a moderate correlation with 'Age'.
- Balance, and EstimatedSalary also shows moderate positive correlation with Exited.
- CreditScore, Tenure , NumOfProducts, HasCrCard and IsActiveMember has negative correlations with Exited

Geography vs Exited

In [25]:
```python
plt.figure(figsize=(15,7))
sns.countplot(x='Geography',hue='Exited', data=data);
```
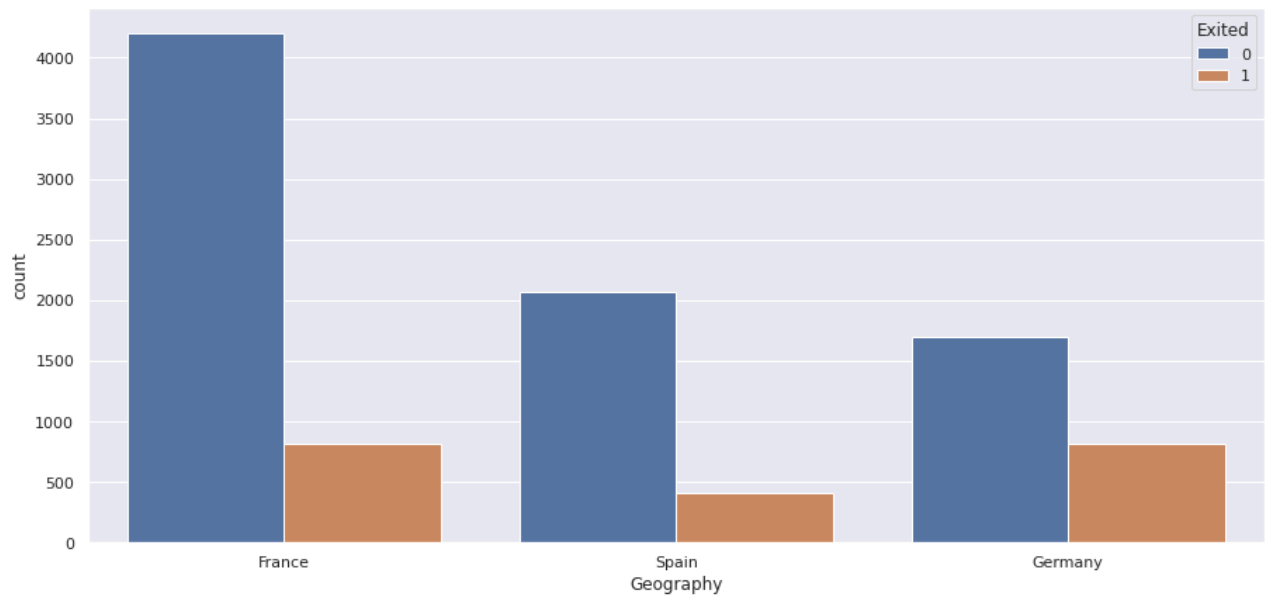

Observations:

- Most of the data is from France.
- In Germany churned customer percent looks almost 50%.

Gender vs Exited

In [26]:
```python
plt.figure(figsize=(15,7))
sns.countplot(x='Gender',hue='Exited', data=data);
```
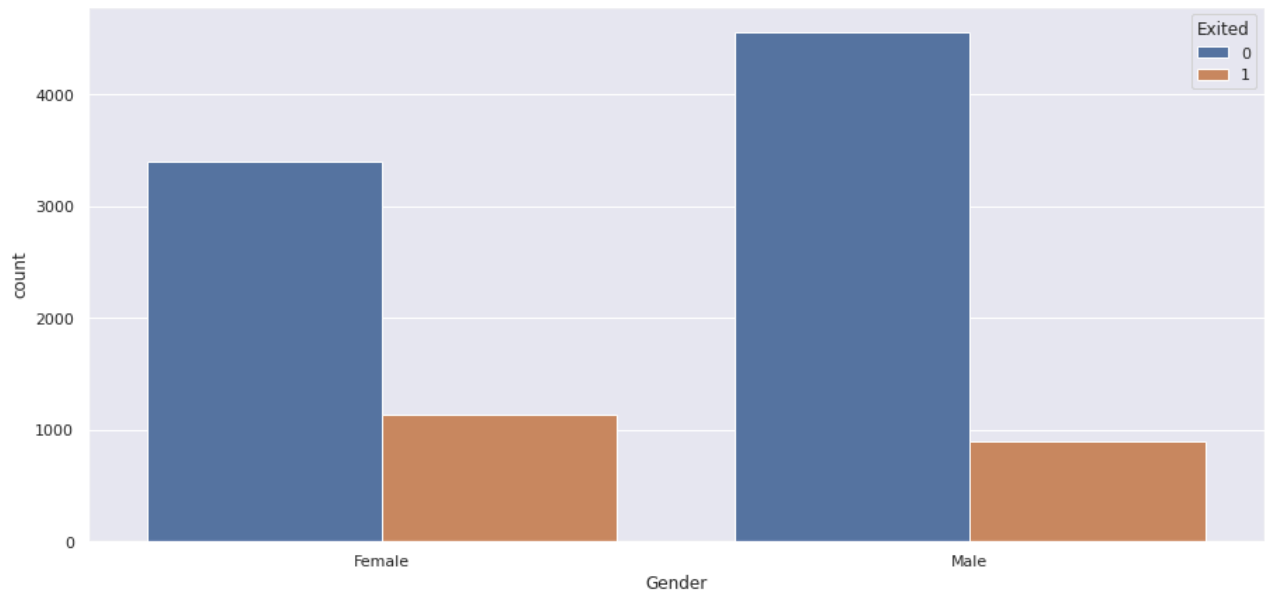
Observations:

- Female customers are churning greater than male customers.

HasCrCard vs Exited

In [27]:
```python
plt.figure(figsize=(15,7))
sns.countplot(x='HasCrCard',hue='Exited', data=data);
```
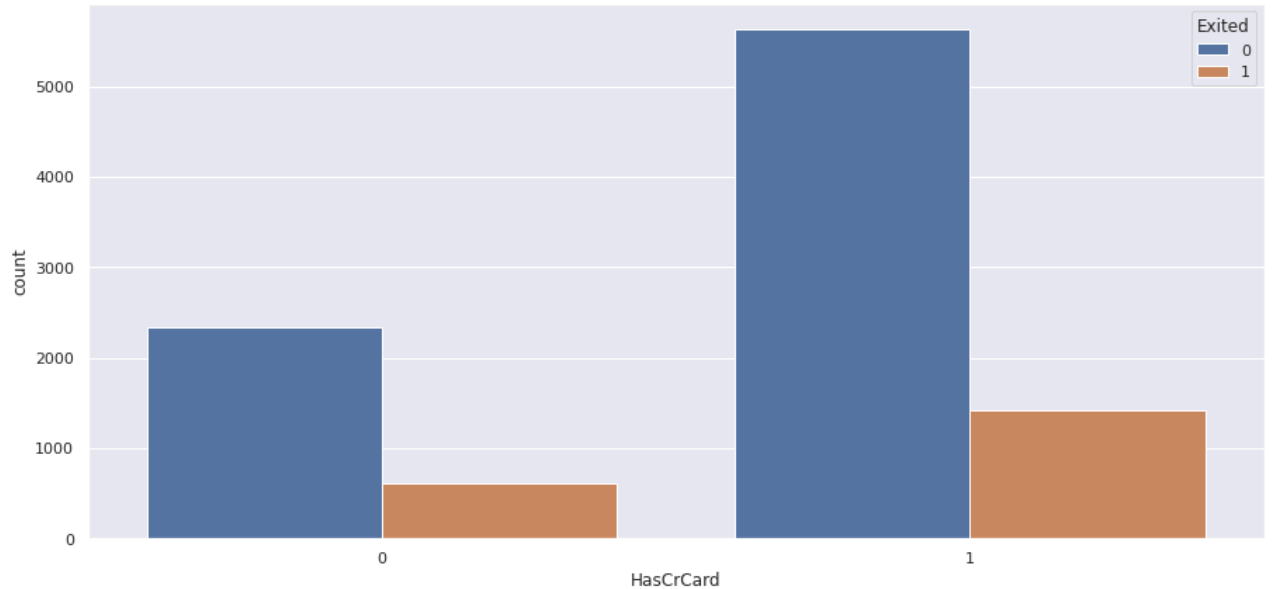

Observations:

- Majority of the customers that churned are those with credit cards.

IsActiveMember vs Exited

In [28]:
```python
plt.figure(figsize=(15,7))
sns.countplot(x='IsActiveMember',hue='Exited', data=data);
```
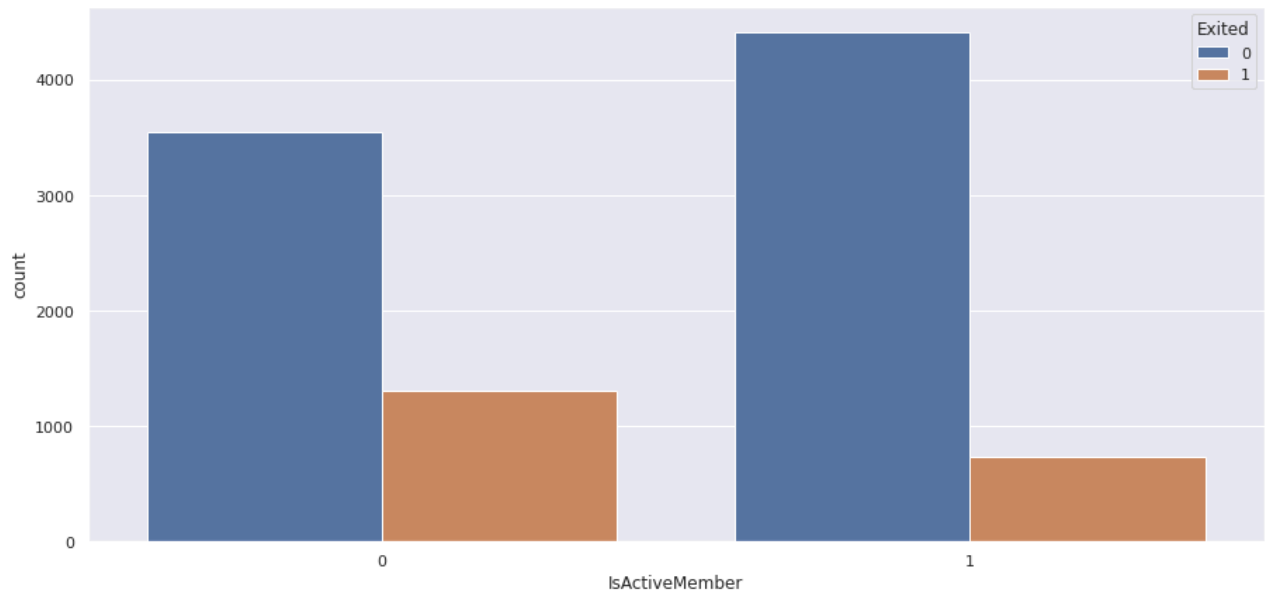
Observations:

- Majority of the customers that churned are those with credit cards.

Tenure vs Exited

In [29]:
```python
plt.figure(figsize=(15,7))
sns.countplot(x='Tenure',hue='Exited', data=data);
```
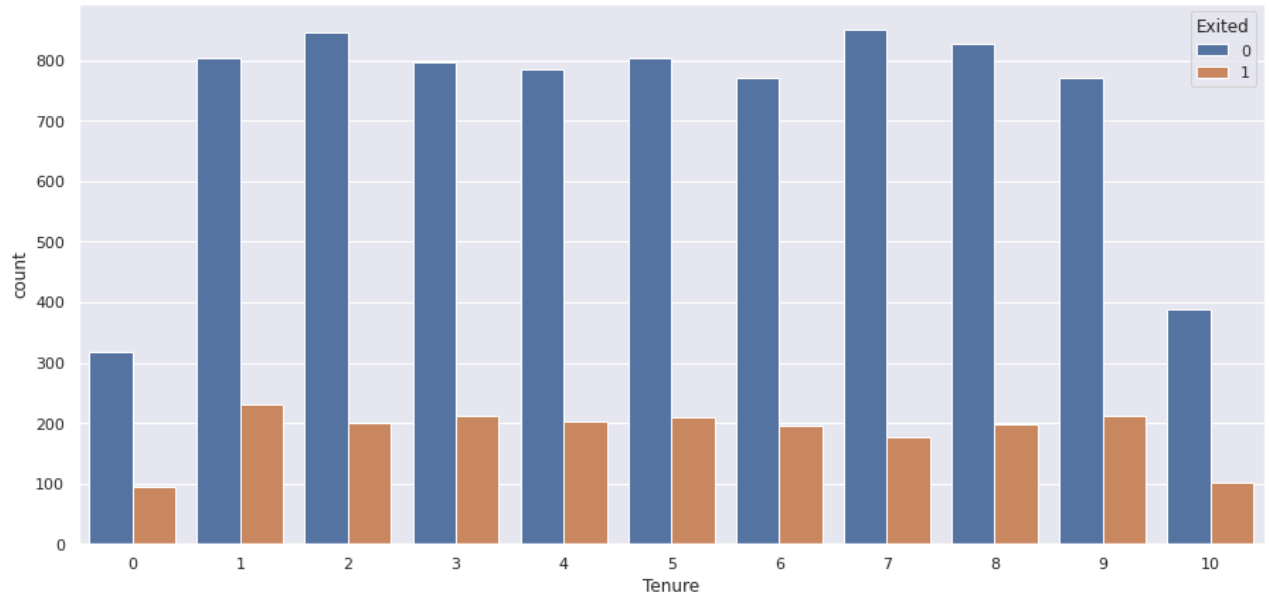

Observations:

- Seems like customers who has less than 1 year and more than 10 years tenure customers are more likely churning higher.

NumOfProducts vs Exited

In [30]:
```python
plt.figure(figsize=(15,7))
sns.countplot(x='NumOfProducts',hue='Exited', data=data);
```
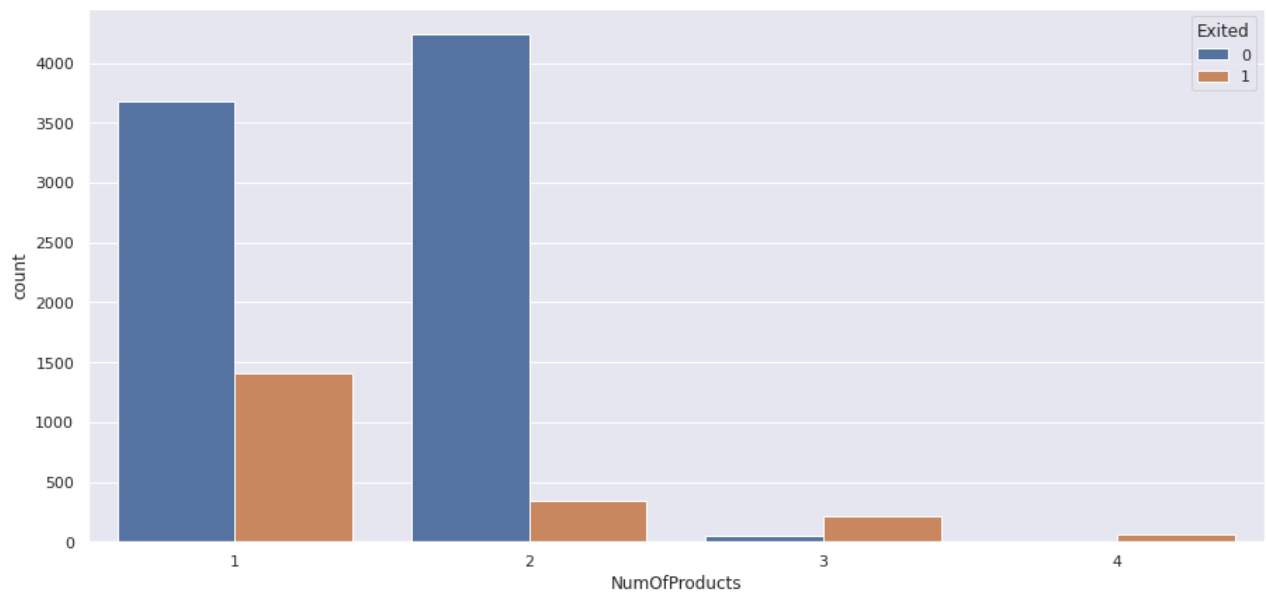

Observations:

- Customers who buy 2 products through bank are higher in the dataset but they are churning less than customers buy 1 product.

CreditScore vs Exited

In [8]:
```python
### Function to plot boxplot
def boxplot(x):
    plt.figure(figsize=(10,7))
    sns.boxplot(data=data, x="Exited",y=data[x],palette="PuBu")
    plt.show()
```

In [33]:
```python
boxplot('CreditScore')
```
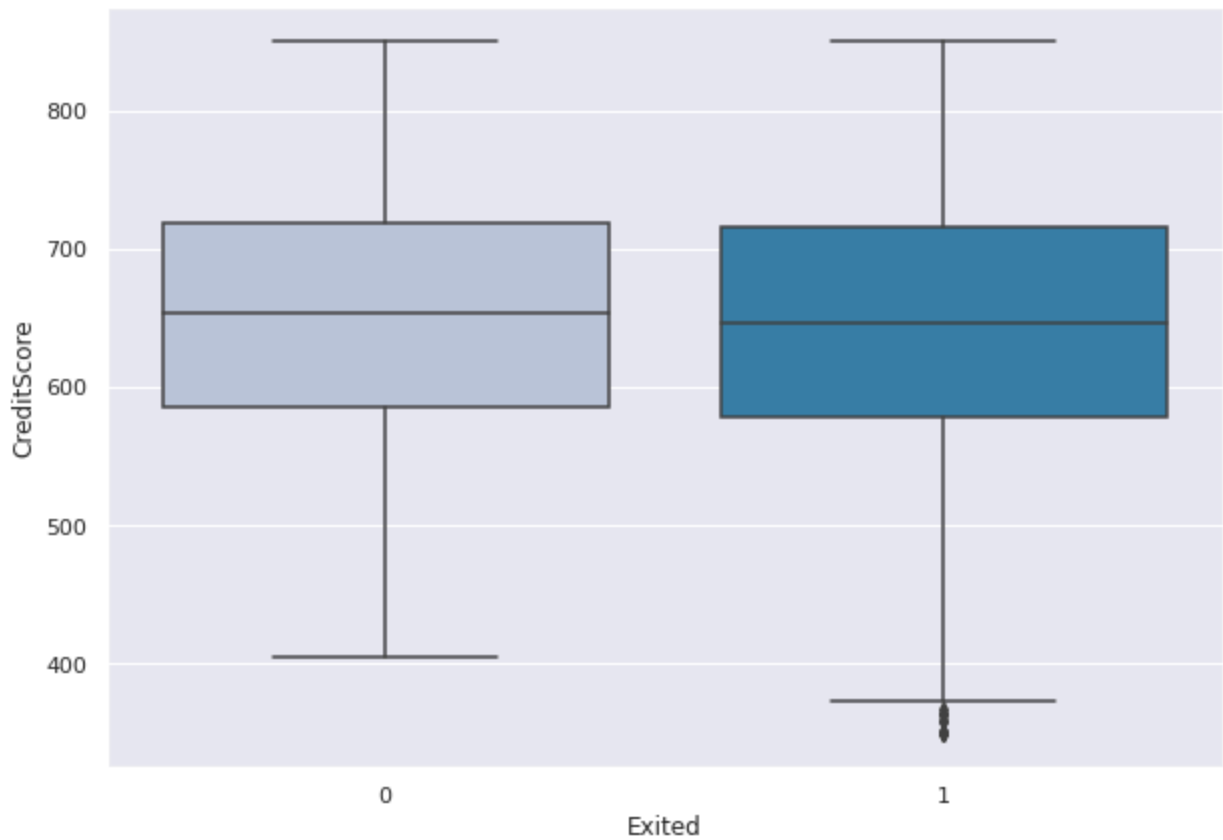
Observations:

- There is no much difference in the credit score distribution between existing and churned customers.

Age vs Exited

In [34]:

```
boxplot('Age')
```
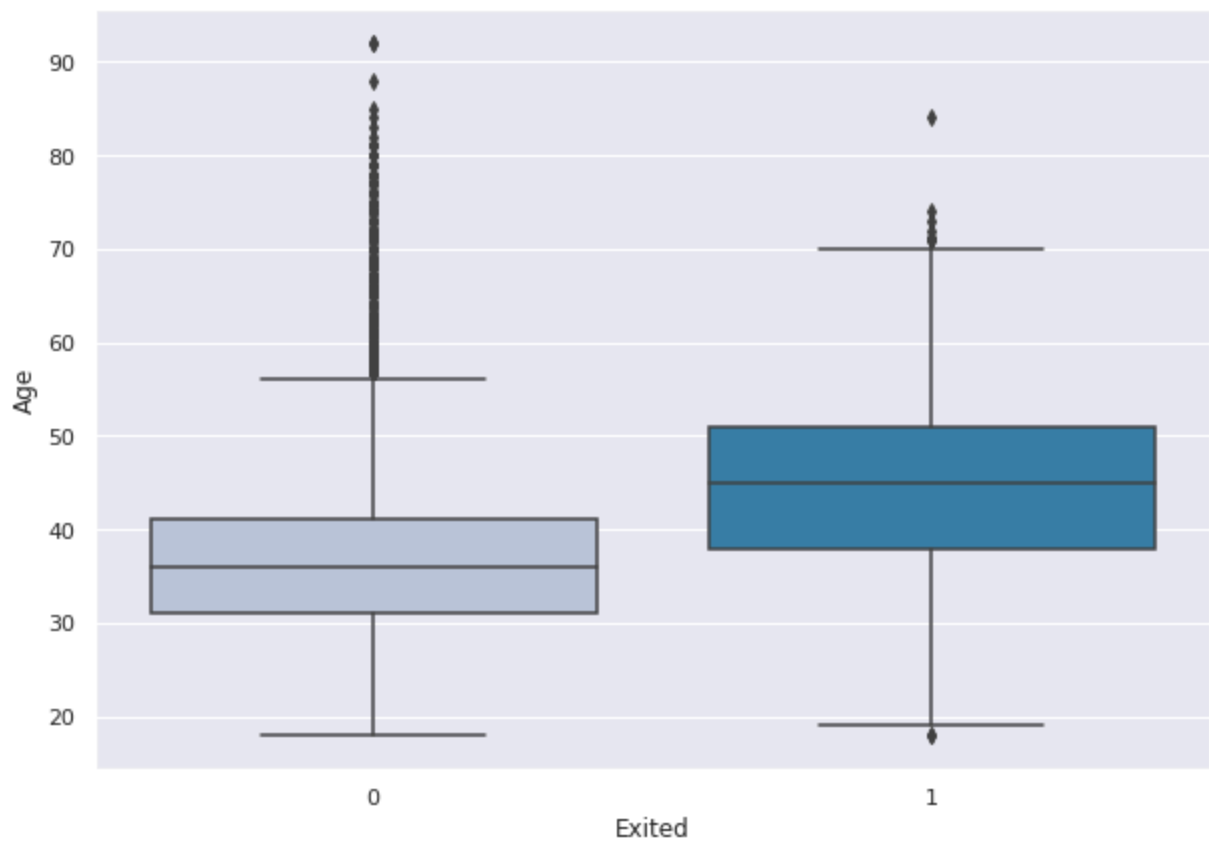
Observations:

- Older customers are churning more than the younger customers.

Balance vs Exited

In [35]:
```
boxplot('Balance')
```
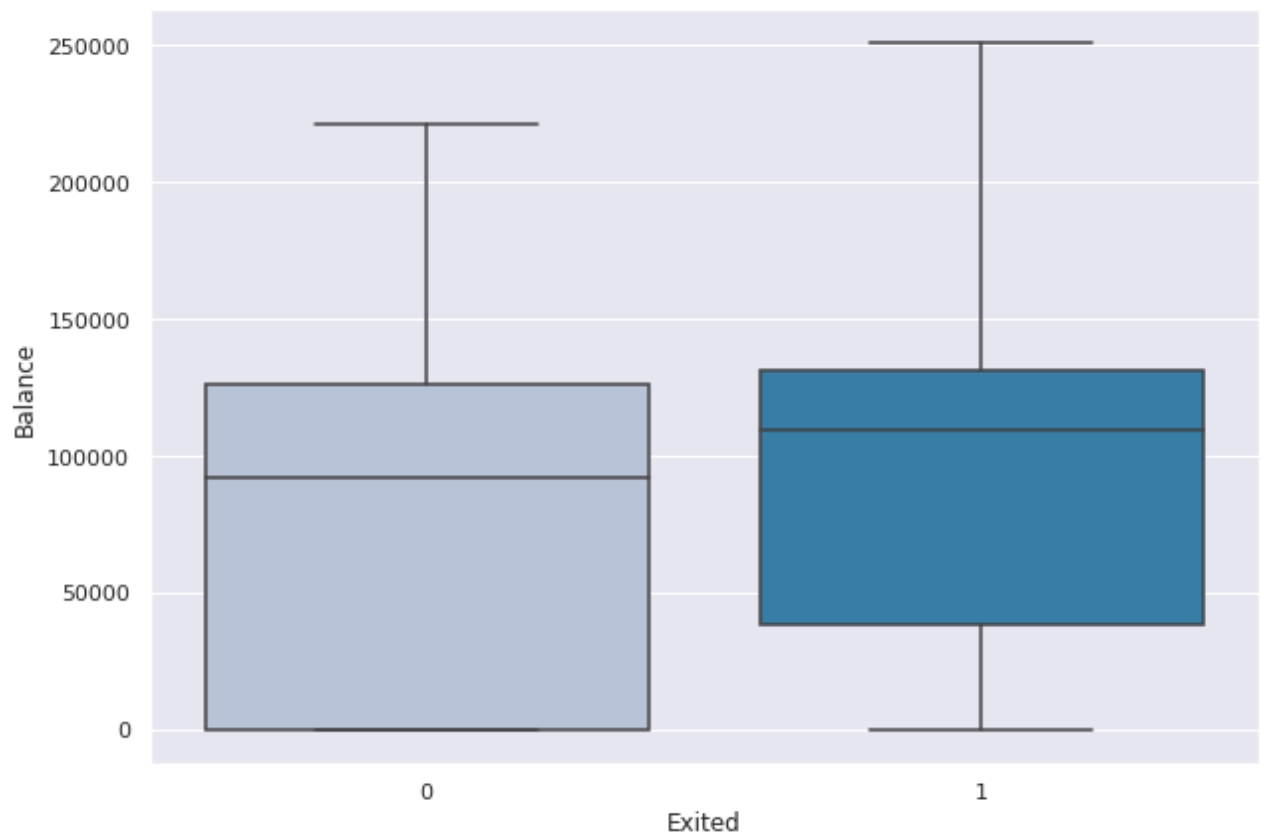
Observations:

- The bank is losing customers with significant bank balances.

EstimatedSalary vs Exited

```
In [36]:  boxplot('EstimatedSalary')
```
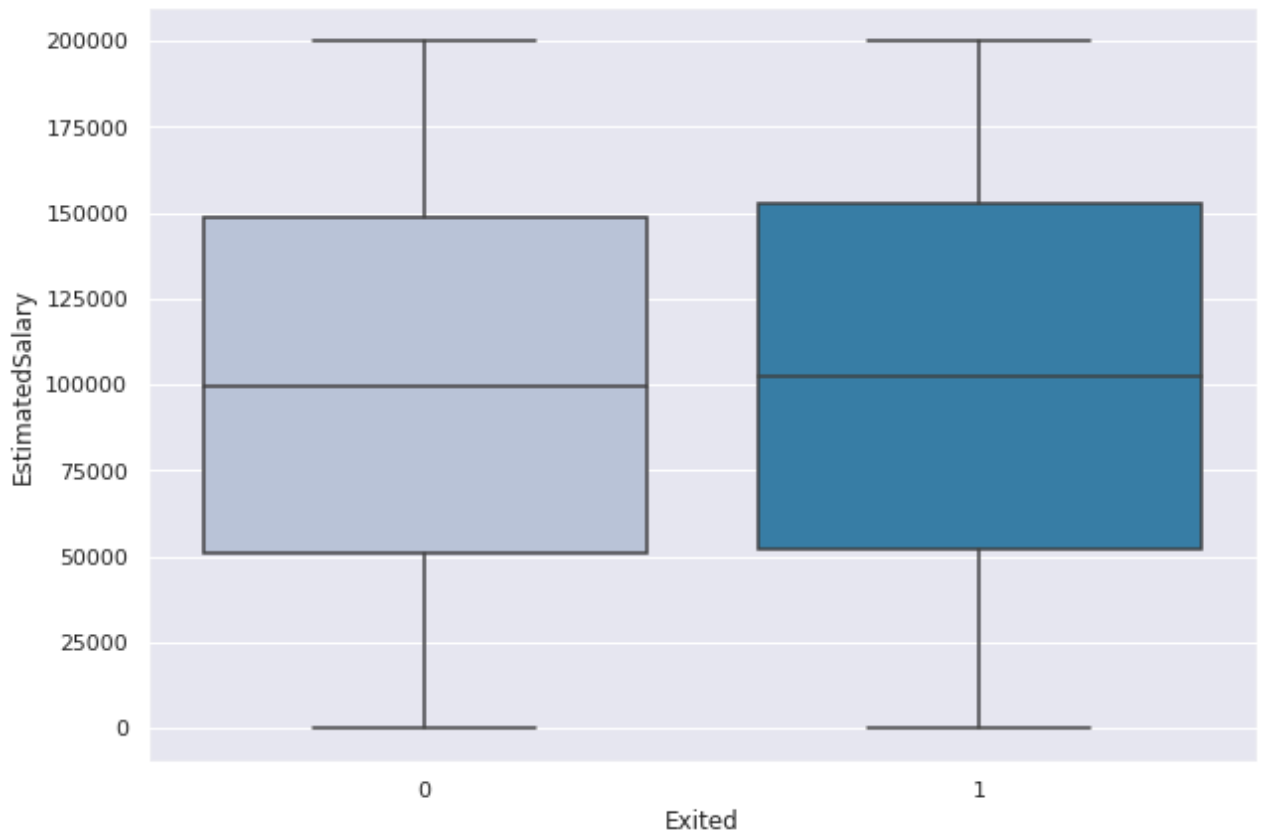
Observations:

- There is no much difference in the estimated salary distribution between existing and churned customers.

Feature engineering

In [4]:
```python
##Splitting Independent and dependent variable in X and Y respectively
#Dropping unwanted columns since it doesn't make any impact on the reuslt
X = data.iloc[:, 3:13].values
y = data.iloc[:, 13].values
```

In [5]:
```python
# Encoding categorical data
# Encoding the Independent Variable
from sklearn.preprocessing import LabelEncoder, OneHotEncoder
from sklearn.compose import ColumnTransformer

# Geography
labelencoder_X = LabelEncoder()
X[:, 1] = labelencoder_X.fit_transform(X[:, 1])

# Gender
labelencoder_X_2 = LabelEncoder()
X[:, 2] = labelencoder_X_2.fit_transform(X[:, 2])

ct = ColumnTransformer([('oh_enc', OneHotEncoder(), [1])], remainder='passthroug
X = ct.fit_transform(X) #.toarray()
X = X[:, 1:]
```

In [6]:
```python
# Splitting the dataset into the Training and Testing set
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.2, rando
sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)
```

In [31]:
```python
X_train.head()
```

Out[31]:

	CreditScore	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	Estima
9069	619	32	4	175406.13	2	1	1	
2603	643	34	7	160426.07	1	0	1	
7738	561	33	6	0.00	2	0	0	
1579	618	41	8	37702.79	1	1	1	
5058	714	37	9	148466.93	2	0	1	

Model Building

- We will now start with the model building process.
- We will create a model.
- Three hidden layer with ReLU as activation function.
- Output layer with 1 nodes (For regression problem)

In [7]:
```python
model = Sequential()
model.add(Dense(6, activation='relu',kernel_initializer='uniform', input_shape=(
model.add(Dense(6, activation='relu',kernel_initializer='uniform'))
model.add(Dense(1, activation='sigmoid',kernel_initializer='uniform'))

model.compile(optimizer = 'adam',loss= "binary_crossentropy",metrics=["accuracy"
```

In [82]:
```python
model.summary()
```

```
Model: "sequential_4"
_____
 Layer (type)                Output Shape              Param #
=================================================================
 dense_12 (Dense)            (None, 6)                 72

 dense_13 (Dense)            (None, 6)                 42

 dense_14 (Dense)            (None, 1)                 7

=================================================================
Total params: 121
Trainable params: 121
Non-trainable params: 0
_____
```

Observations

- The summary of the model shows each layer's name, type, output shape, and the number of parameters at that particular layer.
- It also shows the total number of trainable and non-trainable parameters in the model. A parameter whose value is learned while training the model is called a trainable parameter otherwise it is called a non-trainable parameter.

In [8]:
```python
model.fit(X_train, y_train, batch_size = 10, epochs = 100)
```

```
Epoch 1/100
800/800 [==============================] - 2s 2ms/step - loss: 0.4767 - accurac
y: 0.7960
Epoch 2/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4264 - accurac
y: 0.7960
Epoch 3/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4206 - accurac
y: 0.8071
Epoch 4/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4174 - accurac
y: 0.8261
Epoch 5/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4157 - accurac
y: 0.8282
Epoch 6/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4141 - accurac
y: 0.8288
Epoch 7/100
800/800 [==============================] - 3s 3ms/step - loss: 0.4127 - accurac
y: 0.8313
Epoch 8/100
800/800 [==============================] - 2s 2ms/step - loss: 0.4116 - accurac
y: 0.8317
Epoch 9/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4107 - accurac
y: 0.8313
Epoch 10/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4097 - accurac
y: 0.8331
Epoch 11/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4090 - accurac
y: 0.8341
Epoch 12/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4081 - accurac
y: 0.8338
Epoch 13/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4082 - accurac
y: 0.8336
Epoch 14/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4072 - accurac
y: 0.8339
Epoch 15/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4067 - accurac
y: 0.8328
Epoch 16/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4065 - accurac
y: 0.8332
Epoch 17/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4065 - accurac
y: 0.8339
Epoch 18/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4059 - accurac
```

```
y: 0.8330
Epoch 19/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4056 - accurac
y: 0.8347
Epoch 20/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4052 - accurac
y: 0.8351
Epoch 21/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4051 - accurac
y: 0.8329
Epoch 22/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4050 - accurac
y: 0.8338
Epoch 23/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4054 - accurac
y: 0.8328
Epoch 24/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4045 - accurac
y: 0.8342
Epoch 25/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4040 - accurac
y: 0.8345
Epoch 26/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4034 - accurac
y: 0.8344
Epoch 27/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4036 - accurac
y: 0.8328
Epoch 28/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4037 - accurac
y: 0.8339
Epoch 29/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4028 - accurac
y: 0.8331
Epoch 30/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4033 - accurac
y: 0.8344
Epoch 31/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4029 - accurac
y: 0.8349
Epoch 32/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4031 - accurac
y: 0.8345
Epoch 33/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4029 - accurac
y: 0.8339
Epoch 34/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4027 - accurac
y: 0.8355
Epoch 35/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4029 - accurac
y: 0.8341
Epoch 36/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4021 - accurac
y: 0.8345
Epoch 37/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4027 - accurac
y: 0.8350
Epoch 38/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4027 - accurac
y: 0.8336
Epoch 39/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4022 - accurac
y: 0.8345
Epoch 40/100
```

```
800/800 [==============================] – 1s 1ms/step – loss: 0.4021 – accurac
y: 0.8341
Epoch 41/100
800/800 [==============================] – 1s 2ms/step – loss: 0.4027 – accurac
y: 0.8349
Epoch 42/100
800/800 [==============================] – 1s 2ms/step – loss: 0.4024 – accurac
y: 0.8340
Epoch 43/100
800/800 [==============================] – 1s 2ms/step – loss: 0.4024 – accurac
y: 0.8339
Epoch 44/100
800/800 [==============================] – 1s 2ms/step – loss: 0.4021 – accurac
y: 0.8346
Epoch 45/100
800/800 [==============================] – 1s 1ms/step – loss: 0.4022 – accurac
y: 0.8341
Epoch 46/100
800/800 [==============================] – 1s 1ms/step – loss: 0.4027 – accurac
y: 0.8334
Epoch 47/100
800/800 [==============================] – 1s 2ms/step – loss: 0.4020 – accurac
y: 0.8319
Epoch 48/100
800/800 [==============================] – 1s 1ms/step – loss: 0.4022 – accurac
y: 0.8341
Epoch 49/100
800/800 [==============================] – 1s 2ms/step – loss: 0.4021 – accurac
y: 0.8346
Epoch 50/100
800/800 [==============================] – 1s 1ms/step – loss: 0.4020 – accurac
y: 0.8345
Epoch 51/100
800/800 [==============================] – 1s 1ms/step – loss: 0.4020 – accurac
y: 0.8332
Epoch 52/100
800/800 [==============================] – 1s 1ms/step – loss: 0.4024 – accurac
y: 0.8325
Epoch 53/100
800/800 [==============================] – 1s 1ms/step – loss: 0.4020 – accurac
y: 0.8355
Epoch 54/100
800/800 [==============================] – 1s 1ms/step – loss: 0.4024 – accurac
y: 0.8330
Epoch 55/100
800/800 [==============================] – 1s 1ms/step – loss: 0.4021 – accurac
y: 0.8336
Epoch 56/100
800/800 [==============================] – 1s 1ms/step – loss: 0.4015 – accurac
y: 0.8338
Epoch 57/100
800/800 [==============================] – 1s 2ms/step – loss: 0.4017 – accurac
y: 0.8338
Epoch 58/100
800/800 [==============================] – 1s 1ms/step – loss: 0.4015 – accurac
y: 0.8330
Epoch 59/100
800/800 [==============================] – 1s 2ms/step – loss: 0.4017 – accurac
y: 0.8334
Epoch 60/100
800/800 [==============================] – 1s 2ms/step – loss: 0.4014 – accurac
y: 0.8332
Epoch 61/100
800/800 [==============================] – 1s 1ms/step – loss: 0.4022 – accurac
y: 0.8349
```

```
Epoch 62/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4015 - accurac
y: 0.8338
Epoch 63/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4016 - accurac
y: 0.8336
Epoch 64/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4019 - accurac
y: 0.8344
Epoch 65/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4017 - accurac
y: 0.8322
Epoch 66/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4015 - accurac
y: 0.8330
Epoch 67/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4018 - accurac
y: 0.8341
Epoch 68/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4014 - accurac
y: 0.8342
Epoch 69/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4018 - accurac
y: 0.8344
Epoch 70/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4019 - accurac
y: 0.8332
Epoch 71/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4011 - accurac
y: 0.8324
Epoch 72/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4013 - accurac
y: 0.8363
Epoch 73/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4010 - accurac
y: 0.8347
Epoch 74/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4018 - accurac
y: 0.8328
Epoch 75/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4015 - accurac
y: 0.8335
Epoch 76/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4015 - accurac
y: 0.8335
Epoch 77/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4013 - accurac
y: 0.8340
Epoch 78/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4019 - accurac
y: 0.8329
Epoch 79/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4017 - accurac
y: 0.8344
Epoch 80/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4018 - accurac
y: 0.8335
Epoch 81/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4015 - accurac
y: 0.8332
Epoch 82/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4010 - accurac
y: 0.8331
Epoch 83/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4009 - accurac
```

```
y: 0.8336
Epoch 84/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4016 - accurac
y: 0.8344
Epoch 85/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4017 - accurac
y: 0.8330
Epoch 86/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4013 - accurac
y: 0.8342
Epoch 87/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4013 - accurac
y: 0.8353
Epoch 88/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4015 - accurac
y: 0.8329
Epoch 89/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4016 - accurac
y: 0.8349
Epoch 90/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4011 - accurac
y: 0.8346
Epoch 91/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4009 - accurac
y: 0.8339
Epoch 92/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4013 - accurac
y: 0.8335
Epoch 93/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4016 - accurac
y: 0.8339
Epoch 94/100
800/800 [==============================] - 1s 1ms/step - loss: 0.4013 - accurac
y: 0.8344
Epoch 95/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4010 - accurac
y: 0.8347
Epoch 96/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4015 - accurac
y: 0.8330
Epoch 97/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4011 - accurac
y: 0.8347
Epoch 98/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4015 - accurac
y: 0.8328
Epoch 99/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4011 - accurac
y: 0.8334
Epoch 100/100
800/800 [==============================] - 1s 2ms/step - loss: 0.4011 - accurac
y: 0.8359
```

Out[8]: `<keras.callbacks.History at 0x7f6ceb42ea50>`

- Here the model seems to be overfitted, as the distance between the train curve and validation curve started increasing.

In [9]:
```python
# Checking model performance on train set
#Predicting the Test set results
y_pred = model.predict(X_test)
#Threshold of 50%
```

```
          y_pred = (y_pred > 0.5)
          y_pred
```

Out[9]: array([[False],
                [False],
                [False],
                ...,
                [False],
                [False],
                [False]])

In [10]:
```
#Making the COnfusion Matrix
from sklearn.metrics import confusion_matrix
cm = confusion_matrix(y_test, y_pred)
cm
```

Out[10]: array([[1548,   47],
                [266,   139]])

In [11]:
```
accuracy = (1518+196)/(2000)
accuracy
```

Out[11]: 0.857

So, our model is able to predict the probability of our clients leaving the bank with an accuracy of approx 86%.

In [12]:
```
from keras.wrappers.scikit_learn import KerasClassifier
from sklearn.model_selection import cross_val_score
```

In [13]:
```
#Import Keras library and packages
import keras
from keras.models import Sequential
from keras.layers import Dense

def build_classifier():
    classifier = Sequential()
    classifier.add(Dense(units = 6, kernel_initializer = 'uniform', activation
    classifier.add(Dense(units = 6, kernel_initializer = 'uniform', activation
    classifier.add(Dense(units = 1, kernel_initializer = 'uniform', activation
    classifier.compile(optimizer = 'adam',loss = "binary_crossentropy",metrics=
    return classifier
#fit our model to the traing data using KerasClassifier
classifier = KerasClassifier(build_fn = build_classifier, batch_size = 10, epoch
accuracies = cross_val_score(estimator = classifier, X = X_train, y = y_train, c
```

In [14]:
```
mean = accuracies.mean()
variance = accuracies.std()
```

Let's try with hyperparameter tuning

In [15]:
```
from keras.layers import Dropout
```

In [25]:

```python
#Input Layer with dropout
classifier = Sequential()
classifier.add(Dense(units = 6, kernel_initializer = 'uniform', activation = 're
classifier.add(Dropout(0.1))
#First Hidden Layer with dropout
classifier.add(Dense(units = 6, kernel_initializer = 'uniform', activation = 're
classifier.add(Dropout(0.1))
```

Tuning the ANN

In [26]:

```python
# Tuning the ANN
from keras.wrappers.scikit_learn import KerasClassifier
from sklearn.model_selection import GridSearchCV
from keras.models import Sequential
from keras.layers import Dense
def build_classifier(optimizer):
    classifier = Sequential()
    classifier.add(Dense(units = 6, kernel_initializer = 'uniform', activation
    classifier.add(Dense(units = 6, kernel_initializer = 'uniform', activation
    classifier.add(Dense(units = 1, kernel_initializer = 'uniform', activation
    classifier.compile(optimizer = optimizer, loss = 'binary_crossentropy', met
    return classifier
classifier = KerasClassifier(build_fn = build_classifier)
parameters = {'batch_size': [25, 32],'epochs': [100, 500], 'optimizer': ['adam',
grid_search = GridSearchCV(estimator = classifier,
param_grid = parameters, scoring = 'accuracy',cv = 10)
grid_search = grid_search.fit(X_train, y_train)
best_parameters = grid_search.best_params_
best_accuracy = grid_search.best_score_
```

```
Streaming output truncated to the last 5000 lines.
225/225 [==============================] - 1s 3ms/step - loss: 0.6126 - accurac
y: 0.7956
Epoch 2/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4582 - accurac
y: 0.7969
Epoch 3/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4366 - accurac
y: 0.7969
Epoch 4/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4316 - accurac
y: 0.7969
Epoch 5/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4293 - accurac
y: 0.7969
Epoch 6/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4276 - accurac
y: 0.7969
Epoch 7/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4260 - accurac
y: 0.7969
Epoch 8/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4239 - accurac
y: 0.7969
Epoch 9/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4217 - accurac
y: 0.8086
Epoch 10/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4191 - accurac
```

```
y: 0.8211
Epoch 11/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4171 - accurac
y: 0.8225
Epoch 12/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4150 - accurac
y: 0.8272
Epoch 13/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4129 - accurac
y: 0.8292
Epoch 14/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4109 - accurac
y: 0.8322
Epoch 15/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4094 - accurac
y: 0.8328
Epoch 16/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4081 - accurac
y: 0.8331
Epoch 17/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4067 - accurac
y: 0.8335
Epoch 18/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4057 - accurac
y: 0.8349
Epoch 19/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4049 - accurac
y: 0.8349
Epoch 20/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4041 - accurac
y: 0.8351
Epoch 21/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4031 - accurac
y: 0.8338
Epoch 22/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4021 - accurac
y: 0.8357
Epoch 23/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4020 - accurac
y: 0.8360
Epoch 24/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4013 - accurac
y: 0.8356
Epoch 25/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4006 - accurac
y: 0.8361
Epoch 26/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4000 - accurac
y: 0.8350
Epoch 27/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3999 - accurac
y: 0.8344
Epoch 28/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3993 - accurac
y: 0.8344
Epoch 29/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3989 - accurac
y: 0.8346
Epoch 30/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3986 - accurac
y: 0.8354
Epoch 31/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3980 - accurac
y: 0.8361
Epoch 32/500
```

```
225/225 [==============================] – 1s 2ms/step – loss: 0.3978 – accurac
y: 0.8346
Epoch 33/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3974 – accurac
y: 0.8361
Epoch 34/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3972 – accurac
y: 0.8361
Epoch 35/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3974 – accurac
y: 0.8346
Epoch 36/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3969 – accurac
y: 0.8340
Epoch 37/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3969 – accurac
y: 0.8360
Epoch 38/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3967 – accurac
y: 0.8332
Epoch 39/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3965 – accurac
y: 0.8346
Epoch 40/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3962 – accurac
y: 0.8336
Epoch 41/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3960 – accurac
y: 0.8361
Epoch 42/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3963 – accurac
y: 0.8360
Epoch 43/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3961 – accurac
y: 0.8358
Epoch 44/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3958 – accurac
y: 0.8358
Epoch 45/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3956 – accurac
y: 0.8351
Epoch 46/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3958 – accurac
y: 0.8340
Epoch 47/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3956 – accurac
y: 0.8363
Epoch 48/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3955 – accurac
y: 0.8358
Epoch 49/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3953 – accurac
y: 0.8346
Epoch 50/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3953 – accurac
y: 0.8364
Epoch 51/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3952 – accurac
y: 0.8356
Epoch 52/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3951 – accurac
y: 0.8350
Epoch 53/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3948 – accurac
y: 0.8368
```

```
Epoch 54/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3943 - accurac
y: 0.8364
Epoch 55/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3948 - accurac
y: 0.8357
Epoch 56/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3944 - accurac
y: 0.8364
Epoch 57/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3945 - accurac
y: 0.8374
Epoch 58/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3944 - accurac
y: 0.8374
Epoch 59/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3941 - accurac
y: 0.8360
Epoch 60/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3938 - accurac
y: 0.8389
Epoch 61/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3940 - accurac
y: 0.8368
Epoch 62/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3940 - accurac
y: 0.8353
Epoch 63/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3935 - accurac
y: 0.8358
Epoch 64/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3938 - accurac
y: 0.8368
Epoch 65/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8381
Epoch 66/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3936 - accurac
y: 0.8382
Epoch 67/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3935 - accurac
y: 0.8385
Epoch 68/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8374
Epoch 69/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3933 - accurac
y: 0.8376
Epoch 70/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3933 - accurac
y: 0.8378
Epoch 71/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3933 - accurac
y: 0.8381
Epoch 72/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3935 - accurac
y: 0.8374
Epoch 73/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8385
Epoch 74/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3936 - accurac
y: 0.8383
Epoch 75/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
```

```
y: 0.8376
Epoch 76/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3930 - accurac
y: 0.8381
Epoch 77/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3933 - accurac
y: 0.8388
Epoch 78/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3933 - accurac
y: 0.8382
Epoch 79/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3932 - accurac
y: 0.8368
Epoch 80/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3929 - accurac
y: 0.8393
Epoch 81/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3931 - accurac
y: 0.8386
Epoch 82/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3930 - accurac
y: 0.8381
Epoch 83/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3928 - accurac
y: 0.8385
Epoch 84/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3929 - accurac
y: 0.8389
Epoch 85/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8382
Epoch 86/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3930 - accurac
y: 0.8400
Epoch 87/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3928 - accurac
y: 0.8390
Epoch 88/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3929 - accurac
y: 0.8369
Epoch 89/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3928 - accurac
y: 0.8378
Epoch 90/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3925 - accurac
y: 0.8397
Epoch 91/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3928 - accurac
y: 0.8382
Epoch 92/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3929 - accurac
y: 0.8390
Epoch 93/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3926 - accurac
y: 0.8375
Epoch 94/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3929 - accurac
y: 0.8392
Epoch 95/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3926 - accurac
y: 0.8388
Epoch 96/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3924 - accurac
y: 0.8381
Epoch 97/500
```

```
225/225 [==============================] – 1s 2ms/step – loss: 0.3926 – accurac
y: 0.8379
Epoch 98/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3923 – accurac
y: 0.8400
Epoch 99/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3927 – accurac
y: 0.8388
Epoch 100/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3923 – accurac
y: 0.8393
Epoch 101/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3925 – accurac
y: 0.8385
Epoch 102/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3924 – accurac
y: 0.8399
Epoch 103/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3922 – accurac
y: 0.8403
Epoch 104/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3922 – accurac
y: 0.8396
Epoch 105/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3924 – accurac
y: 0.8375
Epoch 106/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3922 – accurac
y: 0.8382
Epoch 107/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3922 – accurac
y: 0.8404
Epoch 108/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3922 – accurac
y: 0.8385
Epoch 109/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3925 – accurac
y: 0.8385
Epoch 110/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3919 – accurac
y: 0.8382
Epoch 111/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3920 – accurac
y: 0.8406
Epoch 112/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3920 – accurac
y: 0.8403
Epoch 113/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3921 – accurac
y: 0.8381
Epoch 114/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3923 – accurac
y: 0.8381
Epoch 115/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3922 – accurac
y: 0.8394
Epoch 116/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3922 – accurac
y: 0.8385
Epoch 117/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3917 – accurac
y: 0.8404
Epoch 118/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3918 – accurac
y: 0.8397
```

```
Epoch 119/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3922 - accurac
y: 0.8407
Epoch 120/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3921 - accurac
y: 0.8404
Epoch 121/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3919 - accurac
y: 0.8390
Epoch 122/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3918 - accurac
y: 0.8378
Epoch 123/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3920 - accurac
y: 0.8393
Epoch 124/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3920 - accurac
y: 0.8404
Epoch 125/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3919 - accurac
y: 0.8394
Epoch 126/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3917 - accurac
y: 0.8399
Epoch 127/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3916 - accurac
y: 0.8393
Epoch 128/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3915 - accurac
y: 0.8408
Epoch 129/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3916 - accurac
y: 0.8400
Epoch 130/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3917 - accurac
y: 0.8410
Epoch 131/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3914 - accurac
y: 0.8400
Epoch 132/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3915 - accurac
y: 0.8404
Epoch 133/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3913 - accurac
y: 0.8396
Epoch 134/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3918 - accurac
y: 0.8390
Epoch 135/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3914 - accurac
y: 0.8393
Epoch 136/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3916 - accurac
y: 0.8397
Epoch 137/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3918 - accurac
y: 0.8397
Epoch 138/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3918 - accurac
y: 0.8393
Epoch 139/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3914 - accurac
y: 0.8386
Epoch 140/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3913 - accurac
```

```
y: 0.8403
Epoch 141/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3917 – accurac
y: 0.8406
Epoch 142/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3915 – accurac
y: 0.8396
Epoch 143/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3913 – accurac
y: 0.8400
Epoch 144/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3916 – accurac
y: 0.8392
Epoch 145/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3915 – accurac
y: 0.8394
Epoch 146/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3914 – accurac
y: 0.8396
Epoch 147/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3914 – accurac
y: 0.8397
Epoch 148/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3914 – accurac
y: 0.8413
Epoch 149/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3913 – accurac
y: 0.8396
Epoch 150/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3912 – accurac
y: 0.8401
Epoch 151/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3914 – accurac
y: 0.8406
Epoch 152/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3912 – accurac
y: 0.8385
Epoch 153/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3911 – accurac
y: 0.8394
Epoch 154/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3912 – accurac
y: 0.8403
Epoch 155/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3909 – accurac
y: 0.8408
Epoch 156/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3912 – accurac
y: 0.8414
Epoch 157/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3910 – accurac
y: 0.8413
Epoch 158/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3910 – accurac
y: 0.8385
Epoch 159/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3912 – accurac
y: 0.8396
Epoch 160/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3911 – accurac
y: 0.8401
Epoch 161/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3912 – accurac
y: 0.8407
Epoch 162/500
```

```
225/225 [==============================] - 1s 3ms/step - loss: 0.3905 - accurac
y: 0.8399
Epoch 163/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3913 - accurac
y: 0.8396
Epoch 164/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3908 - accurac
y: 0.8397
Epoch 165/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3912 - accurac
y: 0.8411
Epoch 166/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3909 - accurac
y: 0.8396
Epoch 167/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3910 - accurac
y: 0.8403
Epoch 168/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3909 - accurac
y: 0.8406
Epoch 169/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3908 - accurac
y: 0.8406
Epoch 170/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3909 - accurac
y: 0.8400
Epoch 171/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3908 - accurac
y: 0.8406
Epoch 172/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3907 - accurac
y: 0.8417
Epoch 173/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3908 - accurac
y: 0.8397
Epoch 174/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3909 - accurac
y: 0.8407
Epoch 175/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3907 - accurac
y: 0.8383
Epoch 176/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3909 - accurac
y: 0.8401
Epoch 177/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3907 - accurac
y: 0.8396
Epoch 178/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3906 - accurac
y: 0.8399
Epoch 179/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3907 - accurac
y: 0.8415
Epoch 180/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3909 - accurac
y: 0.8410
Epoch 181/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3901 - accurac
y: 0.8411
Epoch 182/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3907 - accurac
y: 0.8400
Epoch 183/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3904 - accurac
y: 0.8414
```

```
Epoch 184/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3905 - accurac
y: 0.8407
Epoch 185/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3905 - accurac
y: 0.8407
Epoch 186/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3903 - accurac
y: 0.8419
Epoch 187/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3903 - accurac
y: 0.8404
Epoch 188/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3906 - accurac
y: 0.8393
Epoch 189/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3906 - accurac
y: 0.8400
Epoch 190/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3905 - accurac
y: 0.8389
Epoch 191/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3900 - accurac
y: 0.8401
Epoch 192/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3907 - accurac
y: 0.8408
Epoch 193/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3904 - accurac
y: 0.8413
Epoch 194/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3904 - accurac
y: 0.8418
Epoch 195/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3902 - accurac
y: 0.8415
Epoch 196/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3907 - accurac
y: 0.8417
Epoch 197/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3904 - accurac
y: 0.8393
Epoch 198/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3906 - accurac
y: 0.8424
Epoch 199/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3902 - accurac
y: 0.8415
Epoch 200/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3905 - accurac
y: 0.8399
Epoch 201/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3905 - accurac
y: 0.8388
Epoch 202/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3904 - accurac
y: 0.8399
Epoch 203/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3904 - accurac
y: 0.8417
Epoch 204/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3903 - accurac
y: 0.8407
Epoch 205/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3904 - accurac
```

```
y: 0.8417
Epoch 206/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3901 - accurac
y: 0.8404
Epoch 207/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3905 - accurac
y: 0.8421
Epoch 208/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3904 - accurac
y: 0.8413
Epoch 209/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3902 - accurac
y: 0.8401
Epoch 210/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3902 - accurac
y: 0.8408
Epoch 211/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3901 - accurac
y: 0.8421
Epoch 212/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3901 - accurac
y: 0.8404
Epoch 213/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3904 - accurac
y: 0.8410
Epoch 214/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3903 - accurac
y: 0.8401
Epoch 215/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3899 - accurac
y: 0.8404
Epoch 216/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3901 - accurac
y: 0.8400
Epoch 217/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3902 - accurac
y: 0.8418
Epoch 218/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3901 - accurac
y: 0.8400
Epoch 219/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3901 - accurac
y: 0.8411
Epoch 220/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3901 - accurac
y: 0.8414
Epoch 221/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3900 - accurac
y: 0.8419
Epoch 222/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3901 - accurac
y: 0.8413
Epoch 223/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3899 - accurac
y: 0.8418
Epoch 224/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3903 - accurac
y: 0.8388
Epoch 225/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3902 - accurac
y: 0.8424
Epoch 226/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3901 - accurac
y: 0.8422
Epoch 227/500
```

```
225/225 [==============================] – 1s 2ms/step – loss: 0.3899 – accurac
y: 0.8411
Epoch 228/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3900 – accurac
y: 0.8414
Epoch 229/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3897 – accurac
y: 0.8399
Epoch 230/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3902 – accurac
y: 0.8410
Epoch 231/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3899 – accurac
y: 0.8425
Epoch 232/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3897 – accurac
y: 0.8410
Epoch 233/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3901 – accurac
y: 0.8419
Epoch 234/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3901 – accurac
y: 0.8403
Epoch 235/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3901 – accurac
y: 0.8415
Epoch 236/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3898 – accurac
y: 0.8410
Epoch 237/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3897 – accurac
y: 0.8421
Epoch 238/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3896 – accurac
y: 0.8414
Epoch 239/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3900 – accurac
y: 0.8404
Epoch 240/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3903 – accurac
y: 0.8422
Epoch 241/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3900 – accurac
y: 0.8414
Epoch 242/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3901 – accurac
y: 0.8422
Epoch 243/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3901 – accurac
y: 0.8401
Epoch 244/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3899 – accurac
y: 0.8404
Epoch 245/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3897 – accurac
y: 0.8419
Epoch 246/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3898 – accurac
y: 0.8425
Epoch 247/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3902 – accurac
y: 0.8400
Epoch 248/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3900 – accurac
y: 0.8418
```

```
Epoch 249/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3901 – accurac
y: 0.8414
Epoch 250/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3901 – accurac
y: 0.8429
Epoch 251/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3900 – accurac
y: 0.8414
Epoch 252/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3901 – accurac
y: 0.8418
Epoch 253/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3897 – accurac
y: 0.8417
Epoch 254/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3898 – accurac
y: 0.8408
Epoch 255/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3900 – accurac
y: 0.8407
Epoch 256/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3901 – accurac
y: 0.8429
Epoch 257/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3899 – accurac
y: 0.8411
Epoch 258/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3900 – accurac
y: 0.8400
Epoch 259/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3902 – accurac
y: 0.8424
Epoch 260/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3902 – accurac
y: 0.8417
Epoch 261/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3898 – accurac
y: 0.8422
Epoch 262/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3897 – accurac
y: 0.8429
Epoch 263/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3901 – accurac
y: 0.8435
Epoch 264/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3898 – accurac
y: 0.8415
Epoch 265/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3898 – accurac
y: 0.8429
Epoch 266/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3899 – accurac
y: 0.8425
Epoch 267/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3899 – accurac
y: 0.8433
Epoch 268/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3900 – accurac
y: 0.8413
Epoch 269/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3897 – accurac
y: 0.8429
Epoch 270/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3901 – accurac
```

```
y: 0.8414
Epoch 271/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3894 - accurac
y: 0.8421
Epoch 272/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3900 - accurac
y: 0.8400
Epoch 273/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3897 - accurac
y: 0.8422
Epoch 274/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3895 - accurac
y: 0.8436
Epoch 275/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3897 - accurac
y: 0.8424
Epoch 276/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3899 - accurac
y: 0.8419
Epoch 277/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3898 - accurac
y: 0.8421
Epoch 278/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3897 - accurac
y: 0.8422
Epoch 279/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3898 - accurac
y: 0.8410
Epoch 280/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3898 - accurac
y: 0.8404
Epoch 281/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3898 - accurac
y: 0.8418
Epoch 282/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3898 - accurac
y: 0.8428
Epoch 283/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3897 - accurac
y: 0.8411
Epoch 284/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3899 - accurac
y: 0.8414
Epoch 285/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3895 - accurac
y: 0.8408
Epoch 286/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3899 - accurac
y: 0.8419
Epoch 287/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3902 - accurac
y: 0.8418
Epoch 288/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3899 - accurac
y: 0.8415
Epoch 289/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3897 - accurac
y: 0.8410
Epoch 290/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3895 - accurac
y: 0.8421
Epoch 291/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3896 - accurac
y: 0.8419
Epoch 292/500
```

```
225/225 [==============================] – 1s 3ms/step – loss: 0.3900 – accurac
y: 0.8411
Epoch 293/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3897 – accurac
y: 0.8432
Epoch 294/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3897 – accurac
y: 0.8417
Epoch 295/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3898 – accurac
y: 0.8413
Epoch 296/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3897 – accurac
y: 0.8404
Epoch 297/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3895 – accurac
y: 0.8432
Epoch 298/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3897 – accurac
y: 0.8407
Epoch 299/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3897 – accurac
y: 0.8426
Epoch 300/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3896 – accurac
y: 0.8415
Epoch 301/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3898 – accurac
y: 0.8426
Epoch 302/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3895 – accurac
y: 0.8410
Epoch 303/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3896 – accurac
y: 0.8404
Epoch 304/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3895 – accurac
y: 0.8406
Epoch 305/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3894 – accurac
y: 0.8411
Epoch 306/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3897 – accurac
y: 0.8421
Epoch 307/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3896 – accurac
y: 0.8414
Epoch 308/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3895 – accurac
y: 0.8411
Epoch 309/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3896 – accurac
y: 0.8417
Epoch 310/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3899 – accurac
y: 0.8415
Epoch 311/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3895 – accurac
y: 0.8422
Epoch 312/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3896 – accurac
y: 0.8415
Epoch 313/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3896 – accurac
y: 0.8415
```

```
Epoch 314/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3896 - accurac
y: 0.8411
Epoch 315/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3894 - accurac
y: 0.8404
Epoch 316/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3895 - accurac
y: 0.8426
Epoch 317/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3896 - accurac
y: 0.8422
Epoch 318/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3895 - accurac
y: 0.8406
Epoch 319/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3895 - accurac
y: 0.8406
Epoch 320/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3897 - accurac
y: 0.8417
Epoch 321/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3892 - accurac
y: 0.8415
Epoch 322/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3893 - accurac
y: 0.8429
Epoch 323/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3895 - accurac
y: 0.8419
Epoch 324/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3895 - accurac
y: 0.8408
Epoch 325/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3894 - accurac
y: 0.8424
Epoch 326/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3898 - accurac
y: 0.8422
Epoch 327/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3896 - accurac
y: 0.8413
Epoch 328/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3896 - accurac
y: 0.8433
Epoch 329/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3895 - accurac
y: 0.8418
Epoch 330/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3894 - accurac
y: 0.8421
Epoch 331/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3893 - accurac
y: 0.8408
Epoch 332/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3893 - accurac
y: 0.8428
Epoch 333/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3894 - accurac
y: 0.8418
Epoch 334/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3897 - accurac
y: 0.8413
Epoch 335/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3891 - accurac
```

```
y: 0.8425
Epoch 336/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3898 - accurac
y: 0.8419
Epoch 337/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3894 - accurac
y: 0.8406
Epoch 338/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3894 - accurac
y: 0.8428
Epoch 339/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3895 - accurac
y: 0.8419
Epoch 340/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3892 - accurac
y: 0.8432
Epoch 341/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3896 - accurac
y: 0.8426
Epoch 342/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3894 - accurac
y: 0.8424
Epoch 343/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3894 - accurac
y: 0.8413
Epoch 344/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3898 - accurac
y: 0.8408
Epoch 345/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3892 - accurac
y: 0.8408
Epoch 346/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3896 - accurac
y: 0.8424
Epoch 347/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3894 - accurac
y: 0.8431
Epoch 348/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3896 - accurac
y: 0.8414
Epoch 349/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3892 - accurac
y: 0.8438
Epoch 350/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3897 - accurac
y: 0.8411
Epoch 351/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3894 - accurac
y: 0.8425
Epoch 352/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3892 - accurac
y: 0.8446
Epoch 353/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3891 - accurac
y: 0.8422
Epoch 354/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3897 - accurac
y: 0.8421
Epoch 355/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3893 - accurac
y: 0.8413
Epoch 356/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3893 - accurac
y: 0.8421
Epoch 357/500
```

```
225/225 [==============================] – 1s 3ms/step – loss: 0.3894 – accurac
y: 0.8432
Epoch 358/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3896 – accurac
y: 0.8419
Epoch 359/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3894 – accurac
y: 0.8431
Epoch 360/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3895 – accurac
y: 0.8417
Epoch 361/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3892 – accurac
y: 0.8424
Epoch 362/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3896 – accurac
y: 0.8429
Epoch 363/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3895 – accurac
y: 0.8438
Epoch 364/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3893 – accurac
y: 0.8428
Epoch 365/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3890 – accurac
y: 0.8424
Epoch 366/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3891 – accurac
y: 0.8424
Epoch 367/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3893 – accurac
y: 0.8422
Epoch 368/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3892 – accurac
y: 0.8431
Epoch 369/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3894 – accurac
y: 0.8407
Epoch 370/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3893 – accurac
y: 0.8411
Epoch 371/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3891 – accurac
y: 0.8418
Epoch 372/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3891 – accurac
y: 0.8422
Epoch 373/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3895 – accurac
y: 0.8418
Epoch 374/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3895 – accurac
y: 0.8414
Epoch 375/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3891 – accurac
y: 0.8418
Epoch 376/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3893 – accurac
y: 0.8422
Epoch 377/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3894 – accurac
y: 0.8426
Epoch 378/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3887 – accurac
y: 0.8419
```

```
Epoch 379/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3894 - accurac
y: 0.8417
Epoch 380/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3893 - accurac
y: 0.8415
Epoch 381/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3889 - accurac
y: 0.8418
Epoch 382/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3893 - accurac
y: 0.8410
Epoch 383/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3892 - accurac
y: 0.8436
Epoch 384/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3893 - accurac
y: 0.8418
Epoch 385/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3891 - accurac
y: 0.8433
Epoch 386/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3890 - accurac
y: 0.8424
Epoch 387/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3888 - accurac
y: 0.8424
Epoch 388/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3889 - accurac
y: 0.8431
Epoch 389/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3893 - accurac
y: 0.8425
Epoch 390/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3890 - accurac
y: 0.8424
Epoch 391/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3891 - accurac
y: 0.8444
Epoch 392/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3891 - accurac
y: 0.8414
Epoch 393/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3891 - accurac
y: 0.8431
Epoch 394/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3890 - accurac
y: 0.8439
Epoch 395/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3884 - accurac
y: 0.8432
Epoch 396/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3890 - accurac
y: 0.8422
Epoch 397/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3891 - accurac
y: 0.8424
Epoch 398/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3893 - accurac
y: 0.8417
Epoch 399/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3889 - accurac
y: 0.8425
Epoch 400/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3892 - accurac
```

```
y: 0.8417
Epoch 401/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3889 – accurac
y: 0.8428
Epoch 402/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3892 – accurac
y: 0.8426
Epoch 403/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3888 – accurac
y: 0.8425
Epoch 404/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3889 – accurac
y: 0.8424
Epoch 405/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3889 – accurac
y: 0.8436
Epoch 406/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3888 – accurac
y: 0.8422
Epoch 407/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3892 – accurac
y: 0.8414
Epoch 408/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3887 – accurac
y: 0.8415
Epoch 409/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3887 – accurac
y: 0.8403
Epoch 410/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3891 – accurac
y: 0.8428
Epoch 411/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3890 – accurac
y: 0.8435
Epoch 412/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3889 – accurac
y: 0.8415
Epoch 413/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3887 – accurac
y: 0.8414
Epoch 414/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3890 – accurac
y: 0.8422
Epoch 415/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3887 – accurac
y: 0.8419
Epoch 416/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3890 – accurac
y: 0.8426
Epoch 417/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3888 – accurac
y: 0.8418
Epoch 418/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3889 – accurac
y: 0.8425
Epoch 419/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3891 – accurac
y: 0.8422
Epoch 420/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3886 – accurac
y: 0.8421
Epoch 421/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3891 – accurac
y: 0.8419
Epoch 422/500
```

```
225/225 [==============================] - 1s 2ms/step - loss: 0.3893 - accurac
y: 0.8428
Epoch 423/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3890 - accurac
y: 0.8418
Epoch 424/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3892 - accurac
y: 0.8413
Epoch 425/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3887 - accurac
y: 0.8417
Epoch 426/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3889 - accurac
y: 0.8407
Epoch 427/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3890 - accurac
y: 0.8406
Epoch 428/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3884 - accurac
y: 0.8431
Epoch 429/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3892 - accurac
y: 0.8419
Epoch 430/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3886 - accurac
y: 0.8426
Epoch 431/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3886 - accurac
y: 0.8419
Epoch 432/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3888 - accurac
y: 0.8425
Epoch 433/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3886 - accurac
y: 0.8421
Epoch 434/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3889 - accurac
y: 0.8400
Epoch 435/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3889 - accurac
y: 0.8407
Epoch 436/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3887 - accurac
y: 0.8424
Epoch 437/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3886 - accurac
y: 0.8407
Epoch 438/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3888 - accurac
y: 0.8413
Epoch 439/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3887 - accurac
y: 0.8421
Epoch 440/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8425
Epoch 441/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3887 - accurac
y: 0.8422
Epoch 442/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3887 - accurac
y: 0.8424
Epoch 443/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3888 - accurac
y: 0.8407
```

```
Epoch 444/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3887 – accurac
y: 0.8414
Epoch 445/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3888 – accurac
y: 0.8403
Epoch 446/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3887 – accurac
y: 0.8428
Epoch 447/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3887 – accurac
y: 0.8415
Epoch 448/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3888 – accurac
y: 0.8410
Epoch 449/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3889 – accurac
y: 0.8421
Epoch 450/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3890 – accurac
y: 0.8429
Epoch 451/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3888 – accurac
y: 0.8436
Epoch 452/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3884 – accurac
y: 0.8428
Epoch 453/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3890 – accurac
y: 0.8408
Epoch 454/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3884 – accurac
y: 0.8401
Epoch 455/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3890 – accurac
y: 0.8415
Epoch 456/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3883 – accurac
y: 0.8417
Epoch 457/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3886 – accurac
y: 0.8397
Epoch 458/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3882 – accurac
y: 0.8425
Epoch 459/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3884 – accurac
y: 0.8436
Epoch 460/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3884 – accurac
y: 0.8425
Epoch 461/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3886 – accurac
y: 0.8407
Epoch 462/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3881 – accurac
y: 0.8417
Epoch 463/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3885 – accurac
y: 0.8435
Epoch 464/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3885 – accurac
y: 0.8422
Epoch 465/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3886 – accurac
```

```
y: 0.8421
Epoch 466/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3884 - accurac
y: 0.8421
Epoch 467/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3885 - accurac
y: 0.8425
Epoch 468/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3883 - accurac
y: 0.8429
Epoch 469/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3884 - accurac
y: 0.8429
Epoch 470/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3887 - accurac
y: 0.8425
Epoch 471/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3883 - accurac
y: 0.8435
Epoch 472/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8429
Epoch 473/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3882 - accurac
y: 0.8424
Epoch 474/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3888 - accurac
y: 0.8424
Epoch 475/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3886 - accurac
y: 0.8436
Epoch 476/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3885 - accurac
y: 0.8435
Epoch 477/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3884 - accurac
y: 0.8426
Epoch 478/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3881 - accurac
y: 0.8435
Epoch 479/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8433
Epoch 480/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3884 - accurac
y: 0.8438
Epoch 481/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3883 - accurac
y: 0.8426
Epoch 482/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3882 - accurac
y: 0.8429
Epoch 483/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3881 - accurac
y: 0.8425
Epoch 484/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3886 - accurac
y: 0.8436
Epoch 485/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3881 - accurac
y: 0.8429
Epoch 486/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3883 - accurac
y: 0.8425
Epoch 487/500
```

```
225/225 [==============================] - 1s 2ms/step - loss: 0.3883 - accurac
y: 0.8442
Epoch 488/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3884 - accurac
y: 0.8428
Epoch 489/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3882 - accurac
y: 0.8438
Epoch 490/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3883 - accurac
y: 0.8425
Epoch 491/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3882 - accurac
y: 0.8436
Epoch 492/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3882 - accurac
y: 0.8424
Epoch 493/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3884 - accurac
y: 0.8436
Epoch 494/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3883 - accurac
y: 0.8422
Epoch 495/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8425
Epoch 496/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3883 - accurac
y: 0.8424
Epoch 497/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3880 - accurac
y: 0.8438
Epoch 498/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3876 - accurac
y: 0.8433
Epoch 499/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3883 - accurac
y: 0.8419
Epoch 500/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3881 - accurac
y: 0.8447
Epoch 1/500
225/225 [==============================] - 1s 2ms/step - loss: 0.6069 - accurac
y: 0.7944
Epoch 2/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4506 - accurac
y: 0.7962
Epoch 3/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4324 - accurac
y: 0.7962
Epoch 4/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4273 - accurac
y: 0.7962
Epoch 5/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4238 - accurac
y: 0.7962
Epoch 6/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4213 - accurac
y: 0.7962
Epoch 7/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4186 - accurac
y: 0.7975
Epoch 8/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4168 - accurac
y: 0.8233
```

```
Epoch 9/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4156 - accurac
y: 0.8264
Epoch 10/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4142 - accurac
y: 0.8286
Epoch 11/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4132 - accurac
y: 0.8286
Epoch 12/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4118 - accurac
y: 0.8308
Epoch 13/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4109 - accurac
y: 0.8314
Epoch 14/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4101 - accurac
y: 0.8329
Epoch 15/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4090 - accurac
y: 0.8332
Epoch 16/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4082 - accurac
y: 0.8325
Epoch 17/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4075 - accurac
y: 0.8335
Epoch 18/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4069 - accurac
y: 0.8339
Epoch 19/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4063 - accurac
y: 0.8349
Epoch 20/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4055 - accurac
y: 0.8358
Epoch 21/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4052 - accurac
y: 0.8356
Epoch 22/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4045 - accurac
y: 0.8351
Epoch 23/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4041 - accurac
y: 0.8364
Epoch 24/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4038 - accurac
y: 0.8364
Epoch 25/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4034 - accurac
y: 0.8350
Epoch 26/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4029 - accurac
y: 0.8351
Epoch 27/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4027 - accurac
y: 0.8358
Epoch 28/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4021 - accurac
y: 0.8354
Epoch 29/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4022 - accurac
y: 0.8349
Epoch 30/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4019 - accurac
```

```
y: 0.8358
Epoch 31/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4018 - accurac
y: 0.8368
Epoch 32/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4015 - accurac
y: 0.8364
Epoch 33/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4012 - accurac
y: 0.8343
Epoch 34/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4009 - accurac
y: 0.8357
Epoch 35/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4009 - accurac
y: 0.8356
Epoch 36/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4007 - accurac
y: 0.8346
Epoch 37/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4006 - accurac
y: 0.8360
Epoch 38/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4004 - accurac
y: 0.8360
Epoch 39/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4003 - accurac
y: 0.8356
Epoch 40/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3999 - accurac
y: 0.8346
Epoch 41/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4001 - accurac
y: 0.8365
Epoch 42/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3996 - accurac
y: 0.8363
Epoch 43/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3997 - accurac
y: 0.8371
Epoch 44/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3996 - accurac
y: 0.8350
Epoch 45/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3994 - accurac
y: 0.8353
Epoch 46/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3993 - accurac
y: 0.8358
Epoch 47/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3985 - accurac
y: 0.8351
Epoch 48/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3990 - accurac
y: 0.8356
Epoch 49/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3987 - accurac
y: 0.8350
Epoch 50/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3983 - accurac
y: 0.8351
Epoch 51/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3982 - accurac
y: 0.8364
Epoch 52/500
```

```
225/225 [==============================] - 1s 3ms/step - loss: 0.3980 - accurac
y: 0.8358
Epoch 53/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3975 - accurac
y: 0.8363
Epoch 54/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3977 - accurac
y: 0.8357
Epoch 55/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3974 - accurac
y: 0.8358
Epoch 56/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3972 - accurac
y: 0.8338
Epoch 57/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3972 - accurac
y: 0.8363
Epoch 58/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3971 - accurac
y: 0.8346
Epoch 59/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3960 - accurac
y: 0.8351
Epoch 60/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3964 - accurac
y: 0.8353
Epoch 61/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3964 - accurac
y: 0.8342
Epoch 62/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3962 - accurac
y: 0.8358
Epoch 63/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3960 - accurac
y: 0.8347
Epoch 64/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3961 - accurac
y: 0.8350
Epoch 65/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3956 - accurac
y: 0.8351
Epoch 66/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3957 - accurac
y: 0.8350
Epoch 67/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3953 - accurac
y: 0.8358
Epoch 68/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3951 - accurac
y: 0.8364
Epoch 69/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3950 - accurac
y: 0.8358
Epoch 70/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3951 - accurac
y: 0.8356
Epoch 71/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3946 - accurac
y: 0.8353
Epoch 72/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3944 - accurac
y: 0.8354
Epoch 73/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3946 - accurac
y: 0.8351
```

```
Epoch 74/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3944 - accurac
y: 0.8363
Epoch 75/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3941 - accurac
y: 0.8357
Epoch 76/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3940 - accurac
y: 0.8371
Epoch 77/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3941 - accurac
y: 0.8365
Epoch 78/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3937 - accurac
y: 0.8343
Epoch 79/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3941 - accurac
y: 0.8381
Epoch 80/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3935 - accurac
y: 0.8368
Epoch 81/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3936 - accurac
y: 0.8358
Epoch 82/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3933 - accurac
y: 0.8368
Epoch 83/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3936 - accurac
y: 0.8350
Epoch 84/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3934 - accurac
y: 0.8351
Epoch 85/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3927 - accurac
y: 0.8358
Epoch 86/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3933 - accurac
y: 0.8354
Epoch 87/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8385
Epoch 88/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3930 - accurac
y: 0.8375
Epoch 89/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3930 - accurac
y: 0.8351
Epoch 90/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3930 - accurac
y: 0.8369
Epoch 91/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3928 - accurac
y: 0.8375
Epoch 92/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8368
Epoch 93/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3930 - accurac
y: 0.8365
Epoch 94/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3929 - accurac
y: 0.8365
Epoch 95/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3928 - accurac
```

```
y: 0.8372
Epoch 96/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3925 - accurac
y: 0.8371
Epoch 97/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3924 - accurac
y: 0.8361
Epoch 98/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3928 - accurac
y: 0.8382
Epoch 99/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3929 - accurac
y: 0.8363
Epoch 100/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3924 - accurac
y: 0.8368
Epoch 101/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3927 - accurac
y: 0.8368
Epoch 102/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3928 - accurac
y: 0.8363
Epoch 103/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3925 - accurac
y: 0.8383
Epoch 104/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3923 - accurac
y: 0.8363
Epoch 105/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3924 - accurac
y: 0.8382
Epoch 106/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3920 - accurac
y: 0.8367
Epoch 107/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3923 - accurac
y: 0.8364
Epoch 108/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3922 - accurac
y: 0.8376
Epoch 109/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3923 - accurac
y: 0.8368
Epoch 110/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3921 - accurac
y: 0.8356
Epoch 111/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3922 - accurac
y: 0.8371
Epoch 112/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3918 - accurac
y: 0.8356
Epoch 113/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3923 - accurac
y: 0.8378
Epoch 114/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3920 - accurac
y: 0.8376
Epoch 115/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3917 - accurac
y: 0.8369
Epoch 116/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3921 - accurac
y: 0.8375
Epoch 117/500
```

```
225/225 [==============================] - 1s 3ms/step - loss: 0.3919 - accurac
y: 0.8364
Epoch 118/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3917 - accurac
y: 0.8360
Epoch 119/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3921 - accurac
y: 0.8381
Epoch 120/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3918 - accurac
y: 0.8374
Epoch 121/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3919 - accurac
y: 0.8368
Epoch 122/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3917 - accurac
y: 0.8397
Epoch 123/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3920 - accurac
y: 0.8378
Epoch 124/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3915 - accurac
y: 0.8371
Epoch 125/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3918 - accurac
y: 0.8385
Epoch 126/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3916 - accurac
y: 0.8378
Epoch 127/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3914 - accurac
y: 0.8388
Epoch 128/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3919 - accurac
y: 0.8378
Epoch 129/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3915 - accurac
y: 0.8379
Epoch 130/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3913 - accurac
y: 0.8375
Epoch 131/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3917 - accurac
y: 0.8385
Epoch 132/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3917 - accurac
y: 0.8381
Epoch 133/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3918 - accurac
y: 0.8376
Epoch 134/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3908 - accurac
y: 0.8389
Epoch 135/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3912 - accurac
y: 0.8376
Epoch 136/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3913 - accurac
y: 0.8374
Epoch 137/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3913 - accurac
y: 0.8372
Epoch 138/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3914 - accurac
y: 0.8372
```

```
Epoch 139/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3916 - accurac
y: 0.8381
Epoch 140/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3915 - accurac
y: 0.8354
Epoch 141/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3914 - accurac
y: 0.8372
Epoch 142/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3912 - accurac
y: 0.8390
Epoch 143/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3909 - accurac
y: 0.8393
Epoch 144/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3916 - accurac
y: 0.8394
Epoch 145/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3913 - accurac
y: 0.8392
Epoch 146/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3916 - accurac
y: 0.8372
Epoch 147/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3911 - accurac
y: 0.8367
Epoch 148/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3914 - accurac
y: 0.8388
Epoch 149/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3913 - accurac
y: 0.8378
Epoch 150/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3912 - accurac
y: 0.8375
Epoch 151/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3913 - accurac
y: 0.8374
Epoch 152/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3913 - accurac
y: 0.8394
Epoch 153/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3913 - accurac
y: 0.8372
Epoch 154/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3912 - accurac
y: 0.8365
Epoch 155/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3909 - accurac
y: 0.8367
Epoch 156/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3909 - accurac
y: 0.8383
Epoch 157/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3911 - accurac
y: 0.8382
Epoch 158/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3908 - accurac
y: 0.8399
Epoch 159/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3914 - accurac
y: 0.8368
Epoch 160/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3908 - accurac
```

```
y: 0.8378
Epoch 161/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3912 – accurac
y: 0.8379
Epoch 162/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3910 – accurac
y: 0.8376
Epoch 163/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3912 – accurac
y: 0.8378
Epoch 164/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3913 – accurac
y: 0.8375
Epoch 165/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3910 – accurac
y: 0.8381
Epoch 166/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3910 – accurac
y: 0.8393
Epoch 167/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3909 – accurac
y: 0.8371
Epoch 168/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3912 – accurac
y: 0.8374
Epoch 169/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3910 – accurac
y: 0.8379
Epoch 170/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3910 – accurac
y: 0.8379
Epoch 171/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3909 – accurac
y: 0.8351
Epoch 172/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3911 – accurac
y: 0.8390
Epoch 173/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3911 – accurac
y: 0.8383
Epoch 174/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3912 – accurac
y: 0.8379
Epoch 175/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3911 – accurac
y: 0.8386
Epoch 176/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3908 – accurac
y: 0.8371
Epoch 177/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3907 – accurac
y: 0.8381
Epoch 178/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3907 – accurac
y: 0.8379
Epoch 179/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3910 – accurac
y: 0.8368
Epoch 180/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3913 – accurac
y: 0.8382
Epoch 181/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3906 – accurac
y: 0.8396
Epoch 182/500
```

```
225/225 [==============================] – 1s 2ms/step – loss: 0.3909 – accurac
y: 0.8375
Epoch 183/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3908 – accurac
y: 0.8378
Epoch 184/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3908 – accurac
y: 0.8388
Epoch 185/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3910 – accurac
y: 0.8379
Epoch 186/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3909 – accurac
y: 0.8376
Epoch 187/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3907 – accurac
y: 0.8375
Epoch 188/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3909 – accurac
y: 0.8374
Epoch 189/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3908 – accurac
y: 0.8371
Epoch 190/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3905 – accurac
y: 0.8397
Epoch 191/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3903 – accurac
y: 0.8375
Epoch 192/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3911 – accurac
y: 0.8381
Epoch 193/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3907 – accurac
y: 0.8382
Epoch 194/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3907 – accurac
y: 0.8385
Epoch 195/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3909 – accurac
y: 0.8397
Epoch 196/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3907 – accurac
y: 0.8375
Epoch 197/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3905 – accurac
y: 0.8385
Epoch 198/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3904 – accurac
y: 0.8374
Epoch 199/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3909 – accurac
y: 0.8375
Epoch 200/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3908 – accurac
y: 0.8379
Epoch 201/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3906 – accurac
y: 0.8365
Epoch 202/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3907 – accurac
y: 0.8382
Epoch 203/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3907 – accurac
y: 0.8374
```

```
Epoch 204/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3904 - accurac
y: 0.8381
Epoch 205/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3906 - accurac
y: 0.8386
Epoch 206/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3907 - accurac
y: 0.8367
Epoch 207/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3905 - accurac
y: 0.8382
Epoch 208/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3907 - accurac
y: 0.8368
Epoch 209/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3903 - accurac
y: 0.8374
Epoch 210/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3907 - accurac
y: 0.8382
Epoch 211/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3906 - accurac
y: 0.8364
Epoch 212/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3903 - accurac
y: 0.8386
Epoch 213/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3906 - accurac
y: 0.8385
Epoch 214/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3907 - accurac
y: 0.8389
Epoch 215/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3908 - accurac
y: 0.8392
Epoch 216/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3905 - accurac
y: 0.8365
Epoch 217/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3904 - accurac
y: 0.8378
Epoch 218/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3907 - accurac
y: 0.8375
Epoch 219/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3901 - accurac
y: 0.8383
Epoch 220/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3902 - accurac
y: 0.8382
Epoch 221/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3907 - accurac
y: 0.8382
Epoch 222/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3902 - accurac
y: 0.8379
Epoch 223/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3904 - accurac
y: 0.8381
Epoch 224/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3904 - accurac
y: 0.8379
Epoch 225/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3908 - accurac
```

```
y: 0.8386
Epoch 226/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3907 - accurac
y: 0.8369
Epoch 227/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3904 - accurac
y: 0.8372
Epoch 228/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3907 - accurac
y: 0.8361
Epoch 229/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3905 - accurac
y: 0.8372
Epoch 230/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3904 - accurac
y: 0.8379
Epoch 231/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3905 - accurac
y: 0.8386
Epoch 232/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3904 - accurac
y: 0.8381
Epoch 233/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3905 - accurac
y: 0.8385
Epoch 234/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3908 - accurac
y: 0.8388
Epoch 235/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3904 - accurac
y: 0.8383
Epoch 236/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3904 - accurac
y: 0.8378
Epoch 237/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3904 - accurac
y: 0.8379
Epoch 238/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3905 - accurac
y: 0.8381
Epoch 239/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3904 - accurac
y: 0.8379
Epoch 240/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3905 - accurac
y: 0.8376
Epoch 241/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3903 - accurac
y: 0.8394
Epoch 242/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3906 - accurac
y: 0.8371
Epoch 243/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3903 - accurac
y: 0.8379
Epoch 244/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3899 - accurac
y: 0.8372
Epoch 245/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3901 - accurac
y: 0.8376
Epoch 246/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3902 - accurac
y: 0.8371
Epoch 247/500
```

```
225/225 [==============================] - 1s 2ms/step - loss: 0.3904 - accurac
y: 0.8388
Epoch 248/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3903 - accurac
y: 0.8378
Epoch 249/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3903 - accurac
y: 0.8390
Epoch 250/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3905 - accurac
y: 0.8378
Epoch 251/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3902 - accurac
y: 0.8379
Epoch 252/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3903 - accurac
y: 0.8376
Epoch 253/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3903 - accurac
y: 0.8378
Epoch 254/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3899 - accurac
y: 0.8374
Epoch 255/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3904 - accurac
y: 0.8381
Epoch 256/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3904 - accurac
y: 0.8385
Epoch 257/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3902 - accurac
y: 0.8360
Epoch 258/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3899 - accurac
y: 0.8385
Epoch 259/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3902 - accurac
y: 0.8374
Epoch 260/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3902 - accurac
y: 0.8371
Epoch 261/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3898 - accurac
y: 0.8378
Epoch 262/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3898 - accurac
y: 0.8389
Epoch 263/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3899 - accurac
y: 0.8386
Epoch 264/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3903 - accurac
y: 0.8382
Epoch 265/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3899 - accurac
y: 0.8386
Epoch 266/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3903 - accurac
y: 0.8400
Epoch 267/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3903 - accurac
y: 0.8390
Epoch 268/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3896 - accurac
y: 0.8376
```

```
Epoch 269/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3899 - accurac
y: 0.8368
Epoch 270/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3902 - accurac
y: 0.8386
Epoch 271/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3900 - accurac
y: 0.8382
Epoch 272/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3900 - accurac
y: 0.8386
Epoch 273/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3899 - accurac
y: 0.8390
Epoch 274/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3900 - accurac
y: 0.8365
Epoch 275/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3899 - accurac
y: 0.8381
Epoch 276/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3896 - accurac
y: 0.8389
Epoch 277/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3898 - accurac
y: 0.8392
Epoch 278/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3898 - accurac
y: 0.8374
Epoch 279/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3896 - accurac
y: 0.8375
Epoch 280/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3900 - accurac
y: 0.8381
Epoch 281/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3896 - accurac
y: 0.8386
Epoch 282/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3897 - accurac
y: 0.8376
Epoch 283/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3898 - accurac
y: 0.8376
Epoch 284/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3900 - accurac
y: 0.8378
Epoch 285/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3898 - accurac
y: 0.8383
Epoch 286/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3896 - accurac
y: 0.8388
Epoch 287/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3897 - accurac
y: 0.8367
Epoch 288/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3897 - accurac
y: 0.8388
Epoch 289/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3898 - accurac
y: 0.8371
Epoch 290/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3894 - accurac
```

```
y: 0.8392
Epoch 291/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3898 – accurac
y: 0.8379
Epoch 292/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3898 – accurac
y: 0.8376
Epoch 293/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3893 – accurac
y: 0.8397
Epoch 294/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3895 – accurac
y: 0.8368
Epoch 295/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3898 – accurac
y: 0.8382
Epoch 296/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3892 – accurac
y: 0.8369
Epoch 297/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3895 – accurac
y: 0.8397
Epoch 298/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3895 – accurac
y: 0.8365
Epoch 299/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3898 – accurac
y: 0.8385
Epoch 300/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3893 – accurac
y: 0.8386
Epoch 301/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3896 – accurac
y: 0.8369
Epoch 302/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3895 – accurac
y: 0.8397
Epoch 303/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3896 – accurac
y: 0.8374
Epoch 304/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3896 – accurac
y: 0.8386
Epoch 305/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3896 – accurac
y: 0.8394
Epoch 306/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3894 – accurac
y: 0.8386
Epoch 307/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3895 – accurac
y: 0.8381
Epoch 308/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3895 – accurac
y: 0.8379
Epoch 309/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3895 – accurac
y: 0.8392
Epoch 310/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3890 – accurac
y: 0.8374
Epoch 311/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3892 – accurac
y: 0.8388
Epoch 312/500
```

```
225/225 [==============================] - 1s 2ms/step - loss: 0.3895 - accurac
y: 0.8388
Epoch 313/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3896 - accurac
y: 0.8389
Epoch 314/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3894 - accurac
y: 0.8385
Epoch 315/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3893 - accurac
y: 0.8381
Epoch 316/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3885 - accurac
y: 0.8386
Epoch 317/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3896 - accurac
y: 0.8393
Epoch 318/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3892 - accurac
y: 0.8388
Epoch 319/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3893 - accurac
y: 0.8403
Epoch 320/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3896 - accurac
y: 0.8375
Epoch 321/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3895 - accurac
y: 0.8369
Epoch 322/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3893 - accurac
y: 0.8386
Epoch 323/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3895 - accurac
y: 0.8375
Epoch 324/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3891 - accurac
y: 0.8369
Epoch 325/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3890 - accurac
y: 0.8393
Epoch 326/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3894 - accurac
y: 0.8381
Epoch 327/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3894 - accurac
y: 0.8381
Epoch 328/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3893 - accurac
y: 0.8390
Epoch 329/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3894 - accurac
y: 0.8393
Epoch 330/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3893 - accurac
y: 0.8372
Epoch 331/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3891 - accurac
y: 0.8390
Epoch 332/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3895 - accurac
y: 0.8382
Epoch 333/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3891 - accurac
y: 0.8396
```

```
Epoch 334/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3897 - accurac
y: 0.8382
Epoch 335/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3889 - accurac
y: 0.8389
Epoch 336/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3893 - accurac
y: 0.8389
Epoch 337/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3891 - accurac
y: 0.8399
Epoch 338/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3891 - accurac
y: 0.8386
Epoch 339/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3892 - accurac
y: 0.8386
Epoch 340/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3884 - accurac
y: 0.8390
Epoch 341/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3887 - accurac
y: 0.8372
Epoch 342/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3894 - accurac
y: 0.8389
Epoch 343/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3892 - accurac
y: 0.8381
Epoch 344/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3892 - accurac
y: 0.8367
Epoch 345/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3888 - accurac
y: 0.8382
Epoch 346/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3894 - accurac
y: 0.8372
Epoch 347/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3887 - accurac
y: 0.8390
Epoch 348/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3889 - accurac
y: 0.8382
Epoch 349/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3890 - accurac
y: 0.8392
Epoch 350/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3892 - accurac
y: 0.8396
Epoch 351/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3888 - accurac
y: 0.8388
Epoch 352/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3890 - accurac
y: 0.8396
Epoch 353/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3885 - accurac
y: 0.8417
Epoch 354/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3891 - accurac
y: 0.8396
Epoch 355/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3888 - accurac
```

```
y: 0.8388
Epoch 356/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3888 - accurac
y: 0.8400
Epoch 357/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3891 - accurac
y: 0.8388
Epoch 358/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3887 - accurac
y: 0.8381
Epoch 359/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3886 - accurac
y: 0.8390
Epoch 360/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3891 - accurac
y: 0.8385
Epoch 361/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3887 - accurac
y: 0.8389
Epoch 362/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3890 - accurac
y: 0.8394
Epoch 363/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3888 - accurac
y: 0.8374
Epoch 364/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3887 - accurac
y: 0.8389
Epoch 365/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3889 - accurac
y: 0.8396
Epoch 366/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3887 - accurac
y: 0.8379
Epoch 367/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3889 - accurac
y: 0.8393
Epoch 368/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3886 - accurac
y: 0.8392
Epoch 369/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3893 - accurac
y: 0.8382
Epoch 370/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3889 - accurac
y: 0.8403
Epoch 371/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3888 - accurac
y: 0.8379
Epoch 372/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3888 - accurac
y: 0.8386
Epoch 373/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3888 - accurac
y: 0.8390
Epoch 374/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3886 - accurac
y: 0.8397
Epoch 375/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3890 - accurac
y: 0.8394
Epoch 376/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3889 - accurac
y: 0.8386
Epoch 377/500
```

```
225/225 [==============================] – 1s 2ms/step – loss: 0.3890 – accurac
y: 0.8393
Epoch 378/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3890 – accurac
y: 0.8386
Epoch 379/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3887 – accurac
y: 0.8401
Epoch 380/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3888 – accurac
y: 0.8390
Epoch 381/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3889 – accurac
y: 0.8385
Epoch 382/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3885 – accurac
y: 0.8388
Epoch 383/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3888 – accurac
y: 0.8390
Epoch 384/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3884 – accurac
y: 0.8407
Epoch 385/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3888 – accurac
y: 0.8385
Epoch 386/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3885 – accurac
y: 0.8400
Epoch 387/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3880 – accurac
y: 0.8392
Epoch 388/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3888 – accurac
y: 0.8383
Epoch 389/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3889 – accurac
y: 0.8390
Epoch 390/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3888 – accurac
y: 0.8404
Epoch 391/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3888 – accurac
y: 0.8401
Epoch 392/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3889 – accurac
y: 0.8389
Epoch 393/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3887 – accurac
y: 0.8385
Epoch 394/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3887 – accurac
y: 0.8397
Epoch 395/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3884 – accurac
y: 0.8383
Epoch 396/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3891 – accurac
y: 0.8403
Epoch 397/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3885 – accurac
y: 0.8386
Epoch 398/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3889 – accurac
y: 0.8388
```

```
Epoch 399/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3888 - accurac
y: 0.8399
Epoch 400/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3886 - accurac
y: 0.8372
Epoch 401/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3888 - accurac
y: 0.8397
Epoch 402/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3887 - accurac
y: 0.8390
Epoch 403/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3884 - accurac
y: 0.8378
Epoch 404/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3888 - accurac
y: 0.8404
Epoch 405/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3888 - accurac
y: 0.8381
Epoch 406/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8393
Epoch 407/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8400
Epoch 408/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3887 - accurac
y: 0.8382
Epoch 409/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3888 - accurac
y: 0.8394
Epoch 410/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8388
Epoch 411/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3889 - accurac
y: 0.8392
Epoch 412/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8401
Epoch 413/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3884 - accurac
y: 0.8396
Epoch 414/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8401
Epoch 415/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8382
Epoch 416/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3884 - accurac
y: 0.8390
Epoch 417/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8404
Epoch 418/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3886 - accurac
y: 0.8400
Epoch 419/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3883 - accurac
y: 0.8397
Epoch 420/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
```

```
y: 0.8392
Epoch 421/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3887 - accurac
y: 0.8389
Epoch 422/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3875 - accurac
y: 0.8388
Epoch 423/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3890 - accurac
y: 0.8383
Epoch 424/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3882 - accurac
y: 0.8394
Epoch 425/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3884 - accurac
y: 0.8394
Epoch 426/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3878 - accurac
y: 0.8404
Epoch 427/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3883 - accurac
y: 0.8389
Epoch 428/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3887 - accurac
y: 0.8379
Epoch 429/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3887 - accurac
y: 0.8388
Epoch 430/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8399
Epoch 431/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3886 - accurac
y: 0.8386
Epoch 432/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8397
Epoch 433/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3881 - accurac
y: 0.8389
Epoch 434/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8390
Epoch 435/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3884 - accurac
y: 0.8382
Epoch 436/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3886 - accurac
y: 0.8394
Epoch 437/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8388
Epoch 438/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3876 - accurac
y: 0.8396
Epoch 439/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3884 - accurac
y: 0.8394
Epoch 440/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3883 - accurac
y: 0.8400
Epoch 441/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3884 - accurac
y: 0.8399
Epoch 442/500
```

```
225/225 [==============================] – 1s 3ms/step – loss: 0.3885 – accurac
y: 0.8403
Epoch 443/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3888 – accurac
y: 0.8389
Epoch 444/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3885 – accurac
y: 0.8396
Epoch 445/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3884 – accurac
y: 0.8388
Epoch 446/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3883 – accurac
y: 0.8411
Epoch 447/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3885 – accurac
y: 0.8399
Epoch 448/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3885 – accurac
y: 0.8382
Epoch 449/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3885 – accurac
y: 0.8396
Epoch 450/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3885 – accurac
y: 0.8397
Epoch 451/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3883 – accurac
y: 0.8397
Epoch 452/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3882 – accurac
y: 0.8399
Epoch 453/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3886 – accurac
y: 0.8388
Epoch 454/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3882 – accurac
y: 0.8385
Epoch 455/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3882 – accurac
y: 0.8389
Epoch 456/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3883 – accurac
y: 0.8400
Epoch 457/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3881 – accurac
y: 0.8394
Epoch 458/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3882 – accurac
y: 0.8410
Epoch 459/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3880 – accurac
y: 0.8389
Epoch 460/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3882 – accurac
y: 0.8397
Epoch 461/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3882 – accurac
y: 0.8392
Epoch 462/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3885 – accurac
y: 0.8382
Epoch 463/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3882 – accurac
y: 0.8376
```

```
Epoch 464/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8399
Epoch 465/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3882 - accurac
y: 0.8382
Epoch 466/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3880 - accurac
y: 0.8382
Epoch 467/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3884 - accurac
y: 0.8393
Epoch 468/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8386
Epoch 469/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3886 - accurac
y: 0.8379
Epoch 470/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3886 - accurac
y: 0.8396
Epoch 471/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3883 - accurac
y: 0.8392
Epoch 472/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3881 - accurac
y: 0.8401
Epoch 473/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8397
Epoch 474/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3883 - accurac
y: 0.8388
Epoch 475/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3884 - accurac
y: 0.8383
Epoch 476/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3885 - accurac
y: 0.8396
Epoch 477/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3883 - accurac
y: 0.8374
Epoch 478/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3882 - accurac
y: 0.8393
Epoch 479/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3888 - accurac
y: 0.8381
Epoch 480/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3882 - accurac
y: 0.8396
Epoch 481/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3883 - accurac
y: 0.8383
Epoch 482/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3884 - accurac
y: 0.8382
Epoch 483/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3885 - accurac
y: 0.8390
Epoch 484/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3882 - accurac
y: 0.8394
Epoch 485/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3883 - accurac
```

```
y: 0.8379
Epoch 486/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3884 - accurac
y: 0.8399
Epoch 487/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3884 - accurac
y: 0.8399
Epoch 488/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3884 - accurac
y: 0.8383
Epoch 489/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3878 - accurac
y: 0.8414
Epoch 490/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3885 - accurac
y: 0.8375
Epoch 491/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3884 - accurac
y: 0.8392
Epoch 492/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3881 - accurac
y: 0.8404
Epoch 493/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3879 - accurac
y: 0.8385
Epoch 494/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3883 - accurac
y: 0.8404
Epoch 495/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3880 - accurac
y: 0.8394
Epoch 496/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3883 - accurac
y: 0.8386
Epoch 497/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3881 - accurac
y: 0.8389
Epoch 498/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3886 - accurac
y: 0.8392
Epoch 499/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3881 - accurac
y: 0.8394
Epoch 500/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3882 - accurac
y: 0.8400
Epoch 1/500
225/225 [==============================] - 1s 3ms/step - loss: 0.5968 - accurac
y: 0.7956
Epoch 2/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4478 - accurac
y: 0.7957
Epoch 3/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4307 - accurac
y: 0.7957
Epoch 4/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4254 - accurac
y: 0.7957
Epoch 5/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4218 - accurac
y: 0.7957
Epoch 6/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4188 - accurac
y: 0.7957
Epoch 7/500
```

```
225/225 [==============================] - 1s 2ms/step - loss: 0.4161 - accurac
y: 0.8156
Epoch 8/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4143 - accurac
y: 0.8244
Epoch 9/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4131 - accurac
y: 0.8283
Epoch 10/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4120 - accurac
y: 0.8301
Epoch 11/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4108 - accurac
y: 0.8290
Epoch 12/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4100 - accurac
y: 0.8326
Epoch 13/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4090 - accurac
y: 0.8321
Epoch 14/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4085 - accurac
y: 0.8342
Epoch 15/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4076 - accurac
y: 0.8351
Epoch 16/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4068 - accurac
y: 0.8363
Epoch 17/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4066 - accurac
y: 0.8367
Epoch 18/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4060 - accurac
y: 0.8358
Epoch 19/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4055 - accurac
y: 0.8360
Epoch 20/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4050 - accurac
y: 0.8365
Epoch 21/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4043 - accurac
y: 0.8361
Epoch 22/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4041 - accurac
y: 0.8364
Epoch 23/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4037 - accurac
y: 0.8365
Epoch 24/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4032 - accurac
y: 0.8372
Epoch 25/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4033 - accurac
y: 0.8383
Epoch 26/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4027 - accurac
y: 0.8363
Epoch 27/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4025 - accurac
y: 0.8364
Epoch 28/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4023 - accurac
y: 0.8364
```

```
Epoch 29/500
225/225 [==============================] – 1s 2ms/step – loss: 0.4018 – accurac
y: 0.8371
Epoch 30/500
225/225 [==============================] – 1s 2ms/step – loss: 0.4017 – accurac
y: 0.8376
Epoch 31/500
225/225 [==============================] – 1s 2ms/step – loss: 0.4013 – accurac
y: 0.8375
Epoch 32/500
225/225 [==============================] – 1s 3ms/step – loss: 0.4015 – accurac
y: 0.8376
Epoch 33/500
225/225 [==============================] – 1s 3ms/step – loss: 0.4011 – accurac
y: 0.8369
Epoch 34/500
225/225 [==============================] – 1s 3ms/step – loss: 0.4012 – accurac
y: 0.8374
Epoch 35/500
225/225 [==============================] – 1s 3ms/step – loss: 0.4006 – accurac
y: 0.8369
Epoch 36/500
225/225 [==============================] – 1s 3ms/step – loss: 0.4006 – accurac
y: 0.8371
Epoch 37/500
225/225 [==============================] – 1s 3ms/step – loss: 0.4005 – accurac
y: 0.8364
Epoch 38/500
225/225 [==============================] – 1s 3ms/step – loss: 0.4001 – accurac
y: 0.8371
Epoch 39/500
225/225 [==============================] – 1s 3ms/step – loss: 0.4002 – accurac
y: 0.8365
Epoch 40/500
225/225 [==============================] – 1s 2ms/step – loss: 0.4001 – accurac
y: 0.8363
Epoch 41/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3999 – accurac
y: 0.8360
Epoch 42/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3997 – accurac
y: 0.8369
Epoch 43/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3996 – accurac
y: 0.8369
Epoch 44/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3995 – accurac
y: 0.8374
Epoch 45/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3995 – accurac
y: 0.8374
Epoch 46/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3992 – accurac
y: 0.8375
Epoch 47/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3993 – accurac
y: 0.8360
Epoch 48/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3991 – accurac
y: 0.8369
Epoch 49/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3992 – accurac
y: 0.8357
Epoch 50/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3991 – accurac
```

```
y: 0.8365
Epoch 51/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3986 – accurac
y: 0.8369
Epoch 52/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3989 – accurac
y: 0.8364
Epoch 53/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3988 – accurac
y: 0.8361
Epoch 54/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3991 – accurac
y: 0.8372
Epoch 55/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3988 – accurac
y: 0.8375
Epoch 56/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3985 – accurac
y: 0.8376
Epoch 57/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3984 – accurac
y: 0.8367
Epoch 58/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3986 – accurac
y: 0.8372
Epoch 59/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3981 – accurac
y: 0.8368
Epoch 60/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3979 – accurac
y: 0.8360
Epoch 61/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3985 – accurac
y: 0.8379
Epoch 62/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3983 – accurac
y: 0.8381
Epoch 63/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3983 – accurac
y: 0.8361
Epoch 64/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3978 – accurac
y: 0.8363
Epoch 65/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3980 – accurac
y: 0.8369
Epoch 66/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3980 – accurac
y: 0.8367
Epoch 67/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3981 – accurac
y: 0.8367
Epoch 68/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3978 – accurac
y: 0.8374
Epoch 69/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3981 – accurac
y: 0.8372
Epoch 70/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3978 – accurac
y: 0.8367
Epoch 71/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3980 – accurac
y: 0.8375
Epoch 72/500
```

```
225/225 [==============================] - 1s 3ms/step - loss: 0.3977 - accurac
y: 0.8363
Epoch 73/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3979 - accurac
y: 0.8369
Epoch 74/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3978 - accurac
y: 0.8371
Epoch 75/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3979 - accurac
y: 0.8360
Epoch 76/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3975 - accurac
y: 0.8375
Epoch 77/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3977 - accurac
y: 0.8368
Epoch 78/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3977 - accurac
y: 0.8369
Epoch 79/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3978 - accurac
y: 0.8361
Epoch 80/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3973 - accurac
y: 0.8382
Epoch 81/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3977 - accurac
y: 0.8382
Epoch 82/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3977 - accurac
y: 0.8361
Epoch 83/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3974 - accurac
y: 0.8367
Epoch 84/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3976 - accurac
y: 0.8375
Epoch 85/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3975 - accurac
y: 0.8367
Epoch 86/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3967 - accurac
y: 0.8376
Epoch 87/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3976 - accurac
y: 0.8364
Epoch 88/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3974 - accurac
y: 0.8374
Epoch 89/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3973 - accurac
y: 0.8374
Epoch 90/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3974 - accurac
y: 0.8383
Epoch 91/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3974 - accurac
y: 0.8375
Epoch 92/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3976 - accurac
y: 0.8361
Epoch 93/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3970 - accurac
y: 0.8372
```

```
Epoch 94/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3973 – accurac
y: 0.8368
Epoch 95/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3972 – accurac
y: 0.8369
Epoch 96/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3973 – accurac
y: 0.8372
Epoch 97/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3973 – accurac
y: 0.8361
Epoch 98/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3972 – accurac
y: 0.8371
Epoch 99/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3973 – accurac
y: 0.8367
Epoch 100/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3973 – accurac
y: 0.8372
Epoch 101/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3970 – accurac
y: 0.8365
Epoch 102/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3971 – accurac
y: 0.8375
Epoch 103/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3974 – accurac
y: 0.8367
Epoch 104/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3973 – accurac
y: 0.8375
Epoch 105/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3973 – accurac
y: 0.8363
Epoch 106/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3971 – accurac
y: 0.8388
Epoch 107/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3968 – accurac
y: 0.8371
Epoch 108/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3972 – accurac
y: 0.8376
Epoch 109/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3973 – accurac
y: 0.8378
Epoch 110/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3969 – accurac
y: 0.8382
Epoch 111/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3969 – accurac
y: 0.8372
Epoch 112/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3974 – accurac
y: 0.8376
Epoch 113/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3969 – accurac
y: 0.8357
Epoch 114/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3973 – accurac
y: 0.8369
Epoch 115/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3970 – accurac
```

```
y: 0.8386
Epoch 116/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3972 – accurac
y: 0.8364
Epoch 117/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3970 – accurac
y: 0.8374
Epoch 118/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3969 – accurac
y: 0.8381
Epoch 119/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3972 – accurac
y: 0.8369
Epoch 120/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3971 – accurac
y: 0.8346
Epoch 121/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3971 – accurac
y: 0.8382
Epoch 122/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3971 – accurac
y: 0.8367
Epoch 123/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3967 – accurac
y: 0.8371
Epoch 124/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3968 – accurac
y: 0.8368
Epoch 125/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3971 – accurac
y: 0.8379
Epoch 126/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3968 – accurac
y: 0.8378
Epoch 127/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3970 – accurac
y: 0.8369
Epoch 128/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3970 – accurac
y: 0.8371
Epoch 129/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3969 – accurac
y: 0.8375
Epoch 130/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3968 – accurac
y: 0.8374
Epoch 131/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3970 – accurac
y: 0.8371
Epoch 132/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3967 – accurac
y: 0.8375
Epoch 133/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3966 – accurac
y: 0.8376
Epoch 134/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3970 – accurac
y: 0.8374
Epoch 135/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3968 – accurac
y: 0.8375
Epoch 136/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3968 – accurac
y: 0.8372
Epoch 137/500
```

```
225/225 [==============================] - 1s 3ms/step - loss: 0.3969 - accurac
y: 0.8357
Epoch 138/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3968 - accurac
y: 0.8368
Epoch 139/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3968 - accurac
y: 0.8374
Epoch 140/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3965 - accurac
y: 0.8367
Epoch 141/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3968 - accurac
y: 0.8383
Epoch 142/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3968 - accurac
y: 0.8368
Epoch 143/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3965 - accurac
y: 0.8367
Epoch 144/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3968 - accurac
y: 0.8371
Epoch 145/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3966 - accurac
y: 0.8367
Epoch 146/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3966 - accurac
y: 0.8369
Epoch 147/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3966 - accurac
y: 0.8375
Epoch 148/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3966 - accurac
y: 0.8379
Epoch 149/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3967 - accurac
y: 0.8372
Epoch 150/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3965 - accurac
y: 0.8367
Epoch 151/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3967 - accurac
y: 0.8374
Epoch 152/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3963 - accurac
y: 0.8365
Epoch 153/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3964 - accurac
y: 0.8385
Epoch 154/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3966 - accurac
y: 0.8371
Epoch 155/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3964 - accurac
y: 0.8379
Epoch 156/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3964 - accurac
y: 0.8371
Epoch 157/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3963 - accurac
y: 0.8379
Epoch 158/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3963 - accurac
y: 0.8378
```

```
Epoch 159/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3960 – accurac
y: 0.8371
Epoch 160/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3962 – accurac
y: 0.8375
Epoch 161/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3960 – accurac
y: 0.8383
Epoch 162/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3958 – accurac
y: 0.8382
Epoch 163/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3958 – accurac
y: 0.8367
Epoch 164/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3957 – accurac
y: 0.8371
Epoch 165/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3956 – accurac
y: 0.8379
Epoch 166/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3954 – accurac
y: 0.8365
Epoch 167/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3954 – accurac
y: 0.8371
Epoch 168/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3953 – accurac
y: 0.8379
Epoch 169/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3950 – accurac
y: 0.8374
Epoch 170/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3952 – accurac
y: 0.8374
Epoch 171/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3950 – accurac
y: 0.8369
Epoch 172/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3951 – accurac
y: 0.8371
Epoch 173/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3946 – accurac
y: 0.8388
Epoch 174/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3949 – accurac
y: 0.8367
Epoch 175/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3946 – accurac
y: 0.8386
Epoch 176/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3944 – accurac
y: 0.8365
Epoch 177/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3944 – accurac
y: 0.8367
Epoch 178/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3942 – accurac
y: 0.8376
Epoch 179/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3944 – accurac
y: 0.8383
Epoch 180/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3941 – accurac
```

```
y: 0.8372
Epoch 181/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3943 - accurac
y: 0.8379
Epoch 182/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3940 - accurac
y: 0.8388
Epoch 183/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3939 - accurac
y: 0.8372
Epoch 184/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3936 - accurac
y: 0.8364
Epoch 185/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8383
Epoch 186/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3938 - accurac
y: 0.8382
Epoch 187/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3934 - accurac
y: 0.8378
Epoch 188/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3933 - accurac
y: 0.8386
Epoch 189/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3931 - accurac
y: 0.8372
Epoch 190/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3932 - accurac
y: 0.8379
Epoch 191/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3931 - accurac
y: 0.8383
Epoch 192/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3931 - accurac
y: 0.8385
Epoch 193/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3928 - accurac
y: 0.8363
Epoch 194/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3927 - accurac
y: 0.8390
Epoch 195/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3928 - accurac
y: 0.8386
Epoch 196/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3926 - accurac
y: 0.8365
Epoch 197/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3928 - accurac
y: 0.8375
Epoch 198/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3925 - accurac
y: 0.8388
Epoch 199/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3927 - accurac
y: 0.8386
Epoch 200/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3924 - accurac
y: 0.8383
Epoch 201/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3923 - accurac
y: 0.8378
Epoch 202/500
```

```
225/225 [==============================] - 1s 3ms/step - loss: 0.3922 - accurac
y: 0.8375
Epoch 203/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3924 - accurac
y: 0.8369
Epoch 204/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3919 - accurac
y: 0.8374
Epoch 205/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3923 - accurac
y: 0.8389
Epoch 206/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3920 - accurac
y: 0.8379
Epoch 207/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3918 - accurac
y: 0.8378
Epoch 208/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3915 - accurac
y: 0.8403
Epoch 209/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3919 - accurac
y: 0.8385
Epoch 210/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3918 - accurac
y: 0.8390
Epoch 211/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3917 - accurac
y: 0.8389
Epoch 212/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3917 - accurac
y: 0.8374
Epoch 213/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3914 - accurac
y: 0.8374
Epoch 214/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3913 - accurac
y: 0.8379
Epoch 215/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3915 - accurac
y: 0.8394
Epoch 216/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3911 - accurac
y: 0.8385
Epoch 217/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3916 - accurac
y: 0.8392
Epoch 218/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3914 - accurac
y: 0.8393
Epoch 219/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3912 - accurac
y: 0.8392
Epoch 220/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3912 - accurac
y: 0.8394
Epoch 221/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3906 - accurac
y: 0.8393
Epoch 222/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3913 - accurac
y: 0.8393
Epoch 223/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3909 - accurac
y: 0.8394
```

```
Epoch 224/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3908 – accurac
y: 0.8382
Epoch 225/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3908 – accurac
y: 0.8400
Epoch 226/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3907 – accurac
y: 0.8410
Epoch 227/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3909 – accurac
y: 0.8403
Epoch 228/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3908 – accurac
y: 0.8394
Epoch 229/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3903 – accurac
y: 0.8408
Epoch 230/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3905 – accurac
y: 0.8399
Epoch 231/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3908 – accurac
y: 0.8401
Epoch 232/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3906 – accurac
y: 0.8403
Epoch 233/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3897 – accurac
y: 0.8399
Epoch 234/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3902 – accurac
y: 0.8407
Epoch 235/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3905 – accurac
y: 0.8394
Epoch 236/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3901 – accurac
y: 0.8399
Epoch 237/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3906 – accurac
y: 0.8408
Epoch 238/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3902 – accurac
y: 0.8399
Epoch 239/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3903 – accurac
y: 0.8393
Epoch 240/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3902 – accurac
y: 0.8392
Epoch 241/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3899 – accurac
y: 0.8401
Epoch 242/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3900 – accurac
y: 0.8392
Epoch 243/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3900 – accurac
y: 0.8400
Epoch 244/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3897 – accurac
y: 0.8393
Epoch 245/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3900 – accurac
```

```
y: 0.8401
Epoch 246/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3899 - accurac
y: 0.8399
Epoch 247/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3899 - accurac
y: 0.8394
Epoch 248/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3894 - accurac
y: 0.8410
Epoch 249/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3898 - accurac
y: 0.8394
Epoch 250/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3895 - accurac
y: 0.8406
Epoch 251/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3892 - accurac
y: 0.8413
Epoch 252/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3897 - accurac
y: 0.8404
Epoch 253/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3894 - accurac
y: 0.8410
Epoch 254/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3895 - accurac
y: 0.8424
Epoch 255/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3895 - accurac
y: 0.8386
Epoch 256/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3895 - accurac
y: 0.8401
Epoch 257/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3895 - accurac
y: 0.8406
Epoch 258/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3897 - accurac
y: 0.8407
Epoch 259/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3895 - accurac
y: 0.8406
Epoch 260/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3892 - accurac
y: 0.8404
Epoch 261/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3897 - accurac
y: 0.8403
Epoch 262/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3891 - accurac
y: 0.8392
Epoch 263/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3894 - accurac
y: 0.8404
Epoch 264/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3893 - accurac
y: 0.8408
Epoch 265/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3895 - accurac
y: 0.8401
Epoch 266/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3891 - accurac
y: 0.8401
Epoch 267/500
```

```
225/225 [==============================] - 1s 3ms/step - loss: 0.3896 - accurac
y: 0.8389
Epoch 268/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3893 - accurac
y: 0.8400
Epoch 269/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3891 - accurac
y: 0.8397
Epoch 270/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3893 - accurac
y: 0.8390
Epoch 271/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3890 - accurac
y: 0.8396
Epoch 272/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3889 - accurac
y: 0.8393
Epoch 273/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3891 - accurac
y: 0.8397
Epoch 274/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3894 - accurac
y: 0.8396
Epoch 275/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3892 - accurac
y: 0.8400
Epoch 276/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3892 - accurac
y: 0.8396
Epoch 277/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3891 - accurac
y: 0.8413
Epoch 278/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3890 - accurac
y: 0.8396
Epoch 279/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3885 - accurac
y: 0.8404
Epoch 280/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3888 - accurac
y: 0.8404
Epoch 281/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3888 - accurac
y: 0.8396
Epoch 282/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3890 - accurac
y: 0.8411
Epoch 283/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3891 - accurac
y: 0.8400
Epoch 284/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3889 - accurac
y: 0.8399
Epoch 285/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3890 - accurac
y: 0.8399
Epoch 286/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3892 - accurac
y: 0.8403
Epoch 287/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3886 - accurac
y: 0.8403
Epoch 288/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3891 - accurac
y: 0.8408
```

```
Epoch 289/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3887 - accurac
y: 0.8401
Epoch 290/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3888 - accurac
y: 0.8396
Epoch 291/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3889 - accurac
y: 0.8406
Epoch 292/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3888 - accurac
y: 0.8415
Epoch 293/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3890 - accurac
y: 0.8394
Epoch 294/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3889 - accurac
y: 0.8397
Epoch 295/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3889 - accurac
y: 0.8415
Epoch 296/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3886 - accurac
y: 0.8411
Epoch 297/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3888 - accurac
y: 0.8411
Epoch 298/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3886 - accurac
y: 0.8401
Epoch 299/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3886 - accurac
y: 0.8407
Epoch 300/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3888 - accurac
y: 0.8408
Epoch 301/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3891 - accurac
y: 0.8390
Epoch 302/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3887 - accurac
y: 0.8411
Epoch 303/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3888 - accurac
y: 0.8403
Epoch 304/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3889 - accurac
y: 0.8396
Epoch 305/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3884 - accurac
y: 0.8396
Epoch 306/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3891 - accurac
y: 0.8396
Epoch 307/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3886 - accurac
y: 0.8415
Epoch 308/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3886 - accurac
y: 0.8394
Epoch 309/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3890 - accurac
y: 0.8419
Epoch 310/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3889 - accurac
```

```
y: 0.8407
Epoch 311/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3888 - accurac
y: 0.8396
Epoch 312/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3886 - accurac
y: 0.8410
Epoch 313/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3889 - accurac
y: 0.8406
Epoch 314/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3886 - accurac
y: 0.8396
Epoch 315/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3888 - accurac
y: 0.8407
Epoch 316/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3891 - accurac
y: 0.8406
Epoch 317/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3885 - accurac
y: 0.8401
Epoch 318/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3889 - accurac
y: 0.8414
Epoch 319/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3887 - accurac
y: 0.8386
Epoch 320/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3885 - accurac
y: 0.8413
Epoch 321/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3885 - accurac
y: 0.8421
Epoch 322/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3886 - accurac
y: 0.8410
Epoch 323/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3886 - accurac
y: 0.8411
Epoch 324/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3889 - accurac
y: 0.8411
Epoch 325/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3888 - accurac
y: 0.8385
Epoch 326/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3886 - accurac
y: 0.8401
Epoch 327/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3888 - accurac
y: 0.8411
Epoch 328/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3884 - accurac
y: 0.8408
Epoch 329/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3883 - accurac
y: 0.8415
Epoch 330/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3887 - accurac
y: 0.8410
Epoch 331/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3886 - accurac
y: 0.8396
Epoch 332/500
```

```
225/225 [==============================] - 0s 2ms/step - loss: 0.3886 - accurac
y: 0.8407
Epoch 333/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3886 - accurac
y: 0.8404
Epoch 334/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3885 - accurac
y: 0.8397
Epoch 335/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3885 - accurac
y: 0.8404
Epoch 336/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3883 - accurac
y: 0.8407
Epoch 337/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3885 - accurac
y: 0.8418
Epoch 338/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3886 - accurac
y: 0.8404
Epoch 339/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3887 - accurac
y: 0.8388
Epoch 340/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3885 - accurac
y: 0.8403
Epoch 341/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3884 - accurac
y: 0.8403
Epoch 342/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3885 - accurac
y: 0.8414
Epoch 343/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3883 - accurac
y: 0.8410
Epoch 344/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3885 - accurac
y: 0.8400
Epoch 345/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3887 - accurac
y: 0.8401
Epoch 346/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3880 - accurac
y: 0.8396
Epoch 347/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3883 - accurac
y: 0.8397
Epoch 348/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3885 - accurac
y: 0.8411
Epoch 349/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3887 - accurac
y: 0.8415
Epoch 350/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3885 - accurac
y: 0.8414
Epoch 351/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3883 - accurac
y: 0.8397
Epoch 352/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3883 - accurac
y: 0.8417
Epoch 353/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3884 - accurac
y: 0.8406
```

```
Epoch 354/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3884 - accurac
y: 0.8407
Epoch 355/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3884 - accurac
y: 0.8413
Epoch 356/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3879 - accurac
y: 0.8404
Epoch 357/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3884 - accurac
y: 0.8406
Epoch 358/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3882 - accurac
y: 0.8394
Epoch 359/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3880 - accurac
y: 0.8400
Epoch 360/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3882 - accurac
y: 0.8413
Epoch 361/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3884 - accurac
y: 0.8403
Epoch 362/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3884 - accurac
y: 0.8403
Epoch 363/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3880 - accurac
y: 0.8403
Epoch 364/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3881 - accurac
y: 0.8397
Epoch 365/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3880 - accurac
y: 0.8401
Epoch 366/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3882 - accurac
y: 0.8418
Epoch 367/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3881 - accurac
y: 0.8410
Epoch 368/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3882 - accurac
y: 0.8403
Epoch 369/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3883 - accurac
y: 0.8413
Epoch 370/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3881 - accurac
y: 0.8392
Epoch 371/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3882 - accurac
y: 0.8411
Epoch 372/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3883 - accurac
y: 0.8394
Epoch 373/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3883 - accurac
y: 0.8410
Epoch 374/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3877 - accurac
y: 0.8426
Epoch 375/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3881 - accurac
```

```
y: 0.8394
Epoch 376/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3876 - accurac
y: 0.8404
Epoch 377/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3882 - accurac
y: 0.8400
Epoch 378/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3875 - accurac
y: 0.8410
Epoch 379/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3879 - accurac
y: 0.8400
Epoch 380/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3881 - accurac
y: 0.8411
Epoch 381/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3881 - accurac
y: 0.8400
Epoch 382/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3882 - accurac
y: 0.8417
Epoch 383/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3880 - accurac
y: 0.8414
Epoch 384/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3879 - accurac
y: 0.8410
Epoch 385/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3882 - accurac
y: 0.8413
Epoch 386/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3881 - accurac
y: 0.8408
Epoch 387/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3881 - accurac
y: 0.8424
Epoch 388/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3881 - accurac
y: 0.8410
Epoch 389/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3877 - accurac
y: 0.8410
Epoch 390/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3883 - accurac
y: 0.8413
Epoch 391/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3880 - accurac
y: 0.8396
Epoch 392/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3879 - accurac
y: 0.8394
Epoch 393/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3880 - accurac
y: 0.8418
Epoch 394/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3880 - accurac
y: 0.8399
Epoch 395/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3879 - accurac
y: 0.8408
Epoch 396/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3876 - accurac
y: 0.8414
Epoch 397/500
```

```
225/225 [==============================] - 1s 2ms/step - loss: 0.3879 - accurac
y: 0.8410
Epoch 398/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3873 - accurac
y: 0.8404
Epoch 399/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3879 - accurac
y: 0.8408
Epoch 400/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3877 - accurac
y: 0.8404
Epoch 401/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3878 - accurac
y: 0.8399
Epoch 402/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3879 - accurac
y: 0.8418
Epoch 403/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3877 - accurac
y: 0.8407
Epoch 404/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3879 - accurac
y: 0.8393
Epoch 405/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3877 - accurac
y: 0.8400
Epoch 406/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3877 - accurac
y: 0.8413
Epoch 407/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3878 - accurac
y: 0.8399
Epoch 408/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3879 - accurac
y: 0.8406
Epoch 409/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3878 - accurac
y: 0.8408
Epoch 410/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3881 - accurac
y: 0.8400
Epoch 411/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3879 - accurac
y: 0.8410
Epoch 412/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3878 - accurac
y: 0.8431
Epoch 413/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3872 - accurac
y: 0.8417
Epoch 414/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3875 - accurac
y: 0.8407
Epoch 415/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3875 - accurac
y: 0.8407
Epoch 416/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3878 - accurac
y: 0.8408
Epoch 417/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3873 - accurac
y: 0.8407
Epoch 418/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3877 - accurac
y: 0.8413
```

```
Epoch 419/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3874 – accurac
y: 0.8408
Epoch 420/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3875 – accurac
y: 0.8403
Epoch 421/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3880 – accurac
y: 0.8414
Epoch 422/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3875 – accurac
y: 0.8413
Epoch 423/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3877 – accurac
y: 0.8407
Epoch 424/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3876 – accurac
y: 0.8411
Epoch 425/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3876 – accurac
y: 0.8411
Epoch 426/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3876 – accurac
y: 0.8418
Epoch 427/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3879 – accurac
y: 0.8407
Epoch 428/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3875 – accurac
y: 0.8407
Epoch 429/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3877 – accurac
y: 0.8424
Epoch 430/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3878 – accurac
y: 0.8406
Epoch 431/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3874 – accurac
y: 0.8401
Epoch 432/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3877 – accurac
y: 0.8396
Epoch 433/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3879 – accurac
y: 0.8406
Epoch 434/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3876 – accurac
y: 0.8399
Epoch 435/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3875 – accurac
y: 0.8400
Epoch 436/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3875 – accurac
y: 0.8411
Epoch 437/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3879 – accurac
y: 0.8404
Epoch 438/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3875 – accurac
y: 0.8394
Epoch 439/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3877 – accurac
y: 0.8417
Epoch 440/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3875 – accurac
```

```
y: 0.8419
Epoch 441/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3877 - accurac
y: 0.8414
Epoch 442/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3874 - accurac
y: 0.8408
Epoch 443/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3873 - accurac
y: 0.8421
Epoch 444/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3877 - accurac
y: 0.8396
Epoch 445/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3876 - accurac
y: 0.8415
Epoch 446/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3878 - accurac
y: 0.8394
Epoch 447/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3873 - accurac
y: 0.8396
Epoch 448/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3875 - accurac
y: 0.8410
Epoch 449/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3878 - accurac
y: 0.8407
Epoch 450/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3875 - accurac
y: 0.8407
Epoch 451/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3878 - accurac
y: 0.8397
Epoch 452/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3874 - accurac
y: 0.8397
Epoch 453/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3874 - accurac
y: 0.8406
Epoch 454/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3878 - accurac
y: 0.8400
Epoch 455/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3877 - accurac
y: 0.8404
Epoch 456/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3871 - accurac
y: 0.8410
Epoch 457/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3873 - accurac
y: 0.8414
Epoch 458/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3877 - accurac
y: 0.8408
Epoch 459/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3876 - accurac
y: 0.8418
Epoch 460/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3876 - accurac
y: 0.8411
Epoch 461/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3871 - accurac
y: 0.8414
Epoch 462/500
```

```
225/225 [==============================] - 1s 2ms/step - loss: 0.3876 - accurac
y: 0.8403
Epoch 463/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3877 - accurac
y: 0.8407
Epoch 464/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3877 - accurac
y: 0.8396
Epoch 465/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3874 - accurac
y: 0.8418
Epoch 466/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3874 - accurac
y: 0.8406
Epoch 467/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3874 - accurac
y: 0.8394
Epoch 468/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3876 - accurac
y: 0.8408
Epoch 469/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3872 - accurac
y: 0.8404
Epoch 470/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3872 - accurac
y: 0.8399
Epoch 471/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3878 - accurac
y: 0.8389
Epoch 472/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3875 - accurac
y: 0.8397
Epoch 473/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3874 - accurac
y: 0.8411
Epoch 474/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3875 - accurac
y: 0.8403
Epoch 475/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3875 - accurac
y: 0.8403
Epoch 476/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3875 - accurac
y: 0.8424
Epoch 477/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3875 - accurac
y: 0.8399
Epoch 478/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3874 - accurac
y: 0.8399
Epoch 479/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3875 - accurac
y: 0.8408
Epoch 480/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3874 - accurac
y: 0.8410
Epoch 481/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3873 - accurac
y: 0.8408
Epoch 482/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3873 - accurac
y: 0.8397
Epoch 483/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3873 - accurac
y: 0.8426
```

```
Epoch 484/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3873 - accurac
y: 0.8413
Epoch 485/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3874 - accurac
y: 0.8406
Epoch 486/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3872 - accurac
y: 0.8410
Epoch 487/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3869 - accurac
y: 0.8417
Epoch 488/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3874 - accurac
y: 0.8413
Epoch 489/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3874 - accurac
y: 0.8393
Epoch 490/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3875 - accurac
y: 0.8397
Epoch 491/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3873 - accurac
y: 0.8414
Epoch 492/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3869 - accurac
y: 0.8407
Epoch 493/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3872 - accurac
y: 0.8411
Epoch 494/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3871 - accurac
y: 0.8407
Epoch 495/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3873 - accurac
y: 0.8396
Epoch 496/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3873 - accurac
y: 0.8407
Epoch 497/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3868 - accurac
y: 0.8399
Epoch 498/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3875 - accurac
y: 0.8411
Epoch 499/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3869 - accurac
y: 0.8404
Epoch 500/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3870 - accurac
y: 0.8401
Epoch 1/500
225/225 [==============================] - 1s 2ms/step - loss: 0.5971 - accurac
y: 0.7939
Epoch 2/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4503 - accurac
y: 0.7961
Epoch 3/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4360 - accurac
y: 0.7961
Epoch 4/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4318 - accurac
y: 0.7961
Epoch 5/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4293 - accurac
```

```
y: 0.7961
Epoch 6/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4272 - accurac
y: 0.7961
Epoch 7/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4256 - accurac
y: 0.7961
Epoch 8/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4236 - accurac
y: 0.7985
Epoch 9/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4218 - accurac
y: 0.8161
Epoch 10/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4204 - accurac
y: 0.8182
Epoch 11/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4192 - accurac
y: 0.8228
Epoch 12/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4180 - accurac
y: 0.8258
Epoch 13/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4174 - accurac
y: 0.8269
Epoch 14/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4164 - accurac
y: 0.8274
Epoch 15/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4156 - accurac
y: 0.8294
Epoch 16/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4148 - accurac
y: 0.8308
Epoch 17/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4145 - accurac
y: 0.8313
Epoch 18/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4138 - accurac
y: 0.8315
Epoch 19/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4131 - accurac
y: 0.8319
Epoch 20/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4126 - accurac
y: 0.8308
Epoch 21/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4118 - accurac
y: 0.8319
Epoch 22/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4114 - accurac
y: 0.8324
Epoch 23/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4107 - accurac
y: 0.8319
Epoch 24/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4104 - accurac
y: 0.8332
Epoch 25/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4101 - accurac
y: 0.8338
Epoch 26/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4098 - accurac
y: 0.8325
Epoch 27/500
```

```
225/225 [==============================] - 1s 2ms/step - loss: 0.4092 - accurac
y: 0.8340
Epoch 28/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4092 - accurac
y: 0.8335
Epoch 29/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4089 - accurac
y: 0.8342
Epoch 30/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4083 - accurac
y: 0.8336
Epoch 31/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4080 - accurac
y: 0.8338
Epoch 32/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4078 - accurac
y: 0.8356
Epoch 33/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4077 - accurac
y: 0.8342
Epoch 34/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4076 - accurac
y: 0.8344
Epoch 35/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4072 - accurac
y: 0.8346
Epoch 36/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4070 - accurac
y: 0.8347
Epoch 37/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4069 - accurac
y: 0.8344
Epoch 38/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4068 - accurac
y: 0.8349
Epoch 39/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4063 - accurac
y: 0.8338
Epoch 40/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4063 - accurac
y: 0.8339
Epoch 41/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4062 - accurac
y: 0.8346
Epoch 42/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4059 - accurac
y: 0.8344
Epoch 43/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4055 - accurac
y: 0.8344
Epoch 44/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4057 - accurac
y: 0.8335
Epoch 45/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4056 - accurac
y: 0.8333
Epoch 46/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4053 - accurac
y: 0.8339
Epoch 47/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4055 - accurac
y: 0.8342
Epoch 48/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4052 - accurac
y: 0.8335
```

```
Epoch 49/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4050 - accurac
y: 0.8350
Epoch 50/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4048 - accurac
y: 0.8340
Epoch 51/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4043 - accurac
y: 0.8338
Epoch 52/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4045 - accurac
y: 0.8347
Epoch 53/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4040 - accurac
y: 0.8336
Epoch 54/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4037 - accurac
y: 0.8350
Epoch 55/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4034 - accurac
y: 0.8340
Epoch 56/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4034 - accurac
y: 0.8354
Epoch 57/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4028 - accurac
y: 0.8349
Epoch 58/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4027 - accurac
y: 0.8351
Epoch 59/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4024 - accurac
y: 0.8344
Epoch 60/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4022 - accurac
y: 0.8347
Epoch 61/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4018 - accurac
y: 0.8363
Epoch 62/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4016 - accurac
y: 0.8354
Epoch 63/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4011 - accurac
y: 0.8346
Epoch 64/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4012 - accurac
y: 0.8340
Epoch 65/500
225/225 [==============================] - 1s 3ms/step - loss: 0.4009 - accurac
y: 0.8349
Epoch 66/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4001 - accurac
y: 0.8358
Epoch 67/500
225/225 [==============================] - 0s 2ms/step - loss: 0.4000 - accurac
y: 0.8356
Epoch 68/500
225/225 [==============================] - 1s 2ms/step - loss: 0.4001 - accurac
y: 0.8357
Epoch 69/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3997 - accurac
y: 0.8358
Epoch 70/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3996 - accurac
```

```
y: 0.8351
Epoch 71/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3995 - accurac
y: 0.8361
Epoch 72/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3990 - accurac
y: 0.8349
Epoch 73/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3990 - accurac
y: 0.8346
Epoch 74/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3987 - accurac
y: 0.8357
Epoch 75/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3985 - accurac
y: 0.8353
Epoch 76/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3980 - accurac
y: 0.8342
Epoch 77/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3983 - accurac
y: 0.8346
Epoch 78/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3981 - accurac
y: 0.8360
Epoch 79/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3980 - accurac
y: 0.8367
Epoch 80/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3980 - accurac
y: 0.8346
Epoch 81/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3976 - accurac
y: 0.8351
Epoch 82/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3978 - accurac
y: 0.8363
Epoch 83/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3978 - accurac
y: 0.8357
Epoch 84/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3974 - accurac
y: 0.8346
Epoch 85/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3975 - accurac
y: 0.8351
Epoch 86/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3970 - accurac
y: 0.8333
Epoch 87/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3973 - accurac
y: 0.8358
Epoch 88/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3971 - accurac
y: 0.8367
Epoch 89/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3973 - accurac
y: 0.8347
Epoch 90/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3971 - accurac
y: 0.8364
Epoch 91/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3968 - accurac
y: 0.8371
Epoch 92/500
```

```
225/225 [==============================] - 1s 2ms/step - loss: 0.3969 - accurac
y: 0.8360
Epoch 93/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3966 - accurac
y: 0.8340
Epoch 94/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3967 - accurac
y: 0.8364
Epoch 95/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3967 - accurac
y: 0.8358
Epoch 96/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3968 - accurac
y: 0.8350
Epoch 97/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3962 - accurac
y: 0.8356
Epoch 98/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3964 - accurac
y: 0.8357
Epoch 99/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3962 - accurac
y: 0.8354
Epoch 100/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3960 - accurac
y: 0.8357
Epoch 101/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3965 - accurac
y: 0.8360
Epoch 102/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3961 - accurac
y: 0.8364
Epoch 103/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3961 - accurac
y: 0.8363
Epoch 104/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3961 - accurac
y: 0.8361
Epoch 105/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3961 - accurac
y: 0.8347
Epoch 106/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3957 - accurac
y: 0.8354
Epoch 107/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3959 - accurac
y: 0.8356
Epoch 108/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3960 - accurac
y: 0.8361
Epoch 109/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3960 - accurac
y: 0.8374
Epoch 110/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3956 - accurac
y: 0.8371
Epoch 111/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3957 - accurac
y: 0.8375
Epoch 112/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3957 - accurac
y: 0.8374
Epoch 113/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3958 - accurac
y: 0.8360
```

```
Epoch 114/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3958 - accurac
y: 0.8354
Epoch 115/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3957 - accurac
y: 0.8357
Epoch 116/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3955 - accurac
y: 0.8375
Epoch 117/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3956 - accurac
y: 0.8364
Epoch 118/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3956 - accurac
y: 0.8374
Epoch 119/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3954 - accurac
y: 0.8353
Epoch 120/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3957 - accurac
y: 0.8354
Epoch 121/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3952 - accurac
y: 0.8353
Epoch 122/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3952 - accurac
y: 0.8367
Epoch 123/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3952 - accurac
y: 0.8351
Epoch 124/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3952 - accurac
y: 0.8368
Epoch 125/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3957 - accurac
y: 0.8349
Epoch 126/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3953 - accurac
y: 0.8346
Epoch 127/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3955 - accurac
y: 0.8368
Epoch 128/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3950 - accurac
y: 0.8371
Epoch 129/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3951 - accurac
y: 0.8368
Epoch 130/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3952 - accurac
y: 0.8367
Epoch 131/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3954 - accurac
y: 0.8367
Epoch 132/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3952 - accurac
y: 0.8351
Epoch 133/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3950 - accurac
y: 0.8368
Epoch 134/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3949 - accurac
y: 0.8351
Epoch 135/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3946 - accurac
```

```
y: 0.8371
Epoch 136/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3946 - accurac
y: 0.8383
Epoch 137/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3952 - accurac
y: 0.8372
Epoch 138/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3949 - accurac
y: 0.8372
Epoch 139/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3949 - accurac
y: 0.8342
Epoch 140/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3952 - accurac
y: 0.8378
Epoch 141/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3949 - accurac
y: 0.8374
Epoch 142/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3951 - accurac
y: 0.8365
Epoch 143/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3951 - accurac
y: 0.8360
Epoch 144/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3945 - accurac
y: 0.8354
Epoch 145/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3947 - accurac
y: 0.8374
Epoch 146/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3944 - accurac
y: 0.8368
Epoch 147/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3949 - accurac
y: 0.8379
Epoch 148/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3948 - accurac
y: 0.8371
Epoch 149/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3946 - accurac
y: 0.8358
Epoch 150/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3950 - accurac
y: 0.8357
Epoch 151/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3945 - accurac
y: 0.8365
Epoch 152/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3945 - accurac
y: 0.8363
Epoch 153/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3943 - accurac
y: 0.8375
Epoch 154/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3946 - accurac
y: 0.8351
Epoch 155/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3946 - accurac
y: 0.8376
Epoch 156/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3948 - accurac
y: 0.8365
Epoch 157/500
```

```
225/225 [==============================] - 1s 2ms/step - loss: 0.3941 - accurac
y: 0.8372
Epoch 158/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3947 - accurac
y: 0.8363
Epoch 159/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3946 - accurac
y: 0.8386
Epoch 160/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3944 - accurac
y: 0.8357
Epoch 161/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3945 - accurac
y: 0.8367
Epoch 162/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3944 - accurac
y: 0.8367
Epoch 163/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3944 - accurac
y: 0.8374
Epoch 164/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3949 - accurac
y: 0.8368
Epoch 165/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3943 - accurac
y: 0.8375
Epoch 166/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3942 - accurac
y: 0.8371
Epoch 167/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3945 - accurac
y: 0.8354
Epoch 168/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3945 - accurac
y: 0.8363
Epoch 169/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3944 - accurac
y: 0.8346
Epoch 170/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3942 - accurac
y: 0.8356
Epoch 171/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3942 - accurac
y: 0.8356
Epoch 172/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3945 - accurac
y: 0.8369
Epoch 173/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3943 - accurac
y: 0.8375
Epoch 174/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3936 - accurac
y: 0.8371
Epoch 175/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3945 - accurac
y: 0.8343
Epoch 176/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3939 - accurac
y: 0.8375
Epoch 177/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3941 - accurac
y: 0.8347
Epoch 178/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3936 - accurac
y: 0.8358
```

```
Epoch 179/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3945 - accurac
y: 0.8356
Epoch 180/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3941 - accurac
y: 0.8361
Epoch 181/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3940 - accurac
y: 0.8375
Epoch 182/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3942 - accurac
y: 0.8368
Epoch 183/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3945 - accurac
y: 0.8354
Epoch 184/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3940 - accurac
y: 0.8371
Epoch 185/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3939 - accurac
y: 0.8343
Epoch 186/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3944 - accurac
y: 0.8361
Epoch 187/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3939 - accurac
y: 0.8364
Epoch 188/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8364
Epoch 189/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3941 - accurac
y: 0.8363
Epoch 190/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3939 - accurac
y: 0.8347
Epoch 191/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3941 - accurac
y: 0.8353
Epoch 192/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3942 - accurac
y: 0.8365
Epoch 193/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3943 - accurac
y: 0.8356
Epoch 194/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3938 - accurac
y: 0.8371
Epoch 195/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3941 - accurac
y: 0.8374
Epoch 196/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3940 - accurac
y: 0.8356
Epoch 197/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3941 - accurac
y: 0.8357
Epoch 198/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3942 - accurac
y: 0.8360
Epoch 199/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3937 - accurac
y: 0.8365
Epoch 200/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3942 - accurac
```

```
y: 0.8346
Epoch 201/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3941 - accurac
y: 0.8356
Epoch 202/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3938 - accurac
y: 0.8367
Epoch 203/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3940 - accurac
y: 0.8347
Epoch 204/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3939 - accurac
y: 0.8354
Epoch 205/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3938 - accurac
y: 0.8357
Epoch 206/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3940 - accurac
y: 0.8369
Epoch 207/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3941 - accurac
y: 0.8365
Epoch 208/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3937 - accurac
y: 0.8367
Epoch 209/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3944 - accurac
y: 0.8350
Epoch 210/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3936 - accurac
y: 0.8358
Epoch 211/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8363
Epoch 212/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3935 - accurac
y: 0.8372
Epoch 213/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3940 - accurac
y: 0.8351
Epoch 214/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3940 - accurac
y: 0.8360
Epoch 215/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3938 - accurac
y: 0.8356
Epoch 216/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3940 - accurac
y: 0.8354
Epoch 217/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3939 - accurac
y: 0.8364
Epoch 218/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3939 - accurac
y: 0.8363
Epoch 219/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3940 - accurac
y: 0.8363
Epoch 220/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3938 - accurac
y: 0.8365
Epoch 221/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3941 - accurac
y: 0.8346
Epoch 222/500
```

```
225/225 [==============================] - 1s 2ms/step - loss: 0.3938 - accurac
y: 0.8342
Epoch 223/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3941 - accurac
y: 0.8369
Epoch 224/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3935 - accurac
y: 0.8342
Epoch 225/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3942 - accurac
y: 0.8354
Epoch 226/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3936 - accurac
y: 0.8361
Epoch 227/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3940 - accurac
y: 0.8361
Epoch 228/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3940 - accurac
y: 0.8357
Epoch 229/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3938 - accurac
y: 0.8358
Epoch 230/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3938 - accurac
y: 0.8358
Epoch 231/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3936 - accurac
y: 0.8356
Epoch 232/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3940 - accurac
y: 0.8365
Epoch 233/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3937 - accurac
y: 0.8367
Epoch 234/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3935 - accurac
y: 0.8368
Epoch 235/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3936 - accurac
y: 0.8349
Epoch 236/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3934 - accurac
y: 0.8364
Epoch 237/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3937 - accurac
y: 0.8386
Epoch 238/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8369
Epoch 239/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3941 - accurac
y: 0.8354
Epoch 240/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3937 - accurac
y: 0.8376
Epoch 241/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3936 - accurac
y: 0.8358
Epoch 242/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3940 - accurac
y: 0.8361
Epoch 243/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3940 - accurac
y: 0.8354
```

```
Epoch 244/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3938 - accurac
y: 0.8357
Epoch 245/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3936 - accurac
y: 0.8381
Epoch 246/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3938 - accurac
y: 0.8363
Epoch 247/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3937 - accurac
y: 0.8354
Epoch 248/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3937 - accurac
y: 0.8360
Epoch 249/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3937 - accurac
y: 0.8357
Epoch 250/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3938 - accurac
y: 0.8368
Epoch 251/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3938 - accurac
y: 0.8353
Epoch 252/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3935 - accurac
y: 0.8360
Epoch 253/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3940 - accurac
y: 0.8361
Epoch 254/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3934 - accurac
y: 0.8363
Epoch 255/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3939 - accurac
y: 0.8360
Epoch 256/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3938 - accurac
y: 0.8369
Epoch 257/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3937 - accurac
y: 0.8374
Epoch 258/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3939 - accurac
y: 0.8363
Epoch 259/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3937 - accurac
y: 0.8358
Epoch 260/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3934 - accurac
y: 0.8375
Epoch 261/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3936 - accurac
y: 0.8365
Epoch 262/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3934 - accurac
y: 0.8356
Epoch 263/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3937 - accurac
y: 0.8357
Epoch 264/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3937 - accurac
y: 0.8376
Epoch 265/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3939 - accurac
```

```
y: 0.8360
Epoch 266/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3934 - accurac
y: 0.8363
Epoch 267/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8354
Epoch 268/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3937 - accurac
y: 0.8353
Epoch 269/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8353
Epoch 270/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3940 - accurac
y: 0.8360
Epoch 271/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8346
Epoch 272/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8358
Epoch 273/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3933 - accurac
y: 0.8367
Epoch 274/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3933 - accurac
y: 0.8379
Epoch 275/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3933 - accurac
y: 0.8357
Epoch 276/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3933 - accurac
y: 0.8347
Epoch 277/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3938 - accurac
y: 0.8358
Epoch 278/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3936 - accurac
y: 0.8354
Epoch 279/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8351
Epoch 280/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8375
Epoch 281/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3934 - accurac
y: 0.8364
Epoch 282/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3934 - accurac
y: 0.8376
Epoch 283/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3937 - accurac
y: 0.8350
Epoch 284/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8361
Epoch 285/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3938 - accurac
y: 0.8363
Epoch 286/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3930 - accurac
y: 0.8369
Epoch 287/500
```

```
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8360
Epoch 288/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3934 - accurac
y: 0.8365
Epoch 289/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8347
Epoch 290/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3936 - accurac
y: 0.8382
Epoch 291/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3934 - accurac
y: 0.8360
Epoch 292/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8381
Epoch 293/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3934 - accurac
y: 0.8363
Epoch 294/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8342
Epoch 295/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8360
Epoch 296/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3936 - accurac
y: 0.8381
Epoch 297/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8374
Epoch 298/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3937 - accurac
y: 0.8350
Epoch 299/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8351
Epoch 300/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8358
Epoch 301/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3936 - accurac
y: 0.8356
Epoch 302/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3934 - accurac
y: 0.8372
Epoch 303/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3934 - accurac
y: 0.8351
Epoch 304/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8367
Epoch 305/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8360
Epoch 306/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3933 - accurac
y: 0.8360
Epoch 307/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3934 - accurac
y: 0.8364
Epoch 308/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8369
```

```
Epoch 309/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3935 – accurac
y: 0.8354
Epoch 310/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3934 – accurac
y: 0.8346
Epoch 311/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3931 – accurac
y: 0.8363
Epoch 312/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3935 – accurac
y: 0.8363
Epoch 313/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3935 – accurac
y: 0.8360
Epoch 314/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3930 – accurac
y: 0.8365
Epoch 315/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3935 – accurac
y: 0.8361
Epoch 316/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3935 – accurac
y: 0.8364
Epoch 317/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3935 – accurac
y: 0.8372
Epoch 318/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3930 – accurac
y: 0.8363
Epoch 319/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3933 – accurac
y: 0.8360
Epoch 320/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3933 – accurac
y: 0.8353
Epoch 321/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3935 – accurac
y: 0.8376
Epoch 322/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3932 – accurac
y: 0.8376
Epoch 323/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3929 – accurac
y: 0.8365
Epoch 324/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3933 – accurac
y: 0.8361
Epoch 325/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3933 – accurac
y: 0.8357
Epoch 326/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3934 – accurac
y: 0.8368
Epoch 327/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3932 – accurac
y: 0.8357
Epoch 328/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3932 – accurac
y: 0.8371
Epoch 329/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3933 – accurac
y: 0.8364
Epoch 330/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3934 – accurac
```

```
y: 0.8351
Epoch 331/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3933 – accurac
y: 0.8354
Epoch 332/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3930 – accurac
y: 0.8363
Epoch 333/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3931 – accurac
y: 0.8358
Epoch 334/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3931 – accurac
y: 0.8381
Epoch 335/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3929 – accurac
y: 0.8378
Epoch 336/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3932 – accurac
y: 0.8372
Epoch 337/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3932 – accurac
y: 0.8382
Epoch 338/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3933 – accurac
y: 0.8365
Epoch 339/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3931 – accurac
y: 0.8360
Epoch 340/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3934 – accurac
y: 0.8374
Epoch 341/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3935 – accurac
y: 0.8365
Epoch 342/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3931 – accurac
y: 0.8371
Epoch 343/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3934 – accurac
y: 0.8364
Epoch 344/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3931 – accurac
y: 0.8368
Epoch 345/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3937 – accurac
y: 0.8361
Epoch 346/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3933 – accurac
y: 0.8354
Epoch 347/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3933 – accurac
y: 0.8364
Epoch 348/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3934 – accurac
y: 0.8365
Epoch 349/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3932 – accurac
y: 0.8368
Epoch 350/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3935 – accurac
y: 0.8376
Epoch 351/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3932 – accurac
y: 0.8378
Epoch 352/500
```

```
225/225 [==============================] – 1s 3ms/step – loss: 0.3931 – accurac
y: 0.8351
Epoch 353/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3935 – accurac
y: 0.8364
Epoch 354/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3933 – accurac
y: 0.8375
Epoch 355/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3929 – accurac
y: 0.8357
Epoch 356/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3930 – accurac
y: 0.8371
Epoch 357/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3931 – accurac
y: 0.8356
Epoch 358/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3933 – accurac
y: 0.8365
Epoch 359/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3934 – accurac
y: 0.8360
Epoch 360/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3926 – accurac
y: 0.8361
Epoch 361/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3936 – accurac
y: 0.8356
Epoch 362/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3931 – accurac
y: 0.8388
Epoch 363/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3936 – accurac
y: 0.8381
Epoch 364/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3933 – accurac
y: 0.8374
Epoch 365/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3933 – accurac
y: 0.8361
Epoch 366/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3934 – accurac
y: 0.8357
Epoch 367/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3934 – accurac
y: 0.8368
Epoch 368/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3934 – accurac
y: 0.8368
Epoch 369/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3927 – accurac
y: 0.8374
Epoch 370/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3931 – accurac
y: 0.8369
Epoch 371/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3933 – accurac
y: 0.8371
Epoch 372/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3930 – accurac
y: 0.8361
Epoch 373/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3936 – accurac
y: 0.8369
```

```
Epoch 374/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8356
Epoch 375/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8371
Epoch 376/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8369
Epoch 377/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8372
Epoch 378/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8363
Epoch 379/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8374
Epoch 380/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3937 - accurac
y: 0.8361
Epoch 381/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3930 - accurac
y: 0.8358
Epoch 382/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3927 - accurac
y: 0.8371
Epoch 383/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3936 - accurac
y: 0.8369
Epoch 384/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8354
Epoch 385/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8367
Epoch 386/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8367
Epoch 387/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8356
Epoch 388/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3934 - accurac
y: 0.8357
Epoch 389/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8361
Epoch 390/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3933 - accurac
y: 0.8367
Epoch 391/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8360
Epoch 392/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3933 - accurac
y: 0.8361
Epoch 393/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8363
Epoch 394/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8375
Epoch 395/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3928 - accurac
```

```
y: 0.8363
Epoch 396/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3935 - accurac
y: 0.8372
Epoch 397/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8353
Epoch 398/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8381
Epoch 399/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8368
Epoch 400/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3935 - accurac
y: 0.8358
Epoch 401/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3927 - accurac
y: 0.8371
Epoch 402/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3933 - accurac
y: 0.8369
Epoch 403/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3930 - accurac
y: 0.8365
Epoch 404/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3933 - accurac
y: 0.8372
Epoch 405/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8365
Epoch 406/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3933 - accurac
y: 0.8351
Epoch 407/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3929 - accurac
y: 0.8367
Epoch 408/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3929 - accurac
y: 0.8363
Epoch 409/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8364
Epoch 410/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8378
Epoch 411/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3934 - accurac
y: 0.8364
Epoch 412/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8367
Epoch 413/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3931 - accurac
y: 0.8357
Epoch 414/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3933 - accurac
y: 0.8368
Epoch 415/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3934 - accurac
y: 0.8376
Epoch 416/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8361
Epoch 417/500
```

```
225/225 [==============================] – 0s 2ms/step – loss: 0.3935 – accurac
y: 0.8354
Epoch 418/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3932 – accurac
y: 0.8367
Epoch 419/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3933 – accurac
y: 0.8369
Epoch 420/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3932 – accurac
y: 0.8361
Epoch 421/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3932 – accurac
y: 0.8369
Epoch 422/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3933 – accurac
y: 0.8368
Epoch 423/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3930 – accurac
y: 0.8358
Epoch 424/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3931 – accurac
y: 0.8363
Epoch 425/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3927 – accurac
y: 0.8381
Epoch 426/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3934 – accurac
y: 0.8357
Epoch 427/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3934 – accurac
y: 0.8358
Epoch 428/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3927 – accurac
y: 0.8365
Epoch 429/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3936 – accurac
y: 0.8374
Epoch 430/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3932 – accurac
y: 0.8358
Epoch 431/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3934 – accurac
y: 0.8365
Epoch 432/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3931 – accurac
y: 0.8360
Epoch 433/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3930 – accurac
y: 0.8372
Epoch 434/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3928 – accurac
y: 0.8369
Epoch 435/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3934 – accurac
y: 0.8364
Epoch 436/500
225/225 [==============================] – 1s 2ms/step – loss: 0.3931 – accurac
y: 0.8367
Epoch 437/500
225/225 [==============================] – 1s 3ms/step – loss: 0.3929 – accurac
y: 0.8368
Epoch 438/500
225/225 [==============================] – 0s 2ms/step – loss: 0.3933 – accurac
y: 0.8361
```

```
Epoch 439/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3932 — accurac
y: 0.8363
Epoch 440/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3935 — accurac
y: 0.8357
Epoch 441/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3931 — accurac
y: 0.8358
Epoch 442/500
225/225 [==============================] — 0s 2ms/step — loss: 0.3933 — accurac
y: 0.8367
Epoch 443/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3933 — accurac
y: 0.8371
Epoch 444/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3934 — accurac
y: 0.8371
Epoch 445/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3932 — accurac
y: 0.8358
Epoch 446/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3934 — accurac
y: 0.8358
Epoch 447/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3930 — accurac
y: 0.8381
Epoch 448/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3933 — accurac
y: 0.8378
Epoch 449/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3931 — accurac
y: 0.8363
Epoch 450/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3931 — accurac
y: 0.8385
Epoch 451/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3934 — accurac
y: 0.8368
Epoch 452/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3932 — accurac
y: 0.8363
Epoch 453/500
225/225 [==============================] — 0s 2ms/step — loss: 0.3929 — accurac
y: 0.8367
Epoch 454/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3936 — accurac
y: 0.8367
Epoch 455/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3935 — accurac
y: 0.8368
Epoch 456/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3934 — accurac
y: 0.8347
Epoch 457/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3929 — accurac
y: 0.8368
Epoch 458/500
225/225 [==============================] — 0s 2ms/step — loss: 0.3930 — accurac
y: 0.8374
Epoch 459/500
225/225 [==============================] — 0s 2ms/step — loss: 0.3936 — accurac
y: 0.8372
Epoch 460/500
225/225 [==============================] — 1s 2ms/step — loss: 0.3934 — accurac
```

```
y: 0.8361
Epoch 461/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3930 - accurac
y: 0.8376
Epoch 462/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3937 - accurac
y: 0.8364
Epoch 463/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3933 - accurac
y: 0.8356
Epoch 464/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8374
Epoch 465/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3931 - accurac
y: 0.8372
Epoch 466/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3933 - accurac
y: 0.8350
Epoch 467/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3932 - accurac
y: 0.8367
Epoch 468/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8349
Epoch 469/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3935 - accurac
y: 0.8379
Epoch 470/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8378
Epoch 471/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3930 - accurac
y: 0.8371
Epoch 472/500
225/225 [==============================] - 1s 3ms/step - loss: 0.3932 - accurac
y: 0.8368
Epoch 473/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8378
Epoch 474/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3925 - accurac
y: 0.8347
Epoch 475/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3931 - accurac
y: 0.8374
Epoch 476/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3932 - accurac
y: 0.8364
Epoch 477/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3928 - accurac
y: 0.8371
Epoch 478/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3929 - accurac
y: 0.8369
Epoch 479/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8372
Epoch 480/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3930 - accurac
y: 0.8365
Epoch 481/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3932 - accurac
y: 0.8371
Epoch 482/500
```

```
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8354
Epoch 483/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3930 - accurac
y: 0.8379
Epoch 484/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3933 - accurac
y: 0.8350
Epoch 485/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3934 - accurac
y: 0.8361
Epoch 486/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3934 - accurac
y: 0.8353
Epoch 487/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8374
Epoch 488/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3930 - accurac
y: 0.8372
Epoch 489/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3933 - accurac
y: 0.8379
Epoch 490/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3931 - accurac
y: 0.8369
Epoch 491/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3933 - accurac
y: 0.8371
Epoch 492/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3930 - accurac
y: 0.8367
Epoch 493/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3932 - accurac
y: 0.8347
Epoch 494/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3933 - accurac
y: 0.8358
Epoch 495/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8389
Epoch 496/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3933 - accurac
y: 0.8365
Epoch 497/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3931 - accurac
y: 0.8360
Epoch 498/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3929 - accurac
y: 0.8368
Epoch 499/500
225/225 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8371
Epoch 500/500
225/225 [==============================] - 0s 2ms/step - loss: 0.3935 - accurac
y: 0.8363
Epoch 1/500
320/320 [==============================] - 1s 2ms/step - loss: 0.5722 - accurac
y: 0.7950
Epoch 2/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4434 - accurac
y: 0.7960
Epoch 3/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4331 - accurac
y: 0.7960
```

```
Epoch 4/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4288 - accurac
y: 0.7960
Epoch 5/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4259 - accurac
y: 0.7960
Epoch 6/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4229 - accurac
y: 0.7960
Epoch 7/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4207 - accurac
y: 0.8100
Epoch 8/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4185 - accurac
y: 0.8210
Epoch 9/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4170 - accurac
y: 0.8250
Epoch 10/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4158 - accurac
y: 0.8259
Epoch 11/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4146 - accurac
y: 0.8279
Epoch 12/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4137 - accurac
y: 0.8276
Epoch 13/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4127 - accurac
y: 0.8290
Epoch 14/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4117 - accurac
y: 0.8316
Epoch 15/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4109 - accurac
y: 0.8329
Epoch 16/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4104 - accurac
y: 0.8330
Epoch 17/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4098 - accurac
y: 0.8331
Epoch 18/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4091 - accurac
y: 0.8324
Epoch 19/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4087 - accurac
y: 0.8339
Epoch 20/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4079 - accurac
y: 0.8326
Epoch 21/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4073 - accurac
y: 0.8339
Epoch 22/500
320/320 [==============================] - 1s 3ms/step - loss: 0.4071 - accurac
y: 0.8338
Epoch 23/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4067 - accurac
y: 0.8346
Epoch 24/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4065 - accurac
y: 0.8339
Epoch 25/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4059 - accurac
```

```
y: 0.8341
Epoch 26/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4056 – accurac
y: 0.8339
Epoch 27/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4055 – accurac
y: 0.8346
Epoch 28/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4050 – accurac
y: 0.8344
Epoch 29/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4046 – accurac
y: 0.8342
Epoch 30/500
320/320 [==============================] – 1s 3ms/step – loss: 0.4045 – accurac
y: 0.8338
Epoch 31/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4043 – accurac
y: 0.8351
Epoch 32/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4042 – accurac
y: 0.8342
Epoch 33/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4039 – accurac
y: 0.8357
Epoch 34/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4036 – accurac
y: 0.8349
Epoch 35/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4037 – accurac
y: 0.8341
Epoch 36/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4034 – accurac
y: 0.8355
Epoch 37/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4032 – accurac
y: 0.8366
Epoch 38/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4030 – accurac
y: 0.8340
Epoch 39/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4029 – accurac
y: 0.8351
Epoch 40/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4031 – accurac
y: 0.8351
Epoch 41/500
320/320 [==============================] – 1s 3ms/step – loss: 0.4026 – accurac
y: 0.8347
Epoch 42/500
320/320 [==============================] – 1s 3ms/step – loss: 0.4028 – accurac
y: 0.8361
Epoch 43/500
320/320 [==============================] – 1s 3ms/step – loss: 0.4026 – accurac
y: 0.8354
Epoch 44/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4023 – accurac
y: 0.8349
Epoch 45/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4023 – accurac
y: 0.8355
Epoch 46/500
320/320 [==============================] – 1s 3ms/step – loss: 0.4020 – accurac
y: 0.8346
Epoch 47/500
```

```
320/320 [==============================] – 1s 2ms/step – loss: 0.4022 – accurac
y: 0.8349
Epoch 48/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4018 – accurac
y: 0.8350
Epoch 49/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4012 – accurac
y: 0.8351
Epoch 50/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4017 – accurac
y: 0.8350
Epoch 51/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4016 – accurac
y: 0.8349
Epoch 52/500
320/320 [==============================] – 1s 3ms/step – loss: 0.4016 – accurac
y: 0.8353
Epoch 53/500
320/320 [==============================] – 1s 3ms/step – loss: 0.4017 – accurac
y: 0.8356
Epoch 54/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4011 – accurac
y: 0.8349
Epoch 55/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4012 – accurac
y: 0.8346
Epoch 56/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4013 – accurac
y: 0.8357
Epoch 57/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4013 – accurac
y: 0.8347
Epoch 58/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4011 – accurac
y: 0.8350
Epoch 59/500
320/320 [==============================] – 1s 3ms/step – loss: 0.4009 – accurac
y: 0.8351
Epoch 60/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4008 – accurac
y: 0.8347
Epoch 61/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4003 – accurac
y: 0.8339
Epoch 62/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4006 – accurac
y: 0.8340
Epoch 63/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4007 – accurac
y: 0.8349
Epoch 64/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4005 – accurac
y: 0.8355
Epoch 65/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4005 – accurac
y: 0.8340
Epoch 66/500
320/320 [==============================] – 1s 3ms/step – loss: 0.4007 – accurac
y: 0.8347
Epoch 67/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4002 – accurac
y: 0.8349
Epoch 68/500
320/320 [==============================] – 1s 2ms/step – loss: 0.4001 – accurac
y: 0.8346
```

```
Epoch 69/500
320/320 [==============================] - 1s 2ms/step - loss: 0.4005 - accurac
y: 0.8357
Epoch 70/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3997 - accurac
y: 0.8365
Epoch 71/500
320/320 [==============================] - 1s 3ms/step - loss: 0.4003 - accurac
y: 0.8340
Epoch 72/500
320/320 [==============================] - 1s 3ms/step - loss: 0.4001 - accurac
y: 0.8341
Epoch 73/500
320/320 [==============================] - 1s 3ms/step - loss: 0.4002 - accurac
y: 0.8341
Epoch 74/500
320/320 [==============================] - 1s 3ms/step - loss: 0.4000 - accurac
y: 0.8344
Epoch 75/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3999 - accurac
y: 0.8351
Epoch 76/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3995 - accurac
y: 0.8344
Epoch 77/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3997 - accurac
y: 0.8346
Epoch 78/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3994 - accurac
y: 0.8347
Epoch 79/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3998 - accurac
y: 0.8340
Epoch 80/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3994 - accurac
y: 0.8347
Epoch 81/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3995 - accurac
y: 0.8342
Epoch 82/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3993 - accurac
y: 0.8350
Epoch 83/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3995 - accurac
y: 0.8367
Epoch 84/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3993 - accurac
y: 0.8350
Epoch 85/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3987 - accurac
y: 0.8353
Epoch 86/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3988 - accurac
y: 0.8356
Epoch 87/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3989 - accurac
y: 0.8334
Epoch 88/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3985 - accurac
y: 0.8351
Epoch 89/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3986 - accurac
y: 0.8365
Epoch 90/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3989 - accurac
```

```
y: 0.8359
Epoch 91/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3985 - accurac
y: 0.8359
Epoch 92/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3984 - accurac
y: 0.8365
Epoch 93/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3983 - accurac
y: 0.8364
Epoch 94/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3982 - accurac
y: 0.8340
Epoch 95/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3979 - accurac
y: 0.8367
Epoch 96/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3982 - accurac
y: 0.8351
Epoch 97/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3979 - accurac
y: 0.8346
Epoch 98/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3979 - accurac
y: 0.8351
Epoch 99/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3977 - accurac
y: 0.8353
Epoch 100/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3978 - accurac
y: 0.8349
Epoch 101/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3977 - accurac
y: 0.8351
Epoch 102/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3976 - accurac
y: 0.8354
Epoch 103/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3978 - accurac
y: 0.8339
Epoch 104/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3976 - accurac
y: 0.8345
Epoch 105/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3974 - accurac
y: 0.8354
Epoch 106/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3973 - accurac
y: 0.8347
Epoch 107/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3970 - accurac
y: 0.8346
Epoch 108/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3972 - accurac
y: 0.8346
Epoch 109/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3972 - accurac
y: 0.8347
Epoch 110/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3972 - accurac
y: 0.8347
Epoch 111/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3971 - accurac
y: 0.8369
Epoch 112/500
```

```
320/320 [==============================] - 1s 2ms/step - loss: 0.3970 - accurac
y: 0.8363
Epoch 113/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3970 - accurac
y: 0.8366
Epoch 114/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3966 - accurac
y: 0.8365
Epoch 115/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3969 - accurac
y: 0.8350
Epoch 116/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3968 - accurac
y: 0.8364
Epoch 117/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3966 - accurac
y: 0.8370
Epoch 118/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3968 - accurac
y: 0.8351
Epoch 119/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3967 - accurac
y: 0.8354
Epoch 120/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3964 - accurac
y: 0.8359
Epoch 121/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3966 - accurac
y: 0.8366
Epoch 122/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3965 - accurac
y: 0.8351
Epoch 123/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3966 - accurac
y: 0.8357
Epoch 124/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3962 - accurac
y: 0.8349
Epoch 125/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3965 - accurac
y: 0.8363
Epoch 126/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3963 - accurac
y: 0.8356
Epoch 127/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3961 - accurac
y: 0.8345
Epoch 128/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3963 - accurac
y: 0.8369
Epoch 129/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3962 - accurac
y: 0.8366
Epoch 130/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3963 - accurac
y: 0.8366
Epoch 131/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3961 - accurac
y: 0.8371
Epoch 132/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3958 - accurac
y: 0.8359
Epoch 133/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3962 - accurac
y: 0.8361
```

```
Epoch 134/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3960 - accurac
y: 0.8361
Epoch 135/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3959 - accurac
y: 0.8360
Epoch 136/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3957 - accurac
y: 0.8364
Epoch 137/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3959 - accurac
y: 0.8350
Epoch 138/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3960 - accurac
y: 0.8364
Epoch 139/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3959 - accurac
y: 0.8353
Epoch 140/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3954 - accurac
y: 0.8376
Epoch 141/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3956 - accurac
y: 0.8371
Epoch 142/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3955 - accurac
y: 0.8359
Epoch 143/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3955 - accurac
y: 0.8371
Epoch 144/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3955 - accurac
y: 0.8376
Epoch 145/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3951 - accurac
y: 0.8381
Epoch 146/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3946 - accurac
y: 0.8367
Epoch 147/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3950 - accurac
y: 0.8364
Epoch 148/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3946 - accurac
y: 0.8375
Epoch 149/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3948 - accurac
y: 0.8385
Epoch 150/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3943 - accurac
y: 0.8360
Epoch 151/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3933 - accurac
y: 0.8385
Epoch 152/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3936 - accurac
y: 0.8379
Epoch 153/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3932 - accurac
y: 0.8361
Epoch 154/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3923 - accurac
y: 0.8380
Epoch 155/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3921 - accurac
```

```
                y: 0.8360
                Epoch 156/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3916 – accurac
                y: 0.8367
                Epoch 157/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3915 – accurac
                y: 0.8367
                Epoch 158/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3905 – accurac
                y: 0.8374
                Epoch 159/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3897 – accurac
                y: 0.8389
                Epoch 160/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3892 – accurac
                y: 0.8381
                Epoch 161/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3885 – accurac
                y: 0.8386
                Epoch 162/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3884 – accurac
                y: 0.8382
                Epoch 163/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3878 – accurac
                y: 0.8381
                Epoch 164/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3876 – accurac
                y: 0.8381
                Epoch 165/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3872 – accurac
                y: 0.8397
                Epoch 166/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3870 – accurac
                y: 0.8399
                Epoch 167/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3868 – accurac
                y: 0.8411
                Epoch 168/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3861 – accurac
                y: 0.8400
                Epoch 169/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3863 – accurac
                y: 0.8410
                Epoch 170/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3862 – accurac
                y: 0.8404
                Epoch 171/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3856 – accurac
                y: 0.8414
                Epoch 172/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3856 – accurac
                y: 0.8429
                Epoch 173/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3855 – accurac
                y: 0.8410
                Epoch 174/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3855 – accurac
                y: 0.8411
                Epoch 175/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3848 – accurac
                y: 0.8426
                Epoch 176/500
                320/320 [==============================] – 1s 2ms/step – loss: 0.3848 – accurac
                y: 0.8404
                Epoch 177/500
```

```
320/320 [==============================] - 1s 2ms/step - loss: 0.3845 - accurac
y: 0.8431
Epoch 178/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3845 - accurac
y: 0.8429
Epoch 179/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3842 - accurac
y: 0.8430
Epoch 180/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3845 - accurac
y: 0.8430
Epoch 181/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3838 - accurac
y: 0.8404
Epoch 182/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3843 - accurac
y: 0.8432
Epoch 183/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3841 - accurac
y: 0.8425
Epoch 184/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3831 - accurac
y: 0.8429
Epoch 185/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3836 - accurac
y: 0.8410
Epoch 186/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3836 - accurac
y: 0.8443
Epoch 187/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3830 - accurac
y: 0.8419
Epoch 188/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3839 - accurac
y: 0.8416
Epoch 189/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3833 - accurac
y: 0.8429
Epoch 190/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3834 - accurac
y: 0.8439
Epoch 191/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3831 - accurac
y: 0.8415
Epoch 192/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3830 - accurac
y: 0.8440
Epoch 193/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3832 - accurac
y: 0.8425
Epoch 194/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3827 - accurac
y: 0.8438
Epoch 195/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3823 - accurac
y: 0.8453
Epoch 196/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3824 - accurac
y: 0.8424
Epoch 197/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3823 - accurac
y: 0.8435
Epoch 198/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3827 - accurac
y: 0.8443
```

```
Epoch 199/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3821 - accurac
y: 0.8464
Epoch 200/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3825 - accurac
y: 0.8435
Epoch 201/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3822 - accurac
y: 0.8440
Epoch 202/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3821 - accurac
y: 0.8436
Epoch 203/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3822 - accurac
y: 0.8449
Epoch 204/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3822 - accurac
y: 0.8432
Epoch 205/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3817 - accurac
y: 0.8428
Epoch 206/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3819 - accurac
y: 0.8439
Epoch 207/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3820 - accurac
y: 0.8443
Epoch 208/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3821 - accurac
y: 0.8438
Epoch 209/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3817 - accurac
y: 0.8454
Epoch 210/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3818 - accurac
y: 0.8454
Epoch 211/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3816 - accurac
y: 0.8443
Epoch 212/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3818 - accurac
y: 0.8456
Epoch 213/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3821 - accurac
y: 0.8446
Epoch 214/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3819 - accurac
y: 0.8447
Epoch 215/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3814 - accurac
y: 0.8444
Epoch 216/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3815 - accurac
y: 0.8432
Epoch 217/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3813 - accurac
y: 0.8436
Epoch 218/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3811 - accurac
y: 0.8453
Epoch 219/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3817 - accurac
y: 0.8431
Epoch 220/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3816 - accurac
```

```
y: 0.8438
Epoch 221/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3813 - accurac
y: 0.8441
Epoch 222/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3813 - accurac
y: 0.8449
Epoch 223/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3816 - accurac
y: 0.8471
Epoch 224/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3816 - accurac
y: 0.8432
Epoch 225/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3815 - accurac
y: 0.8454
Epoch 226/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3811 - accurac
y: 0.8441
Epoch 227/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3811 - accurac
y: 0.8456
Epoch 228/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3813 - accurac
y: 0.8439
Epoch 229/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3804 - accurac
y: 0.8450
Epoch 230/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3810 - accurac
y: 0.8445
Epoch 231/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3814 - accurac
y: 0.8450
Epoch 232/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3809 - accurac
y: 0.8455
Epoch 233/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3809 - accurac
y: 0.8454
Epoch 234/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3806 - accurac
y: 0.8464
Epoch 235/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3808 - accurac
y: 0.8464
Epoch 236/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3809 - accurac
y: 0.8451
Epoch 237/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3806 - accurac
y: 0.8457
Epoch 238/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3806 - accurac
y: 0.8453
Epoch 239/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3805 - accurac
y: 0.8438
Epoch 240/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3808 - accurac
y: 0.8446
Epoch 241/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3808 - accurac
y: 0.8468
Epoch 242/500
```

```
320/320 [==============================] - 1s 2ms/step - loss: 0.3803 - accurac
y: 0.8451
Epoch 243/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3806 - accurac
y: 0.8461
Epoch 244/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3799 - accurac
y: 0.8451
Epoch 245/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3803 - accurac
y: 0.8446
Epoch 246/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3806 - accurac
y: 0.8444
Epoch 247/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3803 - accurac
y: 0.8478
Epoch 248/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3796 - accurac
y: 0.8454
Epoch 249/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3800 - accurac
y: 0.8464
Epoch 250/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3803 - accurac
y: 0.8471
Epoch 251/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3803 - accurac
y: 0.8449
Epoch 252/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3799 - accurac
y: 0.8457
Epoch 253/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3801 - accurac
y: 0.8469
Epoch 254/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3801 - accurac
y: 0.8459
Epoch 255/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3807 - accurac
y: 0.8447
Epoch 256/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3799 - accurac
y: 0.8471
Epoch 257/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3801 - accurac
y: 0.8429
Epoch 258/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3798 - accurac
y: 0.8434
Epoch 259/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3803 - accurac
y: 0.8476
Epoch 260/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3798 - accurac
y: 0.8461
Epoch 261/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3802 - accurac
y: 0.8459
Epoch 262/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3797 - accurac
y: 0.8455
Epoch 263/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3802 - accurac
y: 0.8457
```

```
Epoch 264/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3802 - accurac
y: 0.8465
Epoch 265/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3799 - accurac
y: 0.8469
Epoch 266/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3798 - accurac
y: 0.8465
Epoch 267/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3799 - accurac
y: 0.8468
Epoch 268/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3801 - accurac
y: 0.8446
Epoch 269/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3800 - accurac
y: 0.8468
Epoch 270/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3799 - accurac
y: 0.8466
Epoch 271/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3795 - accurac
y: 0.8480
Epoch 272/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3797 - accurac
y: 0.8465
Epoch 273/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3800 - accurac
y: 0.8476
Epoch 274/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3795 - accurac
y: 0.8471
Epoch 275/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3803 - accurac
y: 0.8465
Epoch 276/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3793 - accurac
y: 0.8461
Epoch 277/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3800 - accurac
y: 0.8453
Epoch 278/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3797 - accurac
y: 0.8456
Epoch 279/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3800 - accurac
y: 0.8471
Epoch 280/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3798 - accurac
y: 0.8485
Epoch 281/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3795 - accurac
y: 0.8480
Epoch 282/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3793 - accurac
y: 0.8457
Epoch 283/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3798 - accurac
y: 0.8457
Epoch 284/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3794 - accurac
y: 0.8472
Epoch 285/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3792 - accurac
```

```
y: 0.8478
Epoch 286/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3794 - accurac
y: 0.8459
Epoch 287/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3793 - accurac
y: 0.8455
Epoch 288/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3794 - accurac
y: 0.8471
Epoch 289/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3792 - accurac
y: 0.8464
Epoch 290/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3793 - accurac
y: 0.8485
Epoch 291/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3795 - accurac
y: 0.8455
Epoch 292/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3796 - accurac
y: 0.8455
Epoch 293/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3797 - accurac
y: 0.8468
Epoch 294/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3796 - accurac
y: 0.8466
Epoch 295/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3792 - accurac
y: 0.8470
Epoch 296/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3794 - accurac
y: 0.8466
Epoch 297/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3787 - accurac
y: 0.8455
Epoch 298/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3789 - accurac
y: 0.8481
Epoch 299/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3795 - accurac
y: 0.8466
Epoch 300/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3799 - accurac
y: 0.8471
Epoch 301/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3795 - accurac
y: 0.8479
Epoch 302/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3792 - accurac
y: 0.8459
Epoch 303/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3794 - accurac
y: 0.8464
Epoch 304/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3793 - accurac
y: 0.8466
Epoch 305/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3790 - accurac
y: 0.8480
Epoch 306/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3787 - accurac
y: 0.8464
Epoch 307/500
```

```
320/320 [==============================] – 1s 2ms/step – loss: 0.3784 – accurac
y: 0.8462
Epoch 308/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3789 – accurac
y: 0.8471
Epoch 309/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3793 – accurac
y: 0.8479
Epoch 310/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3787 – accurac
y: 0.8471
Epoch 311/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3783 – accurac
y: 0.8481
Epoch 312/500
320/320 [==============================] – 1s 3ms/step – loss: 0.3787 – accurac
y: 0.8456
Epoch 313/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3787 – accurac
y: 0.8478
Epoch 314/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3788 – accurac
y: 0.8468
Epoch 315/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3787 – accurac
y: 0.8484
Epoch 316/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3783 – accurac
y: 0.8474
Epoch 317/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3789 – accurac
y: 0.8461
Epoch 318/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3782 – accurac
y: 0.8471
Epoch 319/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3781 – accurac
y: 0.8466
Epoch 320/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3783 – accurac
y: 0.8472
Epoch 321/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3781 – accurac
y: 0.8481
Epoch 322/500
320/320 [==============================] – 1s 3ms/step – loss: 0.3781 – accurac
y: 0.8469
Epoch 323/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3780 – accurac
y: 0.8461
Epoch 324/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3781 – accurac
y: 0.8480
Epoch 325/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3776 – accurac
y: 0.8479
Epoch 326/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3779 – accurac
y: 0.8480
Epoch 327/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3775 – accurac
y: 0.8480
Epoch 328/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3776 – accurac
y: 0.8489
```

```
Epoch 329/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3766 - accurac
y: 0.8472
Epoch 330/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3770 - accurac
y: 0.8474
Epoch 331/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3769 - accurac
y: 0.8481
Epoch 332/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3767 - accurac
y: 0.8478
Epoch 333/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3764 - accurac
y: 0.8476
Epoch 334/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3757 - accurac
y: 0.8481
Epoch 335/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3753 - accurac
y: 0.8489
Epoch 336/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3748 - accurac
y: 0.8495
Epoch 337/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3743 - accurac
y: 0.8489
Epoch 338/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3739 - accurac
y: 0.8485
Epoch 339/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3728 - accurac
y: 0.8519
Epoch 340/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3724 - accurac
y: 0.8493
Epoch 341/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3715 - accurac
y: 0.8496
Epoch 342/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3710 - accurac
y: 0.8508
Epoch 343/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3692 - accurac
y: 0.8501
Epoch 344/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3686 - accurac
y: 0.8521
Epoch 345/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3679 - accurac
y: 0.8505
Epoch 346/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3669 - accurac
y: 0.8524
Epoch 347/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3654 - accurac
y: 0.8516
Epoch 348/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3639 - accurac
y: 0.8530
Epoch 349/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3623 - accurac
y: 0.8520
Epoch 350/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3614 - accurac
```

```
y: 0.8521
Epoch 351/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3597 - accurac
y: 0.8531
Epoch 352/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3582 - accurac
y: 0.8525
Epoch 353/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3568 - accurac
y: 0.8553
Epoch 354/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3554 - accurac
y: 0.8539
Epoch 355/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3542 - accurac
y: 0.8558
Epoch 356/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3534 - accurac
y: 0.8550
Epoch 357/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3525 - accurac
y: 0.8562
Epoch 358/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3508 - accurac
y: 0.8570
Epoch 359/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3505 - accurac
y: 0.8566
Epoch 360/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3488 - accurac
y: 0.8575
Epoch 361/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3485 - accurac
y: 0.8577
Epoch 362/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3474 - accurac
y: 0.8585
Epoch 363/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3466 - accurac
y: 0.8604
Epoch 364/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3458 - accurac
y: 0.8572
Epoch 365/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3449 - accurac
y: 0.8599
Epoch 366/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3434 - accurac
y: 0.8610
Epoch 367/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3431 - accurac
y: 0.8599
Epoch 368/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3431 - accurac
y: 0.8608
Epoch 369/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3423 - accurac
y: 0.8627
Epoch 370/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3422 - accurac
y: 0.8594
Epoch 371/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3413 - accurac
y: 0.8608
Epoch 372/500
```

```
320/320 [==============================] - 1s 2ms/step - loss: 0.3410 - accurac
y: 0.8608
Epoch 373/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3410 - accurac
y: 0.8611
Epoch 374/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3405 - accurac
y: 0.8621
Epoch 375/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3403 - accurac
y: 0.8611
Epoch 376/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3405 - accurac
y: 0.8615
Epoch 377/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3402 - accurac
y: 0.8619
Epoch 378/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3395 - accurac
y: 0.8608
Epoch 379/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3398 - accurac
y: 0.8615
Epoch 380/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3401 - accurac
y: 0.8609
Epoch 381/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3399 - accurac
y: 0.8616
Epoch 382/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3401 - accurac
y: 0.8627
Epoch 383/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3398 - accurac
y: 0.8602
Epoch 384/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3396 - accurac
y: 0.8627
Epoch 385/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3397 - accurac
y: 0.8618
Epoch 386/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3394 - accurac
y: 0.8605
Epoch 387/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3394 - accurac
y: 0.8601
Epoch 388/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3398 - accurac
y: 0.8604
Epoch 389/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3388 - accurac
y: 0.8621
Epoch 390/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3394 - accurac
y: 0.8593
Epoch 391/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3389 - accurac
y: 0.8625
Epoch 392/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3392 - accurac
y: 0.8626
Epoch 393/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3389 - accurac
y: 0.8616
```

```
Epoch 394/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3392 - accurac
y: 0.8609
Epoch 395/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3388 - accurac
y: 0.8619
Epoch 396/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3388 - accurac
y: 0.8601
Epoch 397/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3391 - accurac
y: 0.8618
Epoch 398/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3391 - accurac
y: 0.8624
Epoch 399/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3383 - accurac
y: 0.8611
Epoch 400/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3387 - accurac
y: 0.8614
Epoch 401/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3386 - accurac
y: 0.8614
Epoch 402/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3385 - accurac
y: 0.8587
Epoch 403/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3385 - accurac
y: 0.8616
Epoch 404/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3384 - accurac
y: 0.8625
Epoch 405/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3384 - accurac
y: 0.8596
Epoch 406/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3387 - accurac
y: 0.8615
Epoch 407/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3385 - accurac
y: 0.8616
Epoch 408/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3389 - accurac
y: 0.8609
Epoch 409/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3383 - accurac
y: 0.8606
Epoch 410/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3389 - accurac
y: 0.8610
Epoch 411/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3380 - accurac
y: 0.8621
Epoch 412/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3375 - accurac
y: 0.8614
Epoch 413/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3385 - accurac
y: 0.8622
Epoch 414/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3386 - accurac
y: 0.8610
Epoch 415/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3377 - accurac
```

```
y: 0.8634
Epoch 416/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3379 - accurac
y: 0.8609
Epoch 417/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3381 - accurac
y: 0.8597
Epoch 418/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3377 - accurac
y: 0.8621
Epoch 419/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3376 - accurac
y: 0.8619
Epoch 420/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3384 - accurac
y: 0.8606
Epoch 421/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3383 - accurac
y: 0.8615
Epoch 422/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3375 - accurac
y: 0.8630
Epoch 423/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3381 - accurac
y: 0.8624
Epoch 424/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3377 - accurac
y: 0.8621
Epoch 425/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3374 - accurac
y: 0.8633
Epoch 426/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3377 - accurac
y: 0.8629
Epoch 427/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3383 - accurac
y: 0.8627
Epoch 428/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3379 - accurac
y: 0.8619
Epoch 429/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3378 - accurac
y: 0.8601
Epoch 430/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3377 - accurac
y: 0.8635
Epoch 431/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3376 - accurac
y: 0.8629
Epoch 432/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3374 - accurac
y: 0.8621
Epoch 433/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3375 - accurac
y: 0.8630
Epoch 434/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3382 - accurac
y: 0.8633
Epoch 435/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3372 - accurac
y: 0.8633
Epoch 436/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3372 - accurac
y: 0.8630
Epoch 437/500
```

```
320/320 [==============================] – 1s 2ms/step – loss: 0.3374 – accurac
y: 0.8604
Epoch 438/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3377 – accurac
y: 0.8609
Epoch 439/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3375 – accurac
y: 0.8615
Epoch 440/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3376 – accurac
y: 0.8606
Epoch 441/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3368 – accurac
y: 0.8622
Epoch 442/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3378 – accurac
y: 0.8619
Epoch 443/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3376 – accurac
y: 0.8624
Epoch 444/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3374 – accurac
y: 0.8621
Epoch 445/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3370 – accurac
y: 0.8635
Epoch 446/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3369 – accurac
y: 0.8615
Epoch 447/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3371 – accurac
y: 0.8618
Epoch 448/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3367 – accurac
y: 0.8621
Epoch 449/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3371 – accurac
y: 0.8627
Epoch 450/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3372 – accurac
y: 0.8625
Epoch 451/500
320/320 [==============================] – 1s 3ms/step – loss: 0.3378 – accurac
y: 0.8611
Epoch 452/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3374 – accurac
y: 0.8608
Epoch 453/500
320/320 [==============================] – 1s 3ms/step – loss: 0.3371 – accurac
y: 0.8626
Epoch 454/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3372 – accurac
y: 0.8618
Epoch 455/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3372 – accurac
y: 0.8637
Epoch 456/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3373 – accurac
y: 0.8620
Epoch 457/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3373 – accurac
y: 0.8622
Epoch 458/500
320/320 [==============================] – 1s 2ms/step – loss: 0.3369 – accurac
y: 0.8622
```

```
Epoch 459/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3371 - accurac
y: 0.8635
Epoch 460/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3371 - accurac
y: 0.8630
Epoch 461/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3368 - accurac
y: 0.8616
Epoch 462/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3367 - accurac
y: 0.8618
Epoch 463/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3370 - accurac
y: 0.8635
Epoch 464/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3372 - accurac
y: 0.8636
Epoch 465/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3373 - accurac
y: 0.8625
Epoch 466/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3364 - accurac
y: 0.8634
Epoch 467/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3369 - accurac
y: 0.8627
Epoch 468/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3370 - accurac
y: 0.8621
Epoch 469/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3366 - accurac
y: 0.8620
Epoch 470/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3366 - accurac
y: 0.8629
Epoch 471/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3364 - accurac
y: 0.8633
Epoch 472/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3366 - accurac
y: 0.8629
Epoch 473/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3370 - accurac
y: 0.8618
Epoch 474/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3365 - accurac
y: 0.8651
Epoch 475/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3368 - accurac
y: 0.8631
Epoch 476/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3368 - accurac
y: 0.8615
Epoch 477/500
320/320 [==============================] - 1s 3ms/step - loss: 0.3361 - accurac
y: 0.8655
Epoch 478/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3363 - accurac
y: 0.8639
Epoch 479/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3362 - accurac
y: 0.8636
Epoch 480/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3365 - accurac
```

```
y: 0.8635
Epoch 481/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3360 - accurac
y: 0.8618
Epoch 482/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3363 - accurac
y: 0.8620
Epoch 483/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3359 - accurac
y: 0.8639
Epoch 484/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3362 - accurac
y: 0.8646
Epoch 485/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3359 - accurac
y: 0.8618
Epoch 486/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3359 - accurac
y: 0.8625
Epoch 487/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3358 - accurac
y: 0.8643
Epoch 488/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3361 - accurac
y: 0.8637
Epoch 489/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3361 - accurac
y: 0.8640
Epoch 490/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3358 - accurac
y: 0.8644
Epoch 491/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3360 - accurac
y: 0.8622
Epoch 492/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3355 - accurac
y: 0.8631
Epoch 493/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3353 - accurac
y: 0.8633
Epoch 494/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3358 - accurac
y: 0.8619
Epoch 495/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3354 - accurac
y: 0.8639
Epoch 496/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3359 - accurac
y: 0.8629
Epoch 497/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3355 - accurac
y: 0.8618
Epoch 498/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3356 - accurac
y: 0.8641
Epoch 499/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3352 - accurac
y: 0.8658
Epoch 500/500
320/320 [==============================] - 1s 2ms/step - loss: 0.3355 - accurac
y: 0.8635
```

In [28]:
```
best_parameters
```

Out[28]: {'batch_size': 25, 'epochs': 500, 'optimizer': 'rmsprop'}

- Best parameters for the result
  - 'batch_size': 25,
  - 'epochs': 500,
  - 'optimizer': 'rmsprop'

In [29]:
```
best_accuracy
```

Out[29]: 0.852

Observations:

- The best accuracy achieved is around 85.2%.

Conclusion:

As you can see here the Recall is increased but the precision is very bad. There is still lot of scope of improvements as follows:

1) Threshold can be tuned to get the optimal value.

2) Resampling techniques can be applied to balanced the data and then train the model.

3) More Hyperparameter tuning can be applied to tune the different Hyperparameters.

We can select the Model 1(85.7%) as our final model based on the above analysis.