INFO7390_ADSProject

August 17, 2019

1 Advance in Data Science INFO7390 - Project

1.1 Application of Deep Neural Networks in Diabetes Biomarkers prediction Development

1.2 Abstract :

Biomarkers are basically the indicators which helps in diagnosis of a health condition or disease. This plays an important role in diagnostic department of healthcare sector. Through this project, we are trying to implement deep learning technique in healthcare.

This project aims using different machine learning and deep learning techniques to identify different diabetes biomarkers present in the blood sample of various patients. Developing a neural network model to predict whether person will have diabetes.

1.3 Purpose :

Purpose of the project is to use different machine learning techniques and also deep learning techniques to predict the output and compare the performance of deep neural networks over traditional machine learning models.

1.4 Techniques Used:

We will be using different machine learning as well as deep learning techniques to understand and predict the given outcome.

1.4.1 Machine Learning techniques Used:

Decision Tree, Random Forests, KNN etc.

1.4.2 Deep Learning Techniques Used:

Artificial Neural Network with different number of layers, neurons and activation functions.

1.4.3 Evaluation Metrics Used:

We will be employing Accuracy, AUC-ROC curve, binary cross entropy. We will be plotting the graphs to check training and validation accuracy as well as training and validation loss.

1.5 About Dataset

Dataset has been taken from Kaggle. This dataset comprises of blood sample of different patients used to depict whether person will have diabetes or not.

Sample Size : 768
No of features: 9
Type of problem: Binary classification.

1.5.1 Exploring the dataset

We will be reading the dataset and importing into a dataframe and understand different statistical aspects of the dataset. We will check if null values are present in the dataset.

[109]:
```
#importing sklearn and traditional Python machine learning libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from scipy import stats
import seaborn as sns
import statsmodels.api as sm
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.metrics import confusion_matrix, precision_recall_curve,␣
↪roc_auc_score, roc_curve, accuracy_score
from sklearn.ensemble import RandomForestClassifier
from sklearn.ensemble import GradientBoostingClassifier
from sklearn.model_selection import GridSearchCV
from sklearn.metrics import accuracy_score
from sklearn.neighbors import KNeighborsClassifier

# importing keras, tensorflow and related modules
import tensorflow as tf
from tensorflow.keras import layers
import keras
from keras.models import Sequential # intitialize the ANN
from keras.layers import Dense, Dropout      # create layers
from keras.optimizers import Adam, SGD, RMSprop
```

[4]:
```
# importing the dataset and initializing a dataframe.
diabetes_df=pd.read_csv("diabetes.csv", decimal = ',')
```

1.5.2 Exploratory Data Analysis and Data Cleaning

Here, we will be exploring the data and check for null values, improper formats and other data related issues. We will resolve these issues and clean the data which can be furthur used for building the model.

[5]:
```
diabetes_df.head()
```

[5]:
```
   Pregnancies  Glucose  BloodPressure  SkinThickness  Insulin   BMI  \
0            6      148             72             35        0  33.6
1            1       85             66             29        0  26.6
2            8      183             64              0        0  23.3
3            1       89             66             23       94  28.1
4            0      137             40             35      168  43.1

  DiabetesPedigreeFunction  Age  Outcome
0                    0.627   50        1
1                    0.351   31        0
2                    0.672   32        1
3                    0.167   21        0
4                    2.288   33        1
```

[6]:
```
diabetes_df.shape
```

[6]:
```
(768, 9)
```

[7]:
```
diabetes_df.info
```

[7]:
```
<bound method DataFrame.info of      Pregnancies  Glucose  BloodPressure
SkinThickness  Insulin   BMI  \
0               6      148             72             35        0  33.6
1               1       85             66             29        0  26.6
2               8      183             64              0        0  23.3
3               1       89             66             23       94  28.1
4               0      137             40             35      168  43.1
..            ...      ...            ...            ...      ...   ...
763            10      101             76             48      180  32.9
764             2      122             70             27        0  36.8
765             5      121             72             23      112  26.2
766             1      126             60              0        0  30.1
767             1       93             70             31        0  30.4

    DiabetesPedigreeFunction  Age  Outcome
0                      0.627   50        1
1                      0.351   31        0
2                      0.672   32        1
3                      0.167   21        0
4                      2.288   33        1
..                       ...  ...      ...
763                    0.171   63        0
764                     0.34   27        0
765                    0.245   30        0
766                    0.349   47        1
767                    0.315   23        0

[768 rows x 9 columns]>
```

1.5.3 Data Pre-processing and Exploratory Data Analysis

Before any model building, it is essential to understand the data properly, understand the importance of various features of the dataset. It is essential to clean the dataset and prepare it for model building so that predicting outcome is easier and more efficient.

One part of data pre-processing is checking for the missing values in the dataset. Below line of code executed shows number of missing values in the dataset.

[89]:
```
# checking whether there are any missing values in the dataset.
diabetes_df.isnull().values.any()
```

[89]:
```
False
```

Feature Scaling and why is it important? It is a part of data pre-processing which is applied to independent variables or features of the data.

It is important to normalize the data within a particular range and sometimes it helps in speeding up the calculations in an algorithm.

Below line of code shows scaling of features in the dataset.

[90]:
```
# scale all the columns except the 'outcome'
    scaler = StandardScaler()
    diabetes_df[['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness',␣
 ↪'Insulin', 'BMI', 'DiabetesPedigreeFunction', 'Age']] = \
    scaler.fit_transform(diabetes_df[['Pregnancies', 'Glucose',␣
 ↪'BloodPressure', 'SkinThickness', 'Insulin', 'BMI',␣
 ↪'DiabetesPedigreeFunction', 'Age']])
```

[91]:
```
# defining variables X and Y. Y variable has the target value and X variable␣
 ↪has other features in the dataset.
X = diabetes_df.iloc[:, :-1].values
y = diabetes_df["Outcome"].values
```

[92]:
```
# splitting the data into train and test data in the ratio 70% and 30%
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3)
print(X_train.shape, y_train.shape, X_test.shape, y_test.shape)
#return X_train, X_test, y_train, y_test
```

```
(537, 8) (537,) (231, 8) (231,)
```

[12]:
```
# defining all functions used in the project

#this function is used to plot auc-roc curve
def plot_roc(y_test, y_pred, model_name):
    fpr, tpr, thr = roc_curve(y_test, y_pred)
    fig, ax = plt.subplots(figsize=(8, 8))
    ax.plot(fpr, tpr, 'k-')
    ax.plot([0, 1], [0, 1], 'k--', linewidth=.5)  # roc curve for random model
    ax.grid(True)
    ax.set(title='ROC Curve for {} on PIMA diabetes dataset'.format(model_name),
           xlim=[-0.01, 1.01], ylim=[-0.01, 1.01])
```

```
#function used to fit the training data into the model
def train_clf(clf, X_train, y_train):

    return clf.fit(X_train, y_train)

#function used to predict the outcome and return f1 score
def pred_clf(clf, features, target):

   y_pred = clf.predict(features)
   return f1_score(target.values, y_pred, pos_label = 1)


def train_predict(clf, X_train, y_train, X_test, y_test):

    train_clf(clf, X_train, y_train)

    print("F1 score for training set is: {:.4f}".format(pred_clf(clf, X_train,␣
 ↪y_train)))
    print("F1 score for testing set is: {:.4f}\n".format(pred_clf(clf, X_test,␣
 ↪y_test)))
```

1.5.4 Applying Machine Learning Techniques

We will use Random Forests, K-Nearest Neighbors, Decision Trees to predict the outcome. We will also check for accuracy, AUC-ROC score values.

1.5.5 Random Forest Classifier

Random Forests are also known as random decision forests is a popular ensemble method useful for predicting the outcome.

Random forest classifier creates a set of decision trees from randomly selected subset of training set. It then aggregates the votes from different decision trees to decide the final class of the test object.

Hyperparameters for Random Forests Classifier: Total Number of trees to be generated and decision tree related parameters like minimum split, split criteria etc.

[93]:
```
## Train the RF Model
rf_model = RandomForestClassifier(n_estimators=300)
rf_model.fit(X_train, y_train)
```

[93]:
```
RandomForestClassifier(bootstrap=True, class_weight=None, criterion='gini',
                       max_depth=None, max_features='auto', max_leaf_nodes=None,
                       min_impurity_decrease=0.0, min_impurity_split=None,
                       min_samples_leaf=1, min_samples_split=2,
                       min_weight_fraction_leaf=0.0, n_estimators=300,
                       n_jobs=None, oob_score=False, random_state=None,
```

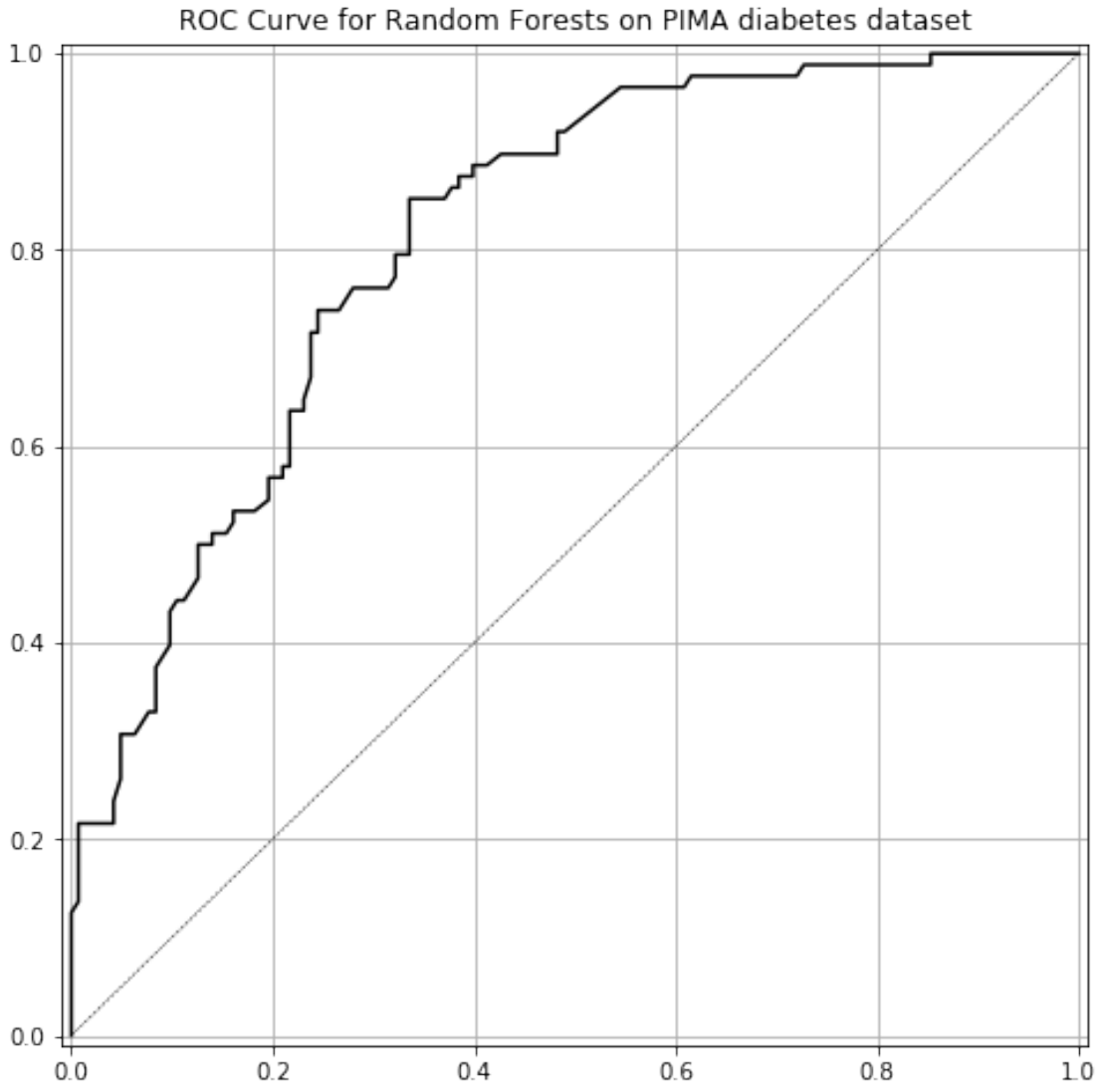
```
                verbose=0, warm_start=False)
```

[97]:
```
# Make predictions on the test set - both "hard" predictions, and the scores␣
 ↪(percent of trees voting yes)
y_pred_class_rf = rf_model.predict(X_test)
y_pred_prob_rf = rf_model.predict_proba(X_test)

print('Accuracy is {:.3f}'.format(accuracy_score(y_test,y_pred_class_rf)))
print('ROC-AUC is {:.3f}'.format(roc_auc_score(y_test,y_pred_prob_rf[:,1])))
```

```
Accuracy is 0.723
ROC-AUC is 0.812
```

[95]:
```
plot_roc(y_test, y_pred_prob_rf[:, 1], 'Random Forests')
```



Accuracy obtained is 72.3 % and AUC-ROC value is 0.81 by employing Random Forest Model.

1.5.6 Using K-Nearest neighbors method

K-Nearest neighbor classifier is a popular algorithm useful for classification problems.

K-nearest neighbor algorithm predicts the class of the data point as per the majority of the votes obtained from the neighboring points and calculates distance such as Euclidean distance, hamming distance, cosine distance etc. Based on the votes, label is assigned to the new data point which needs to be predicted.

[110]:
```
ds_cols = ['Glucose', 'BloodPressure', 'SkinThickness', 'BMI', 'Insulin']
```

[111]:
```
X = diabetes_df.iloc[:, 0:8]
y = diabetes_df.iloc[:, 8]
X_train, X_test, y_train, y_test = train_test_split(X, y, random_state=11111,␣
 ↪test_size=0.3)
print(X_train.shape, y_train.shape, X_test.shape, y_test.shape)
```

```
(537, 8) (537,) (231, 8) (231,)
```

[112]:
```
sc_X = StandardScaler()
X_train = sc_X.fit_transform(X_train)
X_test = sc_X.transform(X_test)
```

[113]:
```
# Define the model: Init K-NN
classifier = KNeighborsClassifier(n_neighbors=7, p=2, metric='euclidean')
```

[114]:
```
classifier.fit(X_train, y_train)
```

[114]:
```
KNeighborsClassifier(algorithm='auto', leaf_size=30, metric='euclidean',
                     metric_params=None, n_jobs=None, n_neighbors=7, p=2,
                     weights='uniform')
```

[115]:
```
y_pred = classifier.predict(X_test)
```

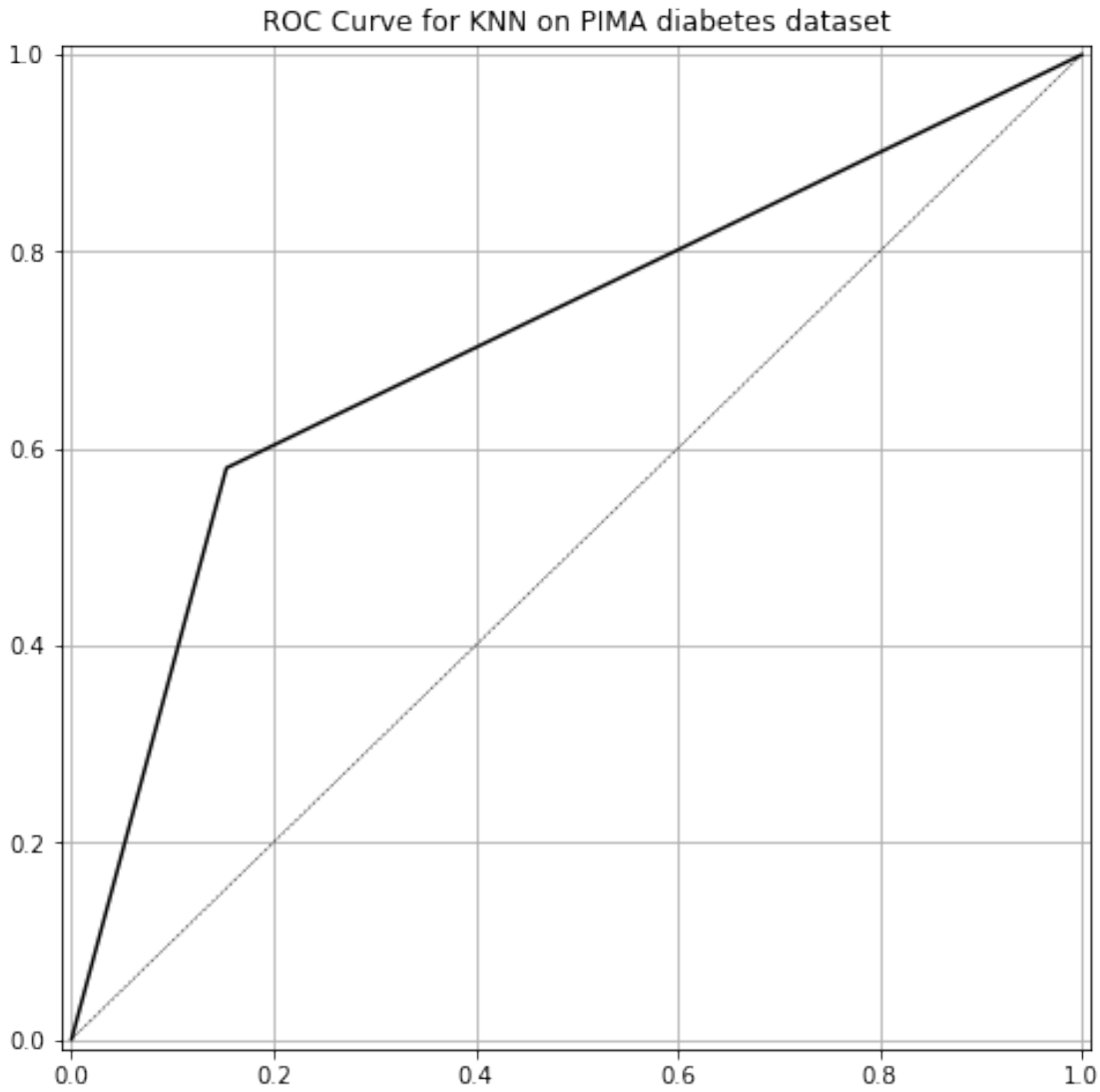
[116]:
```
# Evaluate Model
from sklearn.metrics import f1_score
evaluate_cm = confusion_matrix(y_test, y_pred)
print (evaluate_cm)
print(f1_score(y_test, y_pred))
```

```
[[127  23]
 [ 34  47]]
0.6225165562913907
```

[117]:
```
# creating the confusion matrix
evaluate_cm = confusion_matrix(y_test, y_pred)
print (evaluate_cm)
print('F1 score is ' ,f1_score(y_test, y_pred))
print('Accuracy is' , accuracy_score(y_test, y_pred))
```

```
[[127  23]
 [ 34  47]]
F1 score is  0.6225165562913907
Accuracy is 0.7532467532467533
```

[118]:
```
plot_roc(y_test, y_pred, 'KNN')
```



Accuracy score obtained from KNN method = 75.3%

1.5.7 Gradient Boosting Classifier

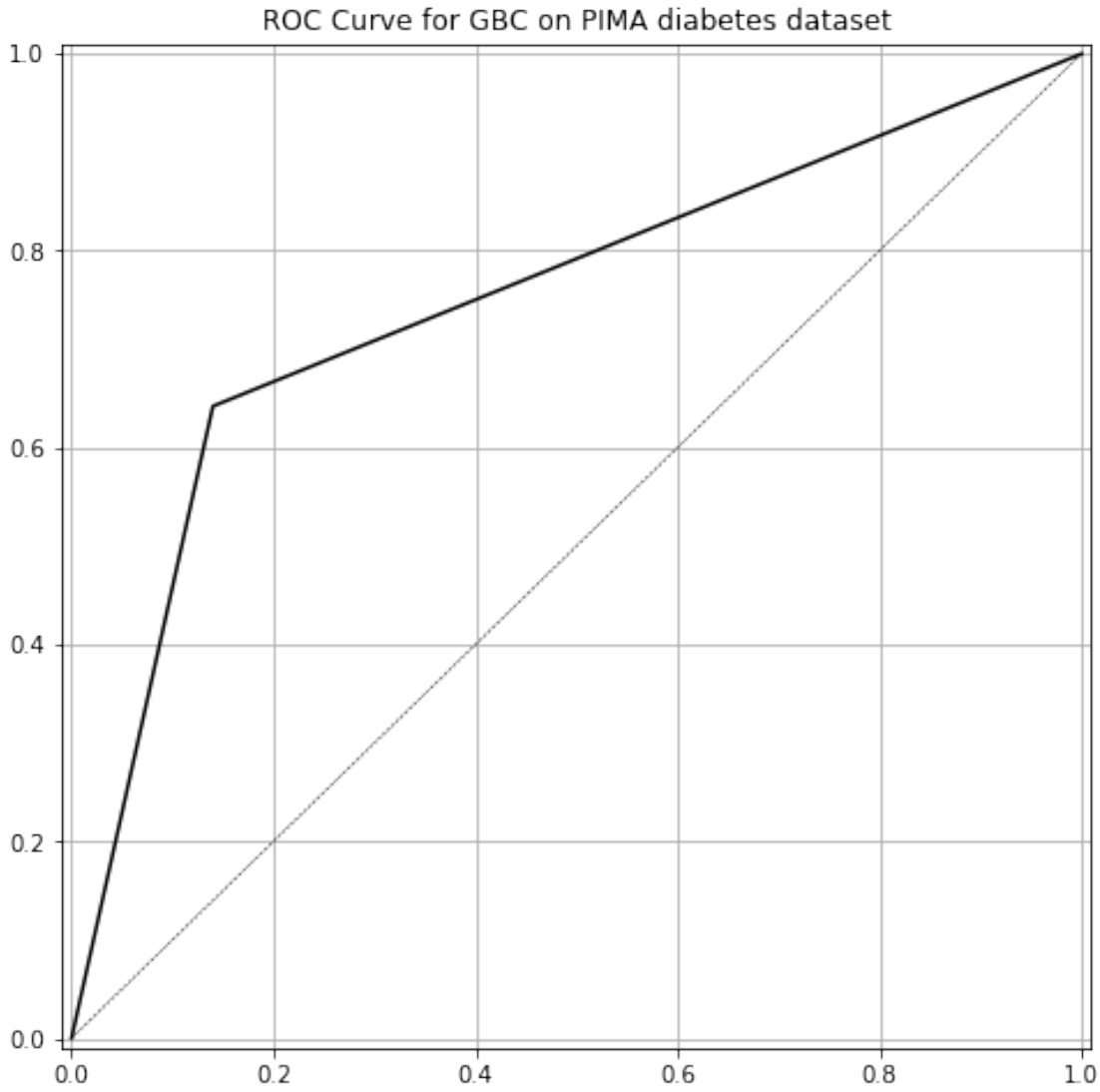
Gradient boosting is a machine learning technique for regression and classification problems, which produces a prediction model in the form of an ensemble of weak prediction models, typically decision trees.

It builds the model in a stage-wise fashion like other boosting methods do, and it generalizes them by allowing optimization of an arbitrary differentiable loss function.

[107]:
```
params = {'max_depth':9, 'subsample':0.5, 'learning_rate':0.01,␣
 ↪'min_samples_leaf':1, 'random_state':42}
gbc = GradientBoostingClassifier(n_estimators=290, **params)
clf_ = gbc.fit(X_train, y_train)
y_pred = clf_.predict(X_test)
print('Accuracy is {}'.format(accuracy_score(y_test,y_pred )))
train_predict(gbc, X_train, y_train, X_test, y_test)
```

```
Accuracy is 0.7835497835497836
F1 score for training set is: 1.0000
F1 score for testing set is: 0.6753
```

[108]:
```
plot_roc(y_test, y_pred, 'GBC')
```



Accuracy obtained by applying Gradient Boosting Classifier is 78.3% Using all 3 techniques , we see that best accuracy obtained from Gradient Boosting Classifier which is 78.3%

Now, we need to develop a neural network model to see how well it performs and if they can achieve a better accuracy from these models. Wide and deep neural networks usually performs better but we need to experiment and see which model performs better.

1.6 Developing Deep Learning Neural Network Model

Artificial Neural Network is a computational model based on the biological neural network which consists of various neurons and attempts to simulate the network of neurons so that it can learn the pattern programmatically and make better decisions.

ANN comprises of input layer , output layer and hidden layers. Weights are assigned to them and using the backward propagation mechanism, weights are updated accordingly.

1.6.1 Important Terminologies and Concepts to understand Neural Network Model

Activation Functions: Activation functions play an important role in neural network model because they introduce non-linearity. The main purpose is to convert a input signal of a node in a ANN to an output signal. This output signal now used as an input in the next layer in the stack.

In ANN, we compute the sum of products of inputs and their corresponding weights and then apply activation function f(x) to it to get the output layer and feed it as an input to the next layer. There are various kinds of activation function. Only discussing the most popular activation functions used in the project.

Sigmoid activation function: It is an activation function of form f(x)=1/1+exp(-x) . Range is between 0 and 1. Useful for binary classification problems.

Tanh activation function: Its mathematical formula is f(x)=1-exp(-2x)/1+exp(-2x). Its output is zero centered because its range in between -1 and 1. Optimization is easier in this case and generally preferred over sigmoid function.

RELU activation function: It is also popularly called as linear rectified unit. It returns the value provided as input directly, or the value 0.0 if the input is less than zero.

Function can be described as g(z) = max{0,z}

[379]:
```
#normalizing values
normalizer = StandardScaler()
X_train_norm = normalizer.fit_transform(X_train)
X_test_norm = normalizer.transform(X_test)
print('X_train_normalized is' , X_train_norm)
print('X test normalized is ',X_test_norm)
```

```
X_train_normalized is [[-0.21654016 -0.04466859  0.07176895 ...  1.43258932
-0.09568657
  -0.25299319]
```

```
 [-1.0996951  -0.61882624 -0.23329642 ...  1.13123171  0.03565317
  -1.0298141 ]
 [ 0.07784482  0.84846554 -0.43667334 ... -0.13971125 -0.99715482
  -0.33930663]
 ...
 [ 0.66661477 -3.87238629 -0.02991951 ...  0.92159163  0.72518683
   0.69645458]
 [-0.51092514  0.62518201 -0.5383618  ... -0.86034901  0.64160699
  -0.7708738 ]
 [-0.80531012  0.21051259  0.68189969 ... -0.58519641 -1.10162962
  -0.94350067]]
X test normalized is  [[-0.51092514  0.05102436 -1.04680408 ...  1.32776928
0.10729303
  -0.59824693]
 [ 0.66661477  0.40189848  0.58021123 ...  1.86497198 -0.73447533
   1.12802175]
 [ 0.07784482 -0.20415682  0.17345741 ... -0.40176135 -0.32254613
   1.12802175]
 ...
 [ 0.07784482 -1.22488154  0.88527661 ... -0.34935133 -0.49866079
   0.09226054]
 [-0.80531012  0.72087495  0.68189969 ...  1.22294924  0.36698753
  -0.42562006]
 [-0.21654016 -1.38436978  0.07176895 ...  0.06992882 -0.63895552
   0.52382771]]
```

1.6.2 Developing a neural network model with 1 hidden layer.

Here, we have defined a model having 3 dense layers. First is the input layer wherein we have defined an input shape which is 8 and also defined activation function. I have used RELU activation function and as 12 neurons.

Second layer consists of a hidden layer having 8 neurons and RELU activation function.

Third layer is the output layer having just 1 neuron and used Sigmoid activation function as the output ranges between 0 and 1. Sigmoid functions are useful for binary classification problems.

We have used Sequential class from Keras library wherein you can build a model, define the layers, input and output.

There are 4 major steps involved in model building: 1. Define a model 2. Compile the model 3. Fit the data into the model 4. Predict the outcome

[389]:
```
# defininging a model with input, 1 hidden layer and output layer.
def nn_model_1(model):
    model.add(Dense(12, input_shape=(8,), activation="relu"))
    model.add(Dense(8, activation="relu"))
    model.add(Dense(1, activation="sigmoid"))
    return model
```

[390]:
```
# calling the above function and initializing the model.
model = Sequential()
model = nn_model_1(model)
```

[391]:
```
#prints the model summary
model.summary()
```

```
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
dense_85 (Dense)             (None, 12)                108
_________________________________________________________________
dense_86 (Dense)             (None, 8)                 104
_________________________________________________________________
dense_87 (Dense)             (None, 1)                 9
=================================================================
Total params: 221
Trainable params: 221
Non-trainable params: 0
_________________________________________________________________
```

Understanding the model compile method:

Optimizers used: There are different options of optimizers which can be used in the model such as Adam , SGD and RMSProp. Most popular is SGD which is nothing but Stochastic Gradient Descent.This is useful to minimize the loss function and computes the gradientat each iteration and then helps in updating the weights in the model using backward propagation algorithm. We have used SGD as an optimizer in the model in the whole project. There are others which can be used in the model as well such as Adam or RMSProp.

Binary Cross Entropy Losses : It is also called as Sigmoid Cross entropy loss. It is basically a sigmoid function and cross-entropy loss. It is independent for each vector component class which is the loss computed for every output vector component not affected by other component values. Since this is a binary classification problem, we have used binary cross entropy loss.

Learning Rates: Learning Rate is a hyperparameter that controls how much we are adjusting the weights of our network with respect the loss gradient. Lower the learning rate, slower we travel along the downward slope. Equation of new weight calculation is given by:

new_weight = existing weight - learning rate * gradient

During the model building, we need to test and check the performance of the model. If the learning rate is too low then gradient will be very slow and if the learning rate is too high then the gradient descent can overshoot the minimum and they might fail to converge.

Optimal value of the learning rate can be found only when the user tests and check or can have intuition based on the past experiences. In this project, I have tried testing with different learning rates to see the model performance.

[402]:
```
# through this code, we are compiling the above generated model.
sgd = SGD(lr=0.05)
model.compile(loss="binary_crossentropy",optimizer=sgd,␣
 ↪metrics=["accuracy"],sample_weight_mode=None)
```

Model fit method In below line of code, we have tried fitting the data into the model and the output of the method is stored in a variable called run_hist_1.

Verbose =1 signifies that it will show the animated training progress in the output when you run the code.

Epochs : It is the hyperparameter set before training the model. One epoch is when an entire dataset is passed both backward and forward through the neural network. It defines the number of times the learning algorithm will work through the entire dataset. We have used different epochs in different models.

[393]:
```
run_hist_1 = model.fit(X_train_norm, y_train, validation_data=(X_test_norm,␣
↪y_test), verbose=1, epochs=200)
```

```
Train on 537 samples, validate on 231 samples
Epoch 1/200
537/537 [==============================] - 2s 3ms/step - loss: 0.6674 - acc:
0.6480 - val_loss: 0.6699 - val_acc: 0.6494
Epoch 2/200
537/537 [==============================] - 0s 85us/step - loss: 0.6254 - acc:
0.6480 - val_loss: 0.6343 - val_acc: 0.6494
Epoch 3/200
537/537 [==============================] - 0s 184us/step - loss: 0.5958 - acc:
0.6611 - val_loss: 0.6058 - val_acc: 0.6797
Epoch 4/200
537/537 [==============================] - 0s 80us/step - loss: 0.5709 - acc:
0.6853 - val_loss: 0.5829 - val_acc: 0.6840
Epoch 5/200
537/537 [==============================] - 0s 217us/step - loss: 0.5500 - acc:
0.7132 - val_loss: 0.5646 - val_acc: 0.7056
Epoch 6/200
537/537 [==============================] - 0s 91us/step - loss: 0.5330 - acc:
0.7318 - val_loss: 0.5495 - val_acc: 0.7229
Epoch 7/200
537/537 [==============================] - 0s 106us/step - loss: 0.5191 - acc:
0.7486 - val_loss: 0.5367 - val_acc: 0.7489
Epoch 8/200
537/537 [==============================] - 0s 171us/step - loss: 0.5081 - acc:
0.7430 - val_loss: 0.5268 - val_acc: 0.7706
Epoch 9/200
537/537 [==============================] - 0s 72us/step - loss: 0.4991 - acc:
0.7467 - val_loss: 0.5206 - val_acc: 0.7749
Epoch 10/200
537/537 [==============================] - 0s 72us/step - loss: 0.4922 - acc:
0.7505 - val_loss: 0.5160 - val_acc: 0.7749
Epoch 11/200
537/537 [==============================] - 0s 223us/step - loss: 0.4868 - acc:
0.7505 - val_loss: 0.5121 - val_acc: 0.7879
Epoch 12/200
537/537 [==============================] - 0s 93us/step - loss: 0.4820 - acc:
```

```
0.7486 - val_loss: 0.5100 - val_acc: 0.7835
Epoch 13/200
537/537 [==============================] - 0s 72us/step - loss: 0.4790 - acc:
0.7523 - val_loss: 0.5080 - val_acc: 0.7879
Epoch 14/200
537/537 [==============================] - 0s 75us/step - loss: 0.4753 - acc:
0.7561 - val_loss: 0.5066 - val_acc: 0.7835
Epoch 15/200
537/537 [==============================] - 0s 152us/step - loss: 0.4727 - acc:
0.7598 - val_loss: 0.5053 - val_acc: 0.7835
Epoch 16/200
537/537 [==============================] - 0s 322us/step - loss: 0.4707 - acc:
0.7654 - val_loss: 0.5049 - val_acc: 0.7835
Epoch 17/200
537/537 [==============================] - 0s 262us/step - loss: 0.4687 - acc:
0.7654 - val_loss: 0.5043 - val_acc: 0.7792
Epoch 18/200
537/537 [==============================] - 0s 199us/step - loss: 0.4657 - acc:
0.7654 - val_loss: 0.5033 - val_acc: 0.7792
Epoch 19/200
537/537 [==============================] - 0s 93us/step - loss: 0.4630 - acc:
0.7691 - val_loss: 0.5028 - val_acc: 0.7835
Epoch 20/200
537/537 [==============================] - 0s 208us/step - loss: 0.4620 - acc:
0.7654 - val_loss: 0.5025 - val_acc: 0.7835
Epoch 21/200
537/537 [==============================] - 0s 96us/step - loss: 0.4596 - acc:
0.7691 - val_loss: 0.5035 - val_acc: 0.7749
Epoch 22/200
537/537 [==============================] - 0s 236us/step - loss: 0.4580 - acc:
0.7691 - val_loss: 0.5020 - val_acc: 0.7835
Epoch 23/200
537/537 [==============================] - 0s 89us/step - loss: 0.4575 - acc:
0.7672 - val_loss: 0.5018 - val_acc: 0.7835
Epoch 24/200
537/537 [==============================] - 0s 137us/step - loss: 0.4556 - acc:
0.7672 - val_loss: 0.5025 - val_acc: 0.7749
Epoch 25/200
537/537 [==============================] - 0s 238us/step - loss: 0.4545 - acc:
0.7747 - val_loss: 0.5014 - val_acc: 0.7749
Epoch 26/200
537/537 [==============================] - 0s 132us/step - loss: 0.4527 - acc:
0.7691 - val_loss: 0.5013 - val_acc: 0.7749
Epoch 27/200
537/537 [==============================] - 0s 155us/step - loss: 0.4511 - acc:
0.7728 - val_loss: 0.5013 - val_acc: 0.7749
Epoch 28/200
537/537 [==============================] - 0s 197us/step - loss: 0.4503 - acc:
```

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0.7709 - val_loss: 0.5016 - val_acc: 0.7706
Epoch 29/200
537/537 [==============================] - 0s 78us/step - loss: 0.4491 - acc:
0.7728 - val_loss: 0.5022 - val_acc: 0.7792
Epoch 30/200
537/537 [==============================] - 0s 215us/step - loss: 0.4486 - acc:
0.7691 - val_loss: 0.5016 - val_acc: 0.7749
Epoch 31/200
537/537 [==============================] - 0s 128us/step - loss: 0.4465 - acc:
0.7765 - val_loss: 0.5022 - val_acc: 0.7835
Epoch 32/200
537/537 [==============================] - 0s 171us/step - loss: 0.4454 - acc:
0.7728 - val_loss: 0.5004 - val_acc: 0.7835
Epoch 33/200
537/537 [==============================] - 0s 190us/step - loss: 0.4447 - acc:
0.7747 - val_loss: 0.5018 - val_acc: 0.7749
Epoch 34/200
537/537 [==============================] - 0s 198us/step - loss: 0.4438 - acc:
0.7784 - val_loss: 0.5021 - val_acc: 0.7749
Epoch 35/200
537/537 [==============================] - 0s 191us/step - loss: 0.4431 - acc:
0.7747 - val_loss: 0.5021 - val_acc: 0.7749
Epoch 36/200
537/537 [==============================] - 0s 238us/step - loss: 0.4419 - acc:
0.7784 - val_loss: 0.5017 - val_acc: 0.7792
Epoch 37/200
537/537 [==============================] - 0s 100us/step - loss: 0.4422 - acc:
0.7858 - val_loss: 0.5026 - val_acc: 0.7749
Epoch 38/200
537/537 [==============================] - 0s 164us/step - loss: 0.4407 - acc:
0.7803 - val_loss: 0.5029 - val_acc: 0.7792
Epoch 39/200
537/537 [==============================] - 0s 104us/step - loss: 0.4398 - acc:
0.7803 - val_loss: 0.5026 - val_acc: 0.7792
Epoch 40/200
537/537 [==============================] - 0s 286us/step - loss: 0.4387 - acc:
0.7821 - val_loss: 0.5020 - val_acc: 0.7792
Epoch 41/200
537/537 [==============================] - 0s 199us/step - loss: 0.4384 - acc:
0.7877 - val_loss: 0.5014 - val_acc: 0.7792
Epoch 42/200
537/537 [==============================] - 0s 113us/step - loss: 0.4374 - acc:
0.7877 - val_loss: 0.5005 - val_acc: 0.7749
Epoch 43/200
537/537 [==============================] - 0s 203us/step - loss: 0.4378 - acc:
0.7877 - val_loss: 0.5012 - val_acc: 0.7749
Epoch 44/200
537/537 [==============================] - 0s 351us/step - loss: 0.4369 - acc:
```

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0.7877 - val_loss: 0.5005 - val_acc: 0.7792
Epoch 45/200
537/537 [==============================] - 0s 134us/step - loss: 0.4355 - acc:
0.7784 - val_loss: 0.5013 - val_acc: 0.7792
Epoch 46/200
537/537 [==============================] - 0s 700us/step - loss: 0.4358 - acc:
0.7914 - val_loss: 0.5009 - val_acc: 0.7792
Epoch 47/200
537/537 [==============================] - 0s 228us/step - loss: 0.4345 - acc:
0.7896 - val_loss: 0.5009 - val_acc: 0.7749
Epoch 48/200
537/537 [==============================] - 0s 739us/step - loss: 0.4351 - acc:
0.7896 - val_loss: 0.5016 - val_acc: 0.7792
Epoch 49/200
537/537 [==============================] - 0s 351us/step - loss: 0.4332 - acc:
0.7877 - val_loss: 0.5027 - val_acc: 0.7792
Epoch 50/200
537/537 [==============================] - 0s 366us/step - loss: 0.4321 - acc:
0.7896 - val_loss: 0.5021 - val_acc: 0.7749
Epoch 51/200
537/537 [==============================] - 0s 436us/step - loss: 0.4316 - acc:
0.7896 - val_loss: 0.5025 - val_acc: 0.7749
Epoch 52/200
537/537 [==============================] - 0s 624us/step - loss: 0.4319 - acc:
0.7877 - val_loss: 0.5025 - val_acc: 0.7706
Epoch 53/200
537/537 [==============================] - 0s 444us/step - loss: 0.4315 - acc:
0.7914 - val_loss: 0.5034 - val_acc: 0.7662
Epoch 54/200
537/537 [==============================] - 0s 234us/step - loss: 0.4304 - acc:
0.7877 - val_loss: 0.5034 - val_acc: 0.7662
Epoch 55/200
537/537 [==============================] - 0s 195us/step - loss: 0.4297 - acc:
0.7933 - val_loss: 0.5033 - val_acc: 0.7662
Epoch 56/200
537/537 [==============================] - 0s 158us/step - loss: 0.4299 - acc:
0.7914 - val_loss: 0.5046 - val_acc: 0.7662
Epoch 57/200
537/537 [==============================] - 0s 273us/step - loss: 0.4297 - acc:
0.7933 - val_loss: 0.5035 - val_acc: 0.7749
Epoch 58/200
537/537 [==============================] - 0s 215us/step - loss: 0.4292 - acc:
0.7914 - val_loss: 0.5037 - val_acc: 0.7662
Epoch 59/200
537/537 [==============================] - 0s 167us/step - loss: 0.4284 - acc:
0.7914 - val_loss: 0.5044 - val_acc: 0.7619
Epoch 60/200
537/537 [==============================] - 0s 110us/step - loss: 0.4279 - acc:
```

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0.7914 - val_loss: 0.5048 - val_acc: 0.7619
Epoch 61/200
537/537 [==============================] - 0s 115us/step - loss: 0.4270 - acc:
0.7914 - val_loss: 0.5042 - val_acc: 0.7749
Epoch 62/200
537/537 [==============================] - 0s 85us/step - loss: 0.4272 - acc:
0.7970 - val_loss: 0.5041 - val_acc: 0.7749
Epoch 63/200
537/537 [==============================] - 0s 149us/step - loss: 0.4263 - acc:
0.7896 - val_loss: 0.5050 - val_acc: 0.7662
Epoch 64/200
537/537 [==============================] - 0s 169us/step - loss: 0.4255 - acc:
0.7970 - val_loss: 0.5064 - val_acc: 0.7619
Epoch 65/200
537/537 [==============================] - 0s 704us/step - loss: 0.4245 - acc:
0.7989 - val_loss: 0.5065 - val_acc: 0.7662
Epoch 66/200
537/537 [==============================] - 0s 327us/step - loss: 0.4254 - acc:
0.7933 - val_loss: 0.5053 - val_acc: 0.7662
Epoch 67/200
537/537 [==============================] - 0s 150us/step - loss: 0.4241 - acc:
0.7914 - val_loss: 0.5050 - val_acc: 0.7749
Epoch 68/200
537/537 [==============================] - 0s 199us/step - loss: 0.4241 - acc:
0.7989 - val_loss: 0.5064 - val_acc: 0.7619
Epoch 69/200
537/537 [==============================] - 0s 151us/step - loss: 0.4228 - acc:
0.7989 - val_loss: 0.5089 - val_acc: 0.7662
Epoch 70/200
537/537 [==============================] - 1s 1ms/step - loss: 0.4231 - acc:
0.7989 - val_loss: 0.5069 - val_acc: 0.7706
Epoch 71/200
537/537 [==============================] - 0s 856us/step - loss: 0.4219 - acc:
0.7970 - val_loss: 0.5071 - val_acc: 0.7706
Epoch 72/200
537/537 [==============================] - 0s 106us/step - loss: 0.4214 - acc:
0.8045 - val_loss: 0.5082 - val_acc: 0.7662
Epoch 73/200
537/537 [==============================] - 0s 225us/step - loss: 0.4211 - acc:
0.7989 - val_loss: 0.5069 - val_acc: 0.7706
Epoch 74/200
537/537 [==============================] - 0s 115us/step - loss: 0.4214 - acc:
0.8007 - val_loss: 0.5092 - val_acc: 0.7706
Epoch 75/200
537/537 [==============================] - 0s 128us/step - loss: 0.4202 - acc:
0.7989 - val_loss: 0.5094 - val_acc: 0.7749
Epoch 76/200
537/537 [==============================] - 0s 204us/step - loss: 0.4192 - acc:
```

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0.8007 - val_loss: 0.5085 - val_acc: 0.7706
Epoch 77/200
537/537 [==============================] - 0s 147us/step - loss: 0.4194 - acc:
0.8045 - val_loss: 0.5084 - val_acc: 0.7662
Epoch 78/200
537/537 [==============================] - 0s 137us/step - loss: 0.4190 - acc:
0.8063 - val_loss: 0.5097 - val_acc: 0.7706
Epoch 79/200
537/537 [==============================] - 0s 156us/step - loss: 0.4198 - acc:
0.8026 - val_loss: 0.5103 - val_acc: 0.7706
Epoch 80/200
537/537 [==============================] - 0s 182us/step - loss: 0.4181 - acc:
0.8026 - val_loss: 0.5108 - val_acc: 0.7749
Epoch 81/200
537/537 [==============================] - 0s 135us/step - loss: 0.4182 - acc:
0.8045 - val_loss: 0.5093 - val_acc: 0.7706
Epoch 82/200
537/537 [==============================] - 0s 251us/step - loss: 0.4176 - acc:
0.8101 - val_loss: 0.5111 - val_acc: 0.7706
Epoch 83/200
537/537 [==============================] - 0s 197us/step - loss: 0.4171 - acc:
0.8045 - val_loss: 0.5114 - val_acc: 0.7706
Epoch 84/200
537/537 [==============================] - 0s 167us/step - loss: 0.4170 - acc:
0.8045 - val_loss: 0.5104 - val_acc: 0.7706
Epoch 85/200
537/537 [==============================] - 0s 180us/step - loss: 0.4159 - acc:
0.8082 - val_loss: 0.5131 - val_acc: 0.7749
Epoch 86/200
537/537 [==============================] - 0s 145us/step - loss: 0.4170 - acc:
0.8026 - val_loss: 0.5138 - val_acc: 0.7749
Epoch 87/200
537/537 [==============================] - 0s 176us/step - loss: 0.4164 - acc:
0.8082 - val_loss: 0.5122 - val_acc: 0.7706
Epoch 88/200
537/537 [==============================] - 0s 123us/step - loss: 0.4154 - acc:
0.8082 - val_loss: 0.5135 - val_acc: 0.7749
Epoch 89/200
537/537 [==============================] - 0s 145us/step - loss: 0.4151 - acc:
0.8045 - val_loss: 0.5119 - val_acc: 0.7706
Epoch 90/200
537/537 [==============================] - 0s 130us/step - loss: 0.4145 - acc:
0.8082 - val_loss: 0.5111 - val_acc: 0.7706
Epoch 91/200
537/537 [==============================] - ETA: 0s - loss: 0.4248 - acc: 0.800 -
0s 170us/step - loss: 0.4148 - acc: 0.8101 - val_loss: 0.5150 - val_acc: 0.7792
Epoch 92/200
537/537 [==============================] - 0s 265us/step - loss: 0.4141 - acc:
```

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0.8082 - val_loss: 0.5138 - val_acc: 0.7662
Epoch 93/200
537/537 [==============================] - 0s 139us/step - loss: 0.4136 - acc:
0.8101 - val_loss: 0.5131 - val_acc: 0.7706
Epoch 94/200
537/537 [==============================] - 0s 91us/step - loss: 0.4138 - acc:
0.8063 - val_loss: 0.5132 - val_acc: 0.7706
Epoch 95/200
537/537 [==============================] - 0s 89us/step - loss: 0.4123 - acc:
0.8119 - val_loss: 0.5166 - val_acc: 0.7706
Epoch 96/200
537/537 [==============================] - 0s 95us/step - loss: 0.4132 - acc:
0.8119 - val_loss: 0.5151 - val_acc: 0.7662
Epoch 97/200
537/537 [==============================] - 0s 98us/step - loss: 0.4116 - acc:
0.8175 - val_loss: 0.5195 - val_acc: 0.7792
Epoch 98/200
537/537 [==============================] - 0s 87us/step - loss: 0.4120 - acc:
0.8138 - val_loss: 0.5191 - val_acc: 0.7706
Epoch 99/200
537/537 [==============================] - 0s 93us/step - loss: 0.4120 - acc:
0.8175 - val_loss: 0.5166 - val_acc: 0.7749
Epoch 100/200
537/537 [==============================] - 0s 392us/step - loss: 0.4110 - acc:
0.8194 - val_loss: 0.5161 - val_acc: 0.7749
Epoch 101/200
537/537 [==============================] - 0s 91us/step - loss: 0.4111 - acc:
0.8156 - val_loss: 0.5196 - val_acc: 0.7879
Epoch 102/200
537/537 [==============================] - 0s 227us/step - loss: 0.4101 - acc:
0.8194 - val_loss: 0.5183 - val_acc: 0.7749
Epoch 103/200
537/537 [==============================] - 0s 424us/step - loss: 0.4097 - acc:
0.8156 - val_loss: 0.5169 - val_acc: 0.7792
Epoch 104/200
537/537 [==============================] - 0s 234us/step - loss: 0.4094 - acc:
0.8156 - val_loss: 0.5185 - val_acc: 0.7792
Epoch 105/200
537/537 [==============================] - 0s 111us/step - loss: 0.4096 - acc:
0.8175 - val_loss: 0.5173 - val_acc: 0.7749
Epoch 106/200
537/537 [==============================] - 0s 113us/step - loss: 0.4091 - acc:
0.8250 - val_loss: 0.5195 - val_acc: 0.7706
Epoch 107/200
537/537 [==============================] - 0s 165us/step - loss: 0.4094 - acc:
0.8212 - val_loss: 0.5191 - val_acc: 0.7706
Epoch 108/200
537/537 [==============================] - 0s 160us/step - loss: 0.4080 - acc:
```

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0.8175 - val_loss: 0.5181 - val_acc: 0.7749
Epoch 109/200
537/537 [==============================] - 0s 206us/step - loss: 0.4076 - acc:
0.8231 - val_loss: 0.5188 - val_acc: 0.7749
Epoch 110/200
537/537 [==============================] - 0s 263us/step - loss: 0.4072 - acc:
0.8212 - val_loss: 0.5194 - val_acc: 0.7749
Epoch 111/200
537/537 [==============================] - 0s 104us/step - loss: 0.4067 - acc:
0.8212 - val_loss: 0.5209 - val_acc: 0.7749
Epoch 112/200
537/537 [==============================] - 0s 121us/step - loss: 0.4066 - acc:
0.8250 - val_loss: 0.5224 - val_acc: 0.7749
Epoch 113/200
537/537 [==============================] - 0s 227us/step - loss: 0.4068 - acc:
0.8194 - val_loss: 0.5216 - val_acc: 0.7749
Epoch 114/200
537/537 [==============================] - 0s 180us/step - loss: 0.4071 - acc:
0.8250 - val_loss: 0.5215 - val_acc: 0.7706
Epoch 115/200
537/537 [==============================] - 0s 120us/step - loss: 0.4057 - acc:
0.8212 - val_loss: 0.5215 - val_acc: 0.7706
Epoch 116/200
537/537 [==============================] - 0s 160us/step - loss: 0.4055 - acc:
0.8268 - val_loss: 0.5226 - val_acc: 0.7749
Epoch 117/200
537/537 [==============================] - 0s 154us/step - loss: 0.4062 - acc:
0.8268 - val_loss: 0.5229 - val_acc: 0.7749
Epoch 118/200
537/537 [==============================] - 0s 221us/step - loss: 0.4046 - acc:
0.8231 - val_loss: 0.5213 - val_acc: 0.7706
Epoch 119/200
537/537 [==============================] - 0s 204us/step - loss: 0.4039 - acc:
0.8268 - val_loss: 0.5243 - val_acc: 0.7749
Epoch 120/200
537/537 [==============================] - 0s 154us/step - loss: 0.4044 - acc:
0.8194 - val_loss: 0.5250 - val_acc: 0.7749
Epoch 121/200
537/537 [==============================] - 0s 247us/step - loss: 0.4037 - acc:
0.8231 - val_loss: 0.5243 - val_acc: 0.7749
Epoch 122/200
537/537 [==============================] - 0s 135us/step - loss: 0.4042 - acc:
0.8250 - val_loss: 0.5253 - val_acc: 0.7792
Epoch 123/200
537/537 [==============================] - 0s 150us/step - loss: 0.4029 - acc:
0.8231 - val_loss: 0.5228 - val_acc: 0.7749
Epoch 124/200
537/537 [==============================] - 0s 147us/step - loss: 0.4030 - acc:
```

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0.8212 - val_loss: 0.5251 - val_acc: 0.7706
Epoch 125/200
537/537 [==============================] - 0s 184us/step - loss: 0.4028 - acc:
0.8250 - val_loss: 0.5277 - val_acc: 0.7749
Epoch 126/200
537/537 [==============================] - 0s 109us/step - loss: 0.4021 - acc:
0.8231 - val_loss: 0.5298 - val_acc: 0.7792
Epoch 127/200
537/537 [==============================] - 0s 184us/step - loss: 0.4007 - acc:
0.8212 - val_loss: 0.5221 - val_acc: 0.7749
Epoch 128/200
537/537 [==============================] - 0s 134us/step - loss: 0.4018 - acc:
0.8231 - val_loss: 0.5249 - val_acc: 0.7706
Epoch 129/200
537/537 [==============================] - 0s 171us/step - loss: 0.4009 - acc:
0.8324 - val_loss: 0.5317 - val_acc: 0.7706
Epoch 130/200
537/537 [==============================] - 0s 98us/step - loss: 0.4000 - acc:
0.8305 - val_loss: 0.5306 - val_acc: 0.7749
Epoch 131/200
537/537 [==============================] - 0s 150us/step - loss: 0.4001 - acc:
0.8212 - val_loss: 0.5262 - val_acc: 0.7706
Epoch 132/200
537/537 [==============================] - 0s 217us/step - loss: 0.3993 - acc:
0.8268 - val_loss: 0.5266 - val_acc: 0.7792
Epoch 133/200
537/537 [==============================] - 0s 101us/step - loss: 0.3990 - acc:
0.8380 - val_loss: 0.5291 - val_acc: 0.7706
Epoch 134/200
537/537 [==============================] - 0s 137us/step - loss: 0.3985 - acc:
0.8380 - val_loss: 0.5307 - val_acc: 0.7706
Epoch 135/200
537/537 [==============================] - 0s 134us/step - loss: 0.3997 - acc:
0.8343 - val_loss: 0.5300 - val_acc: 0.7706
Epoch 136/200
537/537 [==============================] - 0s 106us/step - loss: 0.3982 - acc:
0.8380 - val_loss: 0.5275 - val_acc: 0.7749
Epoch 137/200
537/537 [==============================] - 0s 196us/step - loss: 0.3977 - acc:
0.8361 - val_loss: 0.5273 - val_acc: 0.7706
Epoch 138/200
537/537 [==============================] - 0s 123us/step - loss: 0.3970 - acc:
0.8324 - val_loss: 0.5270 - val_acc: 0.7706
Epoch 139/200
537/537 [==============================] - 0s 134us/step - loss: 0.3980 - acc:
0.8305 - val_loss: 0.5302 - val_acc: 0.7749
Epoch 140/200
537/537 [==============================] - 0s 126us/step - loss: 0.3976 - acc:
```

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0.8380 - val_loss: 0.5315 - val_acc: 0.7619
Epoch 141/200
537/537 [==============================] - 0s 104us/step - loss: 0.3967 - acc:
0.8268 - val_loss: 0.5280 - val_acc: 0.7749
Epoch 142/200
537/537 [==============================] - 0s 163us/step - loss: 0.3974 - acc:
0.8343 - val_loss: 0.5312 - val_acc: 0.7662
Epoch 143/200
537/537 [==============================] - 0s 270us/step - loss: 0.3972 - acc:
0.8343 - val_loss: 0.5299 - val_acc: 0.7662
Epoch 144/200
537/537 [==============================] - ETA: 0s - loss: 0.4041 - acc: 0.830 -
0s 251us/step - loss: 0.3947 - acc: 0.8305 - val_loss: 0.5317 - val_acc: 0.7662
Epoch 145/200
537/537 [==============================] - 0s 119us/step - loss: 0.3953 - acc:
0.8343 - val_loss: 0.5293 - val_acc: 0.7662
Epoch 146/200
537/537 [==============================] - 0s 113us/step - loss: 0.3945 - acc:
0.8287 - val_loss: 0.5284 - val_acc: 0.7749
Epoch 147/200
537/537 [==============================] - 0s 134us/step - loss: 0.3946 - acc:
0.8305 - val_loss: 0.5338 - val_acc: 0.7662
Epoch 148/200
537/537 [==============================] - 0s 145us/step - loss: 0.3935 - acc:
0.8399 - val_loss: 0.5299 - val_acc: 0.7662
Epoch 149/200
537/537 [==============================] - 0s 156us/step - loss: 0.3936 - acc:
0.8361 - val_loss: 0.5359 - val_acc: 0.7662
Epoch 150/200
537/537 [==============================] - 0s 145us/step - loss: 0.3941 - acc:
0.8250 - val_loss: 0.5323 - val_acc: 0.7662
Epoch 151/200
537/537 [==============================] - 0s 197us/step - loss: 0.3932 - acc:
0.8324 - val_loss: 0.5321 - val_acc: 0.7662
Epoch 152/200
537/537 [==============================] - 0s 113us/step - loss: 0.3931 - acc:
0.8380 - val_loss: 0.5311 - val_acc: 0.7662
Epoch 153/200
537/537 [==============================] - 0s 124us/step - loss: 0.3922 - acc:
0.8287 - val_loss: 0.5353 - val_acc: 0.7662
Epoch 154/200
537/537 [==============================] - 0s 159us/step - loss: 0.3924 - acc:
0.8324 - val_loss: 0.5358 - val_acc: 0.7662
Epoch 155/200
537/537 [==============================] - 0s 258us/step - loss: 0.3914 - acc:
0.8305 - val_loss: 0.5318 - val_acc: 0.7706
Epoch 156/200
537/537 [==============================] - 0s 102us/step - loss: 0.3927 - acc:
```

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0.8305 - val_loss: 0.5347 - val_acc: 0.7706
Epoch 157/200
537/537 [==============================] - 0s 303us/step - loss: 0.3906 - acc:
0.8436 - val_loss: 0.5315 - val_acc: 0.7749
Epoch 158/200
537/537 [==============================] - 0s 189us/step - loss: 0.3915 - acc:
0.8287 - val_loss: 0.5339 - val_acc: 0.7749
Epoch 159/200
537/537 [==============================] - 0s 108us/step - loss: 0.3897 - acc:
0.8305 - val_loss: 0.5350 - val_acc: 0.7706
Epoch 160/200
537/537 [==============================] - 0s 117us/step - loss: 0.3895 - acc:
0.8417 - val_loss: 0.5372 - val_acc: 0.7706
Epoch 161/200
537/537 [==============================] - 0s 198us/step - loss: 0.3894 - acc:
0.8361 - val_loss: 0.5332 - val_acc: 0.7706
Epoch 162/200
537/537 [==============================] - 0s 123us/step - loss: 0.3889 - acc:
0.8399 - val_loss: 0.5344 - val_acc: 0.7706
Epoch 163/200
537/537 [==============================] - 0s 109us/step - loss: 0.3893 - acc:
0.8343 - val_loss: 0.5352 - val_acc: 0.7662
Epoch 164/200
537/537 [==============================] - 0s 105us/step - loss: 0.3879 - acc:
0.8380 - val_loss: 0.5387 - val_acc: 0.7706
Epoch 165/200
537/537 [==============================] - 0s 116us/step - loss: 0.3879 - acc:
0.8399 - val_loss: 0.5398 - val_acc: 0.7706
Epoch 166/200
537/537 [==============================] - 0s 182us/step - loss: 0.3871 - acc:
0.8305 - val_loss: 0.5456 - val_acc: 0.7706
Epoch 167/200
537/537 [==============================] - 0s 188us/step - loss: 0.3886 - acc:
0.8361 - val_loss: 0.5391 - val_acc: 0.7706
Epoch 168/200
537/537 [==============================] - 0s 216us/step - loss: 0.3872 - acc:
0.8436 - val_loss: 0.5411 - val_acc: 0.7706
Epoch 169/200
537/537 [==============================] - 0s 197us/step - loss: 0.3859 - acc:
0.8380 - val_loss: 0.5418 - val_acc: 0.7706
Epoch 170/200
537/537 [==============================] - 0s 193us/step - loss: 0.3856 - acc:
0.8417 - val_loss: 0.5389 - val_acc: 0.7662
Epoch 171/200
537/537 [==============================] - 0s 164us/step - loss: 0.3851 - acc:
0.8343 - val_loss: 0.5419 - val_acc: 0.7662
Epoch 172/200
537/537 [==============================] - 0s 201us/step - loss: 0.3857 - acc:
```

```
0.8287 - val_loss: 0.5451 - val_acc: 0.7706
Epoch 173/200
537/537 [==============================] - 0s 234us/step - loss: 0.3854 - acc:
0.8343 - val_loss: 0.5414 - val_acc: 0.7662
Epoch 174/200
537/537 [==============================] - 0s 98us/step - loss: 0.3856 - acc:
0.8287 - val_loss: 0.5466 - val_acc: 0.7706
Epoch 175/200
537/537 [==============================] - 0s 119us/step - loss: 0.3847 - acc:
0.8343 - val_loss: 0.5457 - val_acc: 0.7749
Epoch 176/200
537/537 [==============================] - 0s 111us/step - loss: 0.3831 - acc:
0.8194 - val_loss: 0.5452 - val_acc: 0.7749
Epoch 177/200
537/537 [==============================] - 0s 241us/step - loss: 0.3833 - acc:
0.8417 - val_loss: 0.5448 - val_acc: 0.7706
Epoch 178/200
537/537 [==============================] - 0s 127us/step - loss: 0.3816 - acc:
0.8231 - val_loss: 0.5473 - val_acc: 0.7662
Epoch 179/200
537/537 [==============================] - 0s 179us/step - loss: 0.3822 - acc:
0.8324 - val_loss: 0.5491 - val_acc: 0.7662
Epoch 180/200
537/537 [==============================] - 0s 171us/step - loss: 0.3820 - acc:
0.8268 - val_loss: 0.5481 - val_acc: 0.7749
Epoch 181/200
537/537 [==============================] - 0s 267us/step - loss: 0.3815 - acc:
0.8305 - val_loss: 0.5538 - val_acc: 0.7706
Epoch 182/200
537/537 [==============================] - 0s 227us/step - loss: 0.3805 - acc:
0.8361 - val_loss: 0.5507 - val_acc: 0.7706
Epoch 183/200
537/537 [==============================] - 0s 160us/step - loss: 0.3814 - acc:
0.8287 - val_loss: 0.5613 - val_acc: 0.7792
Epoch 184/200
537/537 [==============================] - 0s 188us/step - loss: 0.3821 - acc:
0.8287 - val_loss: 0.5515 - val_acc: 0.7662
Epoch 185/200
537/537 [==============================] - 0s 264us/step - loss: 0.3797 - acc:
0.8343 - val_loss: 0.5523 - val_acc: 0.7749
Epoch 186/200
537/537 [==============================] - 0s 199us/step - loss: 0.3791 - acc:
0.8343 - val_loss: 0.5520 - val_acc: 0.7749
Epoch 187/200
537/537 [==============================] - 0s 123us/step - loss: 0.3801 - acc:
0.8380 - val_loss: 0.5505 - val_acc: 0.7706
Epoch 188/200
537/537 [==============================] - 0s 137us/step - loss: 0.3787 - acc:
```

```
0.8268 - val_loss: 0.5486 - val_acc: 0.7749
Epoch 189/200
537/537 [==============================] - 0s 121us/step - loss: 0.3805 - acc:
0.8380 - val_loss: 0.5502 - val_acc: 0.7835
Epoch 190/200
537/537 [==============================] - 0s 166us/step - loss: 0.3773 - acc:
0.8324 - val_loss: 0.5530 - val_acc: 0.7706
Epoch 191/200
537/537 [==============================] - 0s 156us/step - loss: 0.3773 - acc:
0.8305 - val_loss: 0.5552 - val_acc: 0.7749
Epoch 192/200
537/537 [==============================] - 0s 137us/step - loss: 0.3772 - acc:
0.8361 - val_loss: 0.5528 - val_acc: 0.7749
Epoch 193/200
537/537 [==============================] - 0s 134us/step - loss: 0.3764 - acc:
0.8287 - val_loss: 0.5514 - val_acc: 0.7835
Epoch 194/200
537/537 [==============================] - 0s 186us/step - loss: 0.3759 - acc:
0.8194 - val_loss: 0.5522 - val_acc: 0.7792
Epoch 195/200
537/537 [==============================] - 0s 112us/step - loss: 0.3766 - acc:
0.8361 - val_loss: 0.5558 - val_acc: 0.7835
Epoch 196/200
537/537 [==============================] - 0s 134us/step - loss: 0.3749 - acc:
0.8380 - val_loss: 0.5559 - val_acc: 0.7792
Epoch 197/200
537/537 [==============================] - 0s 115us/step - loss: 0.3756 - acc:
0.8343 - val_loss: 0.5500 - val_acc: 0.7706
Epoch 198/200
537/537 [==============================] - 0s 141us/step - loss: 0.3757 - acc:
0.8305 - val_loss: 0.5539 - val_acc: 0.7706
Epoch 199/200
537/537 [==============================] - 0s 318us/step - loss: 0.3748 - acc:
0.8324 - val_loss: 0.5527 - val_acc: 0.7706
Epoch 200/200
537/537 [==============================] - 0s 104us/step - loss: 0.3737 - acc:
0.8324 - val_loss: 0.5566 - val_acc: 0.7749
```

[394]:
```
y_pred_class_nn_1 = model.predict_classes(X_test_norm)
y_pred_prob_nn_1 = model.predict(X_test_norm)
```

[395]:
```
# Let's check out the outputs to get a feel for how keras apis work.
y_pred_class_nn_1[:10]
```

[395]:
```
array([[1],
       [1],
       [1],
       [0],
```

```
       [0],
       [1],
       [0],
       [0],
       [1],
       [0]])
```

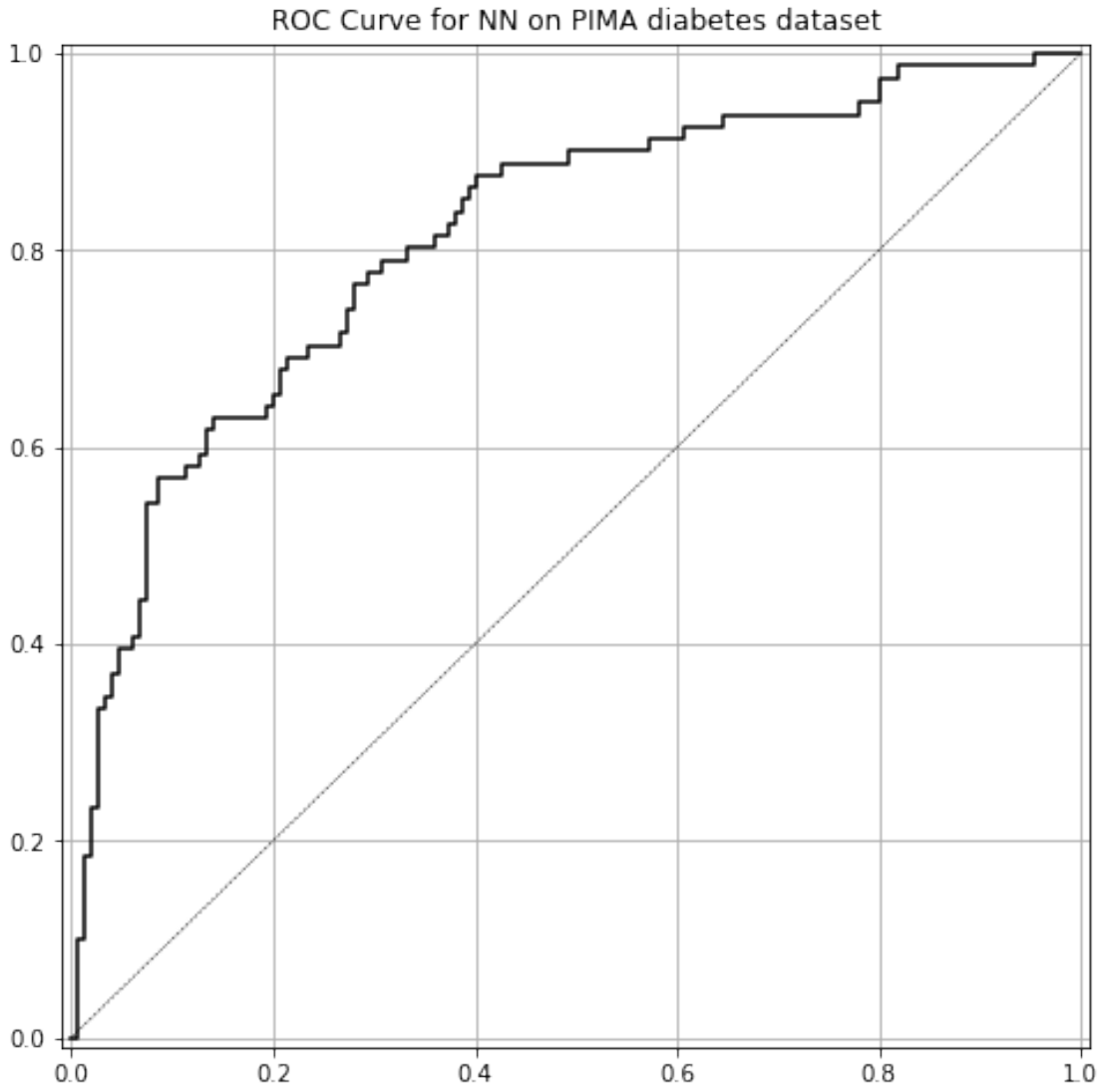
[396]:
```
y_pred_prob_nn_1[:10]
```

[396]:
```
array([[0.70708334],
       [0.89493465],
       [0.518112  ],
       [0.0581139 ],
       [0.23702025],
       [0.57479405],
       [0.00375727],
       [0.48315445],
       [0.9495256 ],
       [0.17577732]], dtype=float32)
```

[397]:
```
# Print model performance and plot the roc curve
print('Accuracy is {:.3f}'.format(accuracy_score(y_test,y_pred_class_nn_1)))
print('ROC-AUC is {:.3f}'.format(roc_auc_score(y_test,y_pred_prob_nn_1)))

plot_roc(y_test, y_pred_prob_nn_1, 'NN')
```

```
Accuracy is 0.775
ROC-AUC is 0.814
```



Accuracy obtained from this model is slightly better 77.5% and ROC-AUC value is 0.814 If we tune the hyperpaprameters and add more layers, epochs, learing rate then model might improve.

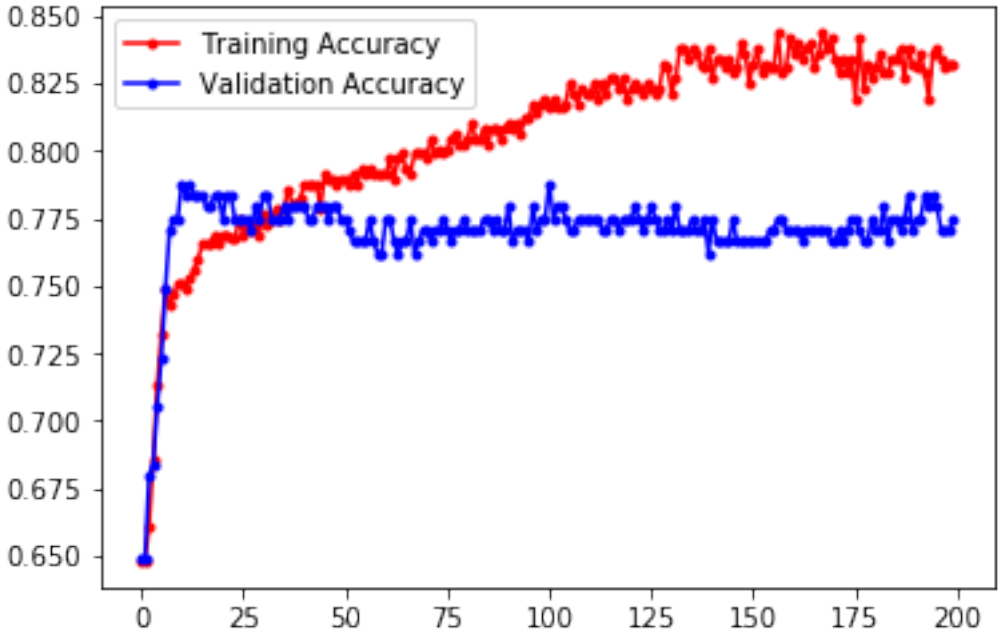
Lets try running for more number of epoch iterations.

[398]:
```
run_hist_1.history.keys()
```

[398]:
```
dict_keys(['val_loss', 'val_acc', 'loss', 'acc'])
```

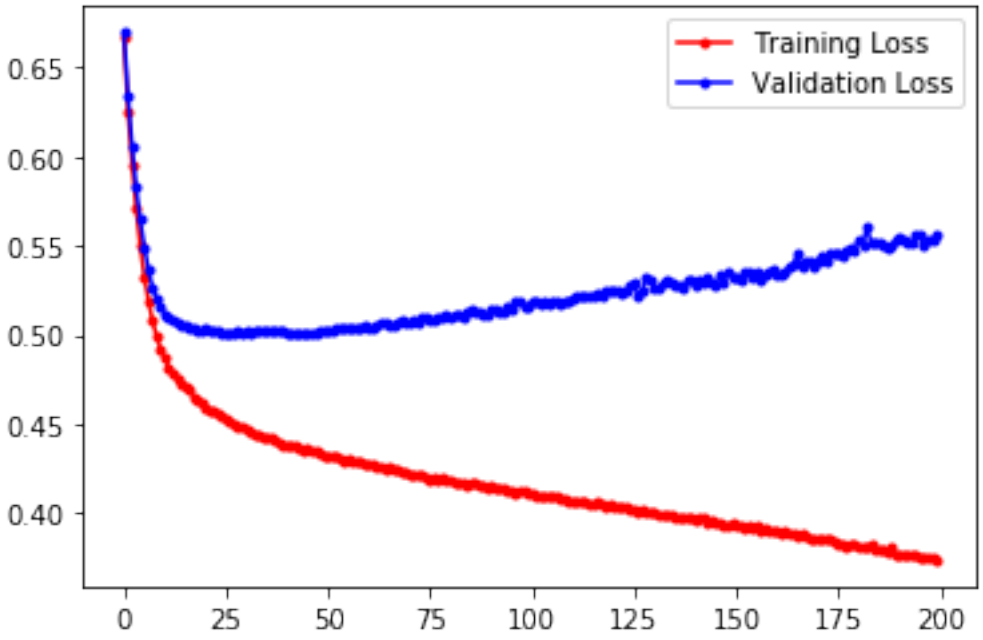
[399]:
```
#plotting the curve to check training and validation accuracy
fig, ax = plt.subplots()
ax.plot(run_hist_1.history["acc"],'r', marker='.', label="Training Accuracy")
ax.plot(run_hist_1.history["val_acc"],'b', marker='.', label="Validation␣
 ↪Accuracy")
ax.legend()
```

[399]: <matplotlib.legend.Legend at 0x1c78e000898>



[400]:
```
fig, ax = plt.subplots()
ax.plot(run_hist_1.history["loss"],'r', marker='.', label="Training Loss")
ax.plot(run_hist_1.history["val_loss"],'b', marker='.', label="Validation Loss")
ax.legend()
```

[400]: <matplotlib.legend.Legend at 0x1c78deecd30>



[401]:
```
print('Training loss=',run_hist_1.history["loss"])

print('Validation Loss=',run_hist_1.history["val_loss"])
```

```
Training loss= [0.667396244057064, 0.6254130719538286, 0.5957936708931595,
0.5708816987176181, 0.5500221115916801, 0.532988995147151, 0.519072246063133,
0.5081218436665597, 0.49905164942173097, 0.4921787594283759, 0.4867541404853764,
0.4819810397687127, 0.47898368706694305, 0.47529946941903184,
0.4727154449599637, 0.47074349699073664, 0.4687215073148632, 0.4656917346256405,
0.46298287584128994, 0.46203451571739806, 0.45959297161084534,
0.457968141002584, 0.4575342527092946, 0.45555174606028437, 0.45450002093776865,
0.452689578524293, 0.451127015456585, 0.45030251239709124, 0.4490982667027905,
0.4485761690295164, 0.44645637062896787, 0.4454214628404301,
0.44473576806555026, 0.4437639905864744, 0.4431102724825648,
0.44185843159144594, 0.4422457546717184, 0.4406720336589067, 0.4398247683958412,
0.43871851995226613, 0.43841959189214297, 0.43744796692104093,
0.43780545049539493, 0.4369372257640242, 0.4355056181522277, 0.4357536056632214,
0.4345020569680567, 0.4350529530638867, 0.4331617617851307, 0.432133271652005,
0.43158440250258207, 0.43189942997705116, 0.4314682817769894,
0.4303564514749765, 0.429693719195254, 0.4298834378936881, 0.4296845543983928,
0.42915283434883844, 0.4284237122069524, 0.42791817785419345,
0.42696694943713964, 0.4271650262163116, 0.42633085094350676,
0.4255309968465311, 0.42454539297679283, 0.42536504558344795,
0.42405910309910555, 0.4240663309115049, 0.4227860406790366, 0.4231412890792115,
0.42194880253775824, 0.42143411099133765, 0.4210778570263967,
0.42142736312397366, 0.4201891349014623, 0.4192464091369338,
0.41936516684082853, 0.4190186040139509, 0.4197788271824075,
0.41805020357643424, 0.41823853532917227, 0.4175751323029538, 0.417096659568879,
0.4170109051343893, 0.41589990752147343, 0.4169707011910124,
0.41637692837741785, 0.41540343823601633, 0.4150848082878958,
0.4145101779444036, 0.4147849514164738, 0.41412778817519574, 0.4136193359697331,
0.41380426798230885, 0.41232409335159503, 0.41324630351927916,
0.41161665403643133, 0.4120195305436239, 0.41198469196173954,
0.4110357094299416, 0.41108297247238446, 0.4101171496305164,
0.40968774589302376, 0.40938716172284034, 0.4096316666354458,
0.40908048738980424, 0.4093925188151596, 0.4080240990640509,
0.40760612798580687, 0.40718461747942025, 0.4066929433154882, 0.406595640286831,
0.40683032691589727, 0.4071378428731773, 0.40567235845649263,
0.4054687394443171, 0.4062036918528253, 0.40455556193321557, 0.4039191256244311,
0.4043679490990701, 0.40366021509055094, 0.4042406794745163, 0.4028895203738683,
0.40297320979045537, 0.4027561691331242, 0.4021252095144332, 0.4007061921906427,
0.40180258683208203, 0.40092844936434785, 0.3999877626447482,
0.4000628667725753, 0.39931690640178696, 0.3990216719149655, 0.3985371877694263,
0.39965549649695, 0.39817034548887326, 0.3976800459501242, 0.3969716795440937,
0.3980458304979726, 0.3975572488938408, 0.3967241408993634, 0.39744913150700334,
0.397216823624943, 0.39468477719100936, 0.39531784950021925,
```

0.39448496161004465, 0.39458603982152884, 0.393540044958587, 0.3936333936019983,
0.3941480611456173, 0.3932473359272245, 0.3930971532560594, 0.3921851085106976,
0.392398262601103, 0.3914043973833045, 0.3927328089318018, 0.39055652913656536,
0.39152160425647897, 0.38965277099076595, 0.38947945755509245,
0.38943040265495327, 0.3889029899566977, 0.38932618670845387,
0.38789453691832404, 0.3878842682145827, 0.3871269405887114, 0.3885851086739943,
0.38720797277029667, 0.38593801600751043, 0.38556918019023023,
0.3851499925445578, 0.3856664821644291, 0.3854495147087055, 0.385564899422381,
0.38467321499099943, 0.3831071172124625, 0.38330679083003677,
0.3816033221045908, 0.382162096114132, 0.38204733647225736, 0.38152805292628555,
0.38052168516251406, 0.38137546908700043, 0.3820535410715881,
0.3797414761237814, 0.3790951451109774, 0.3801035222283511, 0.3786665983151235,
0.38052061988210767, 0.37726651390171584, 0.3772677226439535,
0.37715933997759826, 0.3764175211029124, 0.37588180232536417,
0.37662200865576834, 0.3749183075610042, 0.375631938988492, 0.3756859405191695,
0.3747929741994407, 0.3737019415896254]
Validation Loss= [0.6698603490730385, 0.6342750875464765, 0.6057606612965142,
0.5829151861079327, 0.5646215994636734, 0.549472561130276, 0.5367049285859773,
0.5267829211243303, 0.52061574361025, 0.5159600039065142, 0.5121473192652582,
0.509969318841959, 0.508042680494713, 0.5065985862568859, 0.505342790058681,
0.5048699649897489, 0.5042848568974119, 0.5032821549223615, 0.5028455152914122,
0.5024950275947522, 0.5035221687643043, 0.5019836692841022, 0.5017768998682757,
0.5025063177723905, 0.5014369633548703, 0.5012633600534299, 0.5013476866922337,
0.5016322937104609, 0.5021983310257717, 0.5015643171933822, 0.5022209165416238,
0.500427877619153, 0.5018319630777681, 0.5021491151351434, 0.5020849112566416,
0.5016897961948857, 0.5026137230200168, 0.5029459145420041, 0.5025894773470891,
0.5019527046711414, 0.5014293414431733, 0.5005451488546478, 0.50120235934402,
0.5005114059169571, 0.5013274262735854, 0.5009292856955425, 0.5008809264604147,
0.501573846066669, 0.502684288855755, 0.5021124135106156, 0.5024605932689848,
0.5024718829305657, 0.5034051231749646, 0.5034445088147085, 0.5033172686378677,
0.5046105264843285, 0.5034524322330177, 0.5036819857178312, 0.5043839790346303,
0.5047914802512049, 0.5042032670407068, 0.504078020910164, 0.5050058182957885,
0.5063518401864288, 0.506537116838224, 0.5053078474162461, 0.5049616967960869,
0.5063504162546876, 0.5089318402659841, 0.5069352153575781, 0.5070553798696179,
0.5082407933034938, 0.5069029693737691, 0.5091848828833857, 0.5093587111859095,
0.5085387664697903, 0.508403373487068, 0.5097339789330702, 0.5103109191248427,
0.510793366602489, 0.5092939441596275, 0.5110812846458319, 0.5114308025413777,
0.5104223214960718, 0.513104428589602, 0.5138413855781803, 0.5122122596868705,
0.5134893649326259, 0.5119321622373738, 0.5111018518606821, 0.515046343787924,
0.513803282083371, 0.513098917740248, 0.5131865916572091, 0.5166411212770454,
0.5151295658055838, 0.5194607793768763, 0.519136706729988, 0.5166263785455134,
0.5161046125156022, 0.5195892206776194, 0.5183053165029138, 0.5169073166527274,
0.5184539710030411, 0.5172735234617671, 0.5194967136238561, 0.5191437413682153,
0.518075775403481, 0.5188029494894532, 0.5193617103935836, 0.5208504016781266,
0.5224145418637759, 0.5216335855521165, 0.5214623021873045, 0.5214550937667037,
0.5225705202523764, 0.5229028603989324, 0.5213343342403313, 0.5242951314944726,
0.5249688015097663, 0.5243114691018026, 0.52531543915922, 0.5227803824009833,
0.5250658854777679, 0.527673048116428, 0.5297531728104595, 0.522097899413212,

```
0.52491277469185, 0.5317373234472234, 0.5305745302340685, 0.5261855680189091,
0.5265755334715823, 0.52913875974618, 0.5306826930541497, 0.5300154777574333,
0.5274761330771756, 0.5272739190301854, 0.5270168884492024, 0.5301817825862339,
0.5315260452367526, 0.5279750221477443, 0.5311743982168503, 0.5298597424319296,
0.5317201241528317, 0.5293403294953433, 0.5283509108411285, 0.5338387713803874,
0.529932321666123, 0.5359020885967073, 0.5323403802785006, 0.5320805877576142,
0.5311252307066153, 0.5352712286499156, 0.5357983965120274, 0.5317825235071636,
0.5346968328797972, 0.5315115953678693, 0.5339090128739675, 0.5350402410412247,
0.5371700206618288, 0.5331796647666337, 0.5343679043895755, 0.5352272023628284,
0.5386571409382346, 0.5397935095545533, 0.5456265100152977, 0.5390720022963239,
0.5411014122106296, 0.5418478929119193, 0.5389360878374669, 0.5419250693156089,
0.5450650994137768, 0.5413918622902462, 0.5465715012767098, 0.5456990350634505,
0.5452256165283583, 0.5448285303848647, 0.547322505738312, 0.5490909012365135,
0.5480531922408513, 0.5537525131588891, 0.5506757567455243, 0.561316541134021,
0.5514600205989111, 0.5522653171510408, 0.5519830670965699, 0.5504778037855635,
0.5486381268088436, 0.5502031624833227, 0.5530257212135182, 0.5552094887087355,
0.5528409015306662, 0.551361456577912, 0.5522348288591806, 0.5558308005590975,
0.5558882831753075, 0.5499547819296519, 0.5538555240476286, 0.5527371284249541,
0.5566337084099328]
```

Increasing the epochs to 400 and checking the performance of the model. Lets increase the number of epochs to 400 and check the performance of the model. Rest all the parameter values will remain unchanged. Here we are trying to check if the number of epochs makes a difference in performance to the model.

[147]:
```
run_hist_400 = model.fit(X_train_norm, y_train, validation_data=(X_test_norm,␣
↪y_test), epochs=400)
```

```
Train on 537 samples, validate on 231 samples
Epoch 1/400
537/537 [==============================] - 0s 139us/step - loss: 0.3426 - acc:
0.8436 - val_loss: 0.6438 - val_acc: 0.7186
Epoch 2/400
537/537 [==============================] - 0s 54us/step - loss: 0.3408 - acc:
0.8510 - val_loss: 0.6470 - val_acc: 0.7359
Epoch 3/400
537/537 [==============================] - 0s 59us/step - loss: 0.3426 - acc:
0.8547 - val_loss: 0.6484 - val_acc: 0.7186
Epoch 4/400
537/537 [==============================] - 0s 61us/step - loss: 0.3430 - acc:
0.8454 - val_loss: 0.6456 - val_acc: 0.7273
Epoch 5/400
537/537 [==============================] - 0s 65us/step - loss: 0.3392 - acc:
0.8417 - val_loss: 0.6505 - val_acc: 0.7316
Epoch 6/400
537/537 [==============================] - 0s 65us/step - loss: 0.3422 - acc:
0.8492 - val_loss: 0.6466 - val_acc: 0.7186
Epoch 7/400
```

```
537/537 [==============================] - 0s 58us/step - loss: 0.3398 - acc:
0.8492 - val_loss: 0.6460 - val_acc: 0.7446
Epoch 8/400
537/537 [==============================] - 0s 56us/step - loss: 0.3412 - acc:
0.8566 - val_loss: 0.6533 - val_acc: 0.7229
Epoch 9/400
537/537 [==============================] - 0s 52us/step - loss: 0.3421 - acc:
0.8510 - val_loss: 0.6457 - val_acc: 0.7316
Epoch 10/400
537/537 [==============================] - 0s 56us/step - loss: 0.3390 - acc:
0.8473 - val_loss: 0.6524 - val_acc: 0.7229
Epoch 11/400
537/537 [==============================] - 0s 130us/step - loss: 0.3380 - acc:
0.8492 - val_loss: 0.6604 - val_acc: 0.7359
Epoch 12/400
537/537 [==============================] - 0s 271us/step - loss: 0.3405 - acc:
0.8454 - val_loss: 0.6517 - val_acc: 0.7186
Epoch 13/400
537/537 [==============================] - 0s 193us/step - loss: 0.3373 - acc:
0.8566 - val_loss: 0.6524 - val_acc: 0.7186
Epoch 14/400
537/537 [==============================] - 0s 104us/step - loss: 0.3380 - acc:
0.8492 - val_loss: 0.6485 - val_acc: 0.7186
Epoch 15/400
537/537 [==============================] - 0s 156us/step - loss: 0.3360 - acc:
0.8529 - val_loss: 0.6567 - val_acc: 0.7186
Epoch 16/400
537/537 [==============================] - 0s 162us/step - loss: 0.3359 - acc:
0.8510 - val_loss: 0.6566 - val_acc: 0.7359
Epoch 17/400
537/537 [==============================] - 0s 123us/step - loss: 0.3375 - acc:
0.8529 - val_loss: 0.6588 - val_acc: 0.7186
Epoch 18/400
537/537 [==============================] - 0s 80us/step - loss: 0.3368 - acc:
0.8547 - val_loss: 0.6548 - val_acc: 0.7316
Epoch 19/400
537/537 [==============================] - 0s 141us/step - loss: 0.3367 - acc:
0.8510 - val_loss: 0.6543 - val_acc: 0.7316
Epoch 20/400
537/537 [==============================] - 0s 124us/step - loss: 0.3324 - acc:
0.8566 - val_loss: 0.6564 - val_acc: 0.7359
Epoch 21/400
537/537 [==============================] - 0s 102us/step - loss: 0.3364 - acc:
0.8529 - val_loss: 0.6598 - val_acc: 0.7229
Epoch 22/400
537/537 [==============================] - 0s 174us/step - loss: 0.3355 - acc:
0.8547 - val_loss: 0.6583 - val_acc: 0.7316
Epoch 23/400
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537/537 [==============================] - 0s 178us/step - loss: 0.3341 - acc:
0.8566 - val_loss: 0.6614 - val_acc: 0.7186
Epoch 24/400
537/537 [==============================] - 0s 78us/step - loss: 0.3353 - acc:
0.8566 - val_loss: 0.6602 - val_acc: 0.7403
Epoch 25/400
537/537 [==============================] - 0s 89us/step - loss: 0.3366 - acc:
0.8585 - val_loss: 0.6648 - val_acc: 0.7273
Epoch 26/400
537/537 [==============================] - 0s 169us/step - loss: 0.3345 - acc:
0.8585 - val_loss: 0.6607 - val_acc: 0.7316
Epoch 27/400
537/537 [==============================] - 0s 102us/step - loss: 0.3324 - acc:
0.8603 - val_loss: 0.6703 - val_acc: 0.7143
Epoch 28/400
537/537 [==============================] - 0s 110us/step - loss: 0.3302 - acc:
0.8547 - val_loss: 0.6679 - val_acc: 0.7403
Epoch 29/400
537/537 [==============================] - 0s 91us/step - loss: 0.3337 - acc:
0.8659 - val_loss: 0.6646 - val_acc: 0.7359
Epoch 30/400
537/537 [==============================] - 0s 171us/step - loss: 0.3288 - acc:
0.8529 - val_loss: 0.6750 - val_acc: 0.7143
Epoch 31/400
537/537 [==============================] - 0s 95us/step - loss: 0.3338 - acc:
0.8473 - val_loss: 0.6656 - val_acc: 0.7273
Epoch 32/400
537/537 [==============================] - 0s 121us/step - loss: 0.3299 - acc:
0.8547 - val_loss: 0.6700 - val_acc: 0.7273
Epoch 33/400
537/537 [==============================] - 0s 98us/step - loss: 0.3304 - acc:
0.8510 - val_loss: 0.6713 - val_acc: 0.7229
Epoch 34/400
537/537 [==============================] - 0s 102us/step - loss: 0.3296 - acc:
0.8641 - val_loss: 0.6714 - val_acc: 0.7273
Epoch 35/400
537/537 [==============================] - 0s 89us/step - loss: 0.3306 - acc:
0.8566 - val_loss: 0.6733 - val_acc: 0.7056
Epoch 36/400
537/537 [==============================] - 0s 262us/step - loss: 0.3348 - acc:
0.8641 - val_loss: 0.6796 - val_acc: 0.7056
Epoch 37/400
537/537 [==============================] - 0s 94us/step - loss: 0.3292 - acc:
0.8547 - val_loss: 0.6812 - val_acc: 0.7143
Epoch 38/400
537/537 [==============================] - 0s 82us/step - loss: 0.3293 - acc:
0.8622 - val_loss: 0.6720 - val_acc: 0.7186
Epoch 39/400
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537/537 [==============================] - 0s 210us/step - loss: 0.3331 - acc:
0.8566 - val_loss: 0.6713 - val_acc: 0.7316
Epoch 40/400
537/537 [==============================] - 0s 139us/step - loss: 0.3310 - acc:
0.8547 - val_loss: 0.6755 - val_acc: 0.7273
Epoch 41/400
537/537 [==============================] - 0s 243us/step - loss: 0.3314 - acc:
0.8566 - val_loss: 0.6744 - val_acc: 0.7316
Epoch 42/400
537/537 [==============================] - 0s 205us/step - loss: 0.3296 - acc:
0.8547 - val_loss: 0.6804 - val_acc: 0.7186
Epoch 43/400
537/537 [==============================] - 0s 221us/step - loss: 0.3273 - acc:
0.8659 - val_loss: 0.6839 - val_acc: 0.7186
Epoch 44/400
537/537 [==============================] - 0s 659us/step - loss: 0.3317 - acc:
0.8678 - val_loss: 0.6808 - val_acc: 0.7143
Epoch 45/400
537/537 [==============================] - 0s 162us/step - loss: 0.3275 - acc:
0.8585 - val_loss: 0.6876 - val_acc: 0.7229
Epoch 46/400
537/537 [==============================] - 0s 124us/step - loss: 0.3267 - acc:
0.8659 - val_loss: 0.6833 - val_acc: 0.7186
Epoch 47/400
537/537 [==============================] - 0s 423us/step - loss: 0.3250 - acc:
0.8622 - val_loss: 0.6843 - val_acc: 0.7100
Epoch 48/400
537/537 [==============================] - 0s 871us/step - loss: 0.3260 - acc:
0.8603 - val_loss: 0.6775 - val_acc: 0.7359
Epoch 49/400
537/537 [==============================] - 0s 282us/step - loss: 0.3264 - acc:
0.8566 - val_loss: 0.6858 - val_acc: 0.7229
Epoch 50/400
537/537 [==============================] - 0s 260us/step - loss: 0.3256 - acc:
0.8622 - val_loss: 0.6893 - val_acc: 0.7056
Epoch 51/400
537/537 [==============================] - 0s 321us/step - loss: 0.3226 - acc:
0.8659 - val_loss: 0.6854 - val_acc: 0.7273
Epoch 52/400
537/537 [==============================] - 0s 529us/step - loss: 0.3241 - acc:
0.8715 - val_loss: 0.6895 - val_acc: 0.7229
Epoch 53/400
537/537 [==============================] - 0s 322us/step - loss: 0.3240 - acc:
0.8566 - val_loss: 0.6822 - val_acc: 0.7273
Epoch 54/400
537/537 [==============================] - 0s 478us/step - loss: 0.3226 - acc:
0.8622 - val_loss: 0.6824 - val_acc: 0.7316
Epoch 55/400
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537/537 [==============================] - 0s 132us/step - loss: 0.3250 - acc:
0.8547 - val_loss: 0.6870 - val_acc: 0.7186
Epoch 56/400
537/537 [==============================] - 0s 418us/step - loss: 0.3234 - acc:
0.8603 - val_loss: 0.6899 - val_acc: 0.7403
Epoch 57/400
537/537 [==============================] - 0s 251us/step - loss: 0.3259 - acc:
0.8659 - val_loss: 0.6894 - val_acc: 0.7143
Epoch 58/400
537/537 [==============================] - 0s 176us/step - loss: 0.3211 - acc:
0.8641 - val_loss: 0.6881 - val_acc: 0.7229
Epoch 59/400
537/537 [==============================] - 0s 113us/step - loss: 0.3208 - acc:
0.8641 - val_loss: 0.6924 - val_acc: 0.7316
Epoch 60/400
537/537 [==============================] - 0s 182us/step - loss: 0.3234 - acc:
0.8641 - val_loss: 0.6872 - val_acc: 0.7229
Epoch 61/400
537/537 [==============================] - 0s 156us/step - loss: 0.3178 - acc:
0.8696 - val_loss: 0.6903 - val_acc: 0.7273
Epoch 62/400
537/537 [==============================] - 0s 156us/step - loss: 0.3195 - acc:
0.8622 - val_loss: 0.6855 - val_acc: 0.7273
Epoch 63/400
537/537 [==============================] - 0s 630us/step - loss: 0.3196 - acc:
0.8566 - val_loss: 0.6910 - val_acc: 0.7316
Epoch 64/400
537/537 [==============================] - 0s 203us/step - loss: 0.3177 - acc:
0.8715 - val_loss: 0.6879 - val_acc: 0.7359
Epoch 65/400
537/537 [==============================] - 0s 84us/step - loss: 0.3198 - acc:
0.8603 - val_loss: 0.6901 - val_acc: 0.7229
Epoch 66/400
537/537 [==============================] - 0s 130us/step - loss: 0.3176 - acc:
0.8659 - val_loss: 0.6977 - val_acc: 0.7186
Epoch 67/400
537/537 [==============================] - 0s 85us/step - loss: 0.3174 - acc:
0.8734 - val_loss: 0.6982 - val_acc: 0.7143
Epoch 68/400
537/537 [==============================] - 0s 546us/step - loss: 0.3169 - acc:
0.8622 - val_loss: 0.6930 - val_acc: 0.7316
Epoch 69/400
537/537 [==============================] - 0s 336us/step - loss: 0.3211 - acc:
0.8603 - val_loss: 0.6965 - val_acc: 0.7229
Epoch 70/400
537/537 [==============================] - 0s 209us/step - loss: 0.3182 - acc:
0.8622 - val_loss: 0.6961 - val_acc: 0.7229
Epoch 71/400
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537/537 [==============================] - 0s 645us/step - loss: 0.3199 - acc:
0.8641 - val_loss: 0.6930 - val_acc: 0.7186
Epoch 72/400
537/537 [==============================] - 0s 256us/step - loss: 0.3158 - acc:
0.8678 - val_loss: 0.6975 - val_acc: 0.7186
Epoch 73/400
537/537 [==============================] - 0s 117us/step - loss: 0.3175 - acc:
0.8566 - val_loss: 0.6950 - val_acc: 0.7229
Epoch 74/400
537/537 [==============================] - 0s 113us/step - loss: 0.3138 - acc:
0.8715 - val_loss: 0.6945 - val_acc: 0.7273
Epoch 75/400
537/537 [==============================] - 0s 626us/step - loss: 0.3144 - acc:
0.8603 - val_loss: 0.6931 - val_acc: 0.7186
Epoch 76/400
537/537 [==============================] - 0s 406us/step - loss: 0.3143 - acc:
0.8715 - val_loss: 0.6960 - val_acc: 0.7143
Epoch 77/400
537/537 [==============================] - 0s 276us/step - loss: 0.3157 - acc:
0.8659 - val_loss: 0.6995 - val_acc: 0.7186
Epoch 78/400
537/537 [==============================] - 0s 115us/step - loss: 0.3120 - acc:
0.8641 - val_loss: 0.6966 - val_acc: 0.7316
Epoch 79/400
537/537 [==============================] - 0s 190us/step - loss: 0.3153 - acc:
0.8678 - val_loss: 0.7061 - val_acc: 0.7359
Epoch 80/400
537/537 [==============================] - 0s 268us/step - loss: 0.3188 - acc:
0.8659 - val_loss: 0.6980 - val_acc: 0.7359
Epoch 81/400
537/537 [==============================] - 0s 195us/step - loss: 0.3118 - acc:
0.8696 - val_loss: 0.6978 - val_acc: 0.7316
Epoch 82/400
537/537 [==============================] - 0s 102us/step - loss: 0.3107 - acc:
0.8641 - val_loss: 0.6994 - val_acc: 0.7229
Epoch 83/400
537/537 [==============================] - 0s 121us/step - loss: 0.3119 - acc:
0.8696 - val_loss: 0.7019 - val_acc: 0.7359
Epoch 84/400
537/537 [==============================] - 0s 271us/step - loss: 0.3080 - acc:
0.8659 - val_loss: 0.7203 - val_acc: 0.7143
Epoch 85/400
537/537 [==============================] - 0s 141us/step - loss: 0.3156 - acc:
0.8734 - val_loss: 0.7004 - val_acc: 0.7316
Epoch 86/400
537/537 [==============================] - 0s 154us/step - loss: 0.3131 - acc:
0.8659 - val_loss: 0.7066 - val_acc: 0.7143
Epoch 87/400
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537/537 [==============================] - 0s 232us/step - loss: 0.3137 - acc:
0.8678 - val_loss: 0.7031 - val_acc: 0.7316
Epoch 88/400
537/537 [==============================] - 0s 93us/step - loss: 0.3083 - acc:
0.8678 - val_loss: 0.7060 - val_acc: 0.7273
Epoch 89/400
537/537 [==============================] - 0s 150us/step - loss: 0.3091 - acc:
0.8696 - val_loss: 0.7039 - val_acc: 0.7143
Epoch 90/400
537/537 [==============================] - 0s 108us/step - loss: 0.3107 - acc:
0.8659 - val_loss: 0.6982 - val_acc: 0.7316
Epoch 91/400
537/537 [==============================] - 0s 136us/step - loss: 0.3116 - acc:
0.8696 - val_loss: 0.7023 - val_acc: 0.7229
Epoch 92/400
537/537 [==============================] - 0s 130us/step - loss: 0.3079 - acc:
0.8678 - val_loss: 0.7011 - val_acc: 0.7229
Epoch 93/400
537/537 [==============================] - 0s 150us/step - loss: 0.3103 - acc:
0.8622 - val_loss: 0.7044 - val_acc: 0.7359
Epoch 94/400
537/537 [==============================] - 0s 87us/step - loss: 0.3072 - acc:
0.8752 - val_loss: 0.7072 - val_acc: 0.7186
Epoch 95/400
537/537 [==============================] - 0s 197us/step - loss: 0.3071 - acc:
0.8678 - val_loss: 0.7040 - val_acc: 0.7403
Epoch 96/400
537/537 [==============================] - 0s 312us/step - loss: 0.3084 - acc:
0.8585 - val_loss: 0.7035 - val_acc: 0.7229
Epoch 97/400
537/537 [==============================] - 0s 213us/step - loss: 0.3099 - acc:
0.8641 - val_loss: 0.7057 - val_acc: 0.7229
Epoch 98/400
537/537 [==============================] - 0s 206us/step - loss: 0.3070 - acc:
0.8696 - val_loss: 0.7013 - val_acc: 0.7359
Epoch 99/400
537/537 [==============================] - 0s 130us/step - loss: 0.3068 - acc:
0.8771 - val_loss: 0.7020 - val_acc: 0.7359
Epoch 100/400
537/537 [==============================] - 0s 110us/step - loss: 0.3089 - acc:
0.8678 - val_loss: 0.7097 - val_acc: 0.7186
Epoch 101/400
537/537 [==============================] - 0s 80us/step - loss: 0.3106 - acc:
0.8585 - val_loss: 0.7185 - val_acc: 0.7359
Epoch 102/400
537/537 [==============================] - 0s 202us/step - loss: 0.3061 - acc:
0.8734 - val_loss: 0.7057 - val_acc: 0.7316
Epoch 103/400
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537/537 [==============================] - 0s 150us/step - loss: 0.3078 - acc:
0.8696 - val_loss: 0.7106 - val_acc: 0.7143
Epoch 104/400
537/537 [==============================] - 0s 193us/step - loss: 0.3091 - acc:
0.8622 - val_loss: 0.7157 - val_acc: 0.7229
Epoch 105/400
537/537 [==============================] - 0s 86us/step - loss: 0.3060 - acc:
0.8696 - val_loss: 0.7107 - val_acc: 0.7316
Epoch 106/400
537/537 [==============================] - 0s 186us/step - loss: 0.3059 - acc:
0.8659 - val_loss: 0.7103 - val_acc: 0.7403
Epoch 107/400
537/537 [==============================] - 0s 95us/step - loss: 0.3075 - acc:
0.8752 - val_loss: 0.7075 - val_acc: 0.7273
Epoch 108/400
537/537 [==============================] - 0s 85us/step - loss: 0.3014 - acc:
0.8752 - val_loss: 0.7188 - val_acc: 0.7229
Epoch 109/400
537/537 [==============================] - 0s 139us/step - loss: 0.3083 - acc:
0.8715 - val_loss: 0.7145 - val_acc: 0.7316
Epoch 110/400
537/537 [==============================] - 0s 199us/step - loss: 0.3044 - acc:
0.8734 - val_loss: 0.7076 - val_acc: 0.7446
Epoch 111/400
537/537 [==============================] - 0s 226us/step - loss: 0.3062 - acc:
0.8641 - val_loss: 0.7098 - val_acc: 0.7359
Epoch 112/400
537/537 [==============================] - 0s 83us/step - loss: 0.3040 - acc:
0.8659 - val_loss: 0.7109 - val_acc: 0.7143
Epoch 113/400
537/537 [==============================] - 0s 254us/step - loss: 0.3033 - acc:
0.8715 - val_loss: 0.7137 - val_acc: 0.7273
Epoch 114/400
537/537 [==============================] - 0s 93us/step - loss: 0.3057 - acc:
0.8678 - val_loss: 0.7110 - val_acc: 0.7316
Epoch 115/400
537/537 [==============================] - 0s 134us/step - loss: 0.3026 - acc:
0.8641 - val_loss: 0.7259 - val_acc: 0.7186
Epoch 116/400
537/537 [==============================] - 0s 199us/step - loss: 0.3076 - acc:
0.8678 - val_loss: 0.7113 - val_acc: 0.7316
Epoch 117/400
537/537 [==============================] - 0s 124us/step - loss: 0.3011 - acc:
0.8752 - val_loss: 0.7170 - val_acc: 0.7489
Epoch 118/400
537/537 [==============================] - 0s 184us/step - loss: 0.3014 - acc:
0.8696 - val_loss: 0.7309 - val_acc: 0.7489
Epoch 119/400
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537/537 [==============================] - 0s 141us/step - loss: 0.3011 - acc:
0.8752 - val_loss: 0.7194 - val_acc: 0.7229
Epoch 120/400
537/537 [==============================] - 0s 108us/step - loss: 0.3038 - acc:
0.8641 - val_loss: 0.7149 - val_acc: 0.7403
Epoch 121/400
537/537 [==============================] - 0s 210us/step - loss: 0.2985 - acc:
0.8734 - val_loss: 0.7205 - val_acc: 0.7316
Epoch 122/400
537/537 [==============================] - 0s 132us/step - loss: 0.3053 - acc:
0.8752 - val_loss: 0.7259 - val_acc: 0.7143
Epoch 123/400
537/537 [==============================] - 0s 199us/step - loss: 0.3031 - acc:
0.8678 - val_loss: 0.7297 - val_acc: 0.7446
Epoch 124/400
537/537 [==============================] - 0s 253us/step - loss: 0.3012 - acc:
0.8696 - val_loss: 0.7155 - val_acc: 0.7316
Epoch 125/400
537/537 [==============================] - 0s 100us/step - loss: 0.3004 - acc:
0.8696 - val_loss: 0.7200 - val_acc: 0.7359
Epoch 126/400
537/537 [==============================] - 0s 178us/step - loss: 0.3037 - acc:
0.8622 - val_loss: 0.7185 - val_acc: 0.7359
Epoch 127/400
537/537 [==============================] - 0s 117us/step - loss: 0.3003 - acc:
0.8752 - val_loss: 0.7321 - val_acc: 0.7489
Epoch 128/400
537/537 [==============================] - 0s 126us/step - loss: 0.2999 - acc:
0.8715 - val_loss: 0.7169 - val_acc: 0.7446
Epoch 129/400
537/537 [==============================] - 0s 110us/step - loss: 0.2993 - acc:
0.8678 - val_loss: 0.7378 - val_acc: 0.7446
Epoch 130/400
537/537 [==============================] - 0s 108us/step - loss: 0.3040 - acc:
0.8641 - val_loss: 0.7199 - val_acc: 0.7316
Epoch 131/400
537/537 [==============================] - 0s 191us/step - loss: 0.3013 - acc:
0.8659 - val_loss: 0.7164 - val_acc: 0.7316
Epoch 132/400
537/537 [==============================] - 0s 186us/step - loss: 0.2980 - acc:
0.8641 - val_loss: 0.7424 - val_acc: 0.7143
Epoch 133/400
537/537 [==============================] - 0s 310us/step - loss: 0.3002 - acc:
0.8585 - val_loss: 0.7262 - val_acc: 0.7403
Epoch 134/400
537/537 [==============================] - 0s 231us/step - loss: 0.2997 - acc:
0.8603 - val_loss: 0.7250 - val_acc: 0.7359
Epoch 135/400
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537/537 [==============================] - 0s 160us/step - loss: 0.2988 - acc:
0.8696 - val_loss: 0.7266 - val_acc: 0.7359
Epoch 136/400
537/537 [==============================] - 0s 110us/step - loss: 0.2973 - acc:
0.8603 - val_loss: 0.7431 - val_acc: 0.7446
Epoch 137/400
537/537 [==============================] - 0s 314us/step - loss: 0.3004 - acc:
0.8585 - val_loss: 0.7312 - val_acc: 0.7446
Epoch 138/400
537/537 [==============================] - 0s 119us/step - loss: 0.2973 - acc:
0.8696 - val_loss: 0.7249 - val_acc: 0.7359
Epoch 139/400
537/537 [==============================] - 0s 171us/step - loss: 0.3005 - acc:
0.8547 - val_loss: 0.7272 - val_acc: 0.7316
Epoch 140/400
537/537 [==============================] - 0s 188us/step - loss: 0.3012 - acc:
0.8696 - val_loss: 0.7251 - val_acc: 0.7403
Epoch 141/400
537/537 [==============================] - 0s 189us/step - loss: 0.3013 - acc:
0.8696 - val_loss: 0.7336 - val_acc: 0.7446
Epoch 142/400
537/537 [==============================] - 0s 145us/step - loss: 0.3010 - acc:
0.8715 - val_loss: 0.7408 - val_acc: 0.7359
Epoch 143/400
537/537 [==============================] - 0s 147us/step - loss: 0.3034 - acc:
0.8659 - val_loss: 0.7284 - val_acc: 0.7229
Epoch 144/400
537/537 [==============================] - 0s 189us/step - loss: 0.2941 - acc:
0.8622 - val_loss: 0.7310 - val_acc: 0.7186
Epoch 145/400
537/537 [==============================] - 0s 124us/step - loss: 0.3019 - acc:
0.8678 - val_loss: 0.7246 - val_acc: 0.7316
Epoch 146/400
537/537 [==============================] - 0s 165us/step - loss: 0.2947 - acc:
0.8678 - val_loss: 0.7208 - val_acc: 0.7446
Epoch 147/400
537/537 [==============================] - 0s 163us/step - loss: 0.2967 - acc:
0.8734 - val_loss: 0.7358 - val_acc: 0.7403
Epoch 148/400
537/537 [==============================] - 0s 215us/step - loss: 0.2999 - acc:
0.8641 - val_loss: 0.7271 - val_acc: 0.7359
Epoch 149/400
537/537 [==============================] - ETA: 0s - loss: 0.3222 - acc: 0.812 -
0s 106us/step - loss: 0.3002 - acc: 0.8696 - val_loss: 0.7287 - val_acc: 0.7186
Epoch 150/400
537/537 [==============================] - 0s 100us/step - loss: 0.2962 - acc:
0.8696 - val_loss: 0.7299 - val_acc: 0.7229
Epoch 151/400
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537/537 [==============================] - 0s 100us/step - loss: 0.2936 - acc:
0.8715 - val_loss: 0.7324 - val_acc: 0.7186
Epoch 152/400
537/537 [==============================] - 0s 132us/step - loss: 0.2990 - acc:
0.8641 - val_loss: 0.7514 - val_acc: 0.7403
Epoch 153/400
537/537 [==============================] - 0s 78us/step - loss: 0.2989 - acc:
0.8585 - val_loss: 0.7302 - val_acc: 0.7273
Epoch 154/400
537/537 [==============================] - 0s 100us/step - loss: 0.2945 - acc:
0.8734 - val_loss: 0.7385 - val_acc: 0.7403
Epoch 155/400
537/537 [==============================] - 0s 128us/step - loss: 0.2992 - acc:
0.8659 - val_loss: 0.7357 - val_acc: 0.7143
Epoch 156/400
537/537 [==============================] - 0s 136us/step - loss: 0.3001 - acc:
0.8696 - val_loss: 0.7303 - val_acc: 0.7186
Epoch 157/400
537/537 [==============================] - 0s 124us/step - loss: 0.2941 - acc:
0.8641 - val_loss: 0.7383 - val_acc: 0.7143
Epoch 158/400
537/537 [==============================] - 0s 176us/step - loss: 0.2975 - acc:
0.8715 - val_loss: 0.7490 - val_acc: 0.7403
Epoch 159/400
537/537 [==============================] - 0s 178us/step - loss: 0.2992 - acc:
0.8715 - val_loss: 0.7300 - val_acc: 0.7229
Epoch 160/400
537/537 [==============================] - 0s 137us/step - loss: 0.3045 - acc:
0.8678 - val_loss: 0.7368 - val_acc: 0.7229
Epoch 161/400
537/537 [==============================] - 0s 117us/step - loss: 0.3001 - acc:
0.8641 - val_loss: 0.7403 - val_acc: 0.7446
Epoch 162/400
537/537 [==============================] - 0s 175us/step - loss: 0.2892 - acc:
0.8734 - val_loss: 0.7336 - val_acc: 0.7273
Epoch 163/400
537/537 [==============================] - 0s 249us/step - loss: 0.2963 - acc:
0.8715 - val_loss: 0.7316 - val_acc: 0.7316
Epoch 164/400
537/537 [==============================] - 0s 156us/step - loss: 0.2916 - acc:
0.8752 - val_loss: 0.7415 - val_acc: 0.7143
Epoch 165/400
537/537 [==============================] - 0s 93us/step - loss: 0.2952 - acc:
0.8659 - val_loss: 0.7468 - val_acc: 0.7273
Epoch 166/400
537/537 [==============================] - 0s 123us/step - loss: 0.2948 - acc:
0.8678 - val_loss: 0.7362 - val_acc: 0.7359
Epoch 167/400
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537/537 [==============================] - 0s 297us/step - loss: 0.2947 - acc:
0.8678 - val_loss: 0.7375 - val_acc: 0.7359
Epoch 168/400
537/537 [==============================] - 0s 130us/step - loss: 0.2937 - acc:
0.8715 - val_loss: 0.7370 - val_acc: 0.7359
Epoch 169/400
537/537 [==============================] - 0s 173us/step - loss: 0.2932 - acc:
0.8734 - val_loss: 0.7410 - val_acc: 0.7056
Epoch 170/400
537/537 [==============================] - 0s 134us/step - loss: 0.2911 - acc:
0.8790 - val_loss: 0.7393 - val_acc: 0.7229
Epoch 171/400
537/537 [==============================] - 0s 206us/step - loss: 0.2941 - acc:
0.8678 - val_loss: 0.7383 - val_acc: 0.7100
Epoch 172/400
537/537 [==============================] - 0s 132us/step - loss: 0.2944 - acc:
0.8659 - val_loss: 0.7340 - val_acc: 0.7273
Epoch 173/400
537/537 [==============================] - 0s 104us/step - loss: 0.2939 - acc:
0.8790 - val_loss: 0.7447 - val_acc: 0.7316
Epoch 174/400
537/537 [==============================] - 0s 67us/step - loss: 0.2954 - acc:
0.8678 - val_loss: 0.7383 - val_acc: 0.7100
Epoch 175/400
537/537 [==============================] - 0s 58us/step - loss: 0.2922 - acc:
0.8808 - val_loss: 0.7376 - val_acc: 0.7403
Epoch 176/400
537/537 [==============================] - 0s 171us/step - loss: 0.2918 - acc:
0.8715 - val_loss: 0.7568 - val_acc: 0.7186
Epoch 177/400
537/537 [==============================] - 0s 65us/step - loss: 0.2928 - acc:
0.8696 - val_loss: 0.7372 - val_acc: 0.7359
Epoch 178/400
537/537 [==============================] - 0s 67us/step - loss: 0.2973 - acc:
0.8585 - val_loss: 0.7411 - val_acc: 0.7273
Epoch 179/400
537/537 [==============================] - 0s 87us/step - loss: 0.2943 - acc:
0.8715 - val_loss: 0.7424 - val_acc: 0.7100
Epoch 180/400
537/537 [==============================] - 0s 193us/step - loss: 0.2934 - acc:
0.8696 - val_loss: 0.7407 - val_acc: 0.7143
Epoch 181/400
537/537 [==============================] - 0s 78us/step - loss: 0.2904 - acc:
0.8659 - val_loss: 0.7473 - val_acc: 0.7359
Epoch 182/400
537/537 [==============================] - 0s 85us/step - loss: 0.2917 - acc:
0.8752 - val_loss: 0.7465 - val_acc: 0.7186
Epoch 183/400
```

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537/537 [==============================] - 0s 109us/step - loss: 0.2981 - acc:
0.8659 - val_loss: 0.7425 - val_acc: 0.7186
Epoch 184/400
537/537 [==============================] - 0s 132us/step - loss: 0.2929 - acc:
0.8734 - val_loss: 0.7496 - val_acc: 0.7229
Epoch 185/400
537/537 [==============================] - 0s 238us/step - loss: 0.2936 - acc:
0.8659 - val_loss: 0.7501 - val_acc: 0.7273
Epoch 186/400
537/537 [==============================] - 0s 251us/step - loss: 0.2915 - acc:
0.8752 - val_loss: 0.7422 - val_acc: 0.7186
Epoch 187/400
537/537 [==============================] - 0s 162us/step - loss: 0.2946 - acc:
0.8771 - val_loss: 0.7752 - val_acc: 0.7359
Epoch 188/400
537/537 [==============================] - 0s 176us/step - loss: 0.3033 - acc:
0.8678 - val_loss: 0.7478 - val_acc: 0.7143
Epoch 189/400
537/537 [==============================] - 0s 104us/step - loss: 0.2917 - acc:
0.8808 - val_loss: 0.7485 - val_acc: 0.7229
Epoch 190/400
537/537 [==============================] - 0s 95us/step - loss: 0.2955 - acc:
0.8696 - val_loss: 0.7655 - val_acc: 0.7229
Epoch 191/400
537/537 [==============================] - 0s 191us/step - loss: 0.2938 - acc:
0.8734 - val_loss: 0.7441 - val_acc: 0.7186
Epoch 192/400
537/537 [==============================] - 0s 221us/step - loss: 0.2939 - acc:
0.8641 - val_loss: 0.7384 - val_acc: 0.7403
Epoch 193/400
537/537 [==============================] - 0s 183us/step - loss: 0.2881 - acc:
0.8715 - val_loss: 0.7568 - val_acc: 0.7359
Epoch 194/400
537/537 [==============================] - 0s 173us/step - loss: 0.2909 - acc:
0.8622 - val_loss: 0.7477 - val_acc: 0.7403
Epoch 195/400
537/537 [==============================] - 0s 141us/step - loss: 0.2907 - acc:
0.8734 - val_loss: 0.7455 - val_acc: 0.7273
Epoch 196/400
537/537 [==============================] - 0s 201us/step - loss: 0.2924 - acc:
0.8585 - val_loss: 0.7528 - val_acc: 0.7273
Epoch 197/400
537/537 [==============================] - 0s 232us/step - loss: 0.2861 - acc:
0.8734 - val_loss: 0.7441 - val_acc: 0.7186
Epoch 198/400
537/537 [==============================] - 0s 104us/step - loss: 0.2941 - acc:
0.8715 - val_loss: 0.7564 - val_acc: 0.7273
Epoch 199/400
```

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537/537 [==============================] - 0s 179us/step - loss: 0.2896 - acc:
0.8734 - val_loss: 0.7508 - val_acc: 0.7186
Epoch 200/400
537/537 [==============================] - 0s 95us/step - loss: 0.2969 - acc:
0.8603 - val_loss: 0.7477 - val_acc: 0.7229
Epoch 201/400
537/537 [==============================] - 0s 180us/step - loss: 0.2930 - acc:
0.8696 - val_loss: 0.7525 - val_acc: 0.7316
Epoch 202/400
537/537 [==============================] - 0s 119us/step - loss: 0.2903 - acc:
0.8641 - val_loss: 0.7558 - val_acc: 0.7229
Epoch 203/400
537/537 [==============================] - 0s 119us/step - loss: 0.2925 - acc:
0.8622 - val_loss: 0.7718 - val_acc: 0.7446
Epoch 204/400
537/537 [==============================] - 0s 104us/step - loss: 0.2908 - acc:
0.8696 - val_loss: 0.7541 - val_acc: 0.7359
Epoch 205/400
537/537 [==============================] - 0s 115us/step - loss: 0.2947 - acc:
0.8659 - val_loss: 0.7702 - val_acc: 0.7316
Epoch 206/400
537/537 [==============================] - 0s 212us/step - loss: 0.2941 - acc:
0.8641 - val_loss: 0.7495 - val_acc: 0.7316
Epoch 207/400
537/537 [==============================] - 0s 113us/step - loss: 0.2886 - acc:
0.8734 - val_loss: 0.7492 - val_acc: 0.7273
Epoch 208/400
537/537 [==============================] - 0s 150us/step - loss: 0.2902 - acc:
0.8734 - val_loss: 0.7546 - val_acc: 0.7273
Epoch 209/400
537/537 [==============================] - 0s 191us/step - loss: 0.2909 - acc:
0.8659 - val_loss: 0.7543 - val_acc: 0.7056
Epoch 210/400
537/537 [==============================] - 0s 111us/step - loss: 0.2882 - acc:
0.8734 - val_loss: 0.7872 - val_acc: 0.7359
Epoch 211/400
537/537 [==============================] - 0s 104us/step - loss: 0.2897 - acc:
0.8715 - val_loss: 0.7501 - val_acc: 0.7100
Epoch 212/400
537/537 [==============================] - 0s 171us/step - loss: 0.2912 - acc:
0.8659 - val_loss: 0.7675 - val_acc: 0.7446
Epoch 213/400
537/537 [==============================] - 0s 165us/step - loss: 0.3003 - acc:
0.8696 - val_loss: 0.7530 - val_acc: 0.7229
Epoch 214/400
537/537 [==============================] - 0s 297us/step - loss: 0.2891 - acc:
0.8678 - val_loss: 0.7687 - val_acc: 0.7316
Epoch 215/400
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537/537 [==============================] - 0s 78us/step - loss: 0.2904 - acc:
0.8641 - val_loss: 0.7564 - val_acc: 0.7403
Epoch 216/400
537/537 [==============================] - 0s 113us/step - loss: 0.2902 - acc:
0.8715 - val_loss: 0.7505 - val_acc: 0.7359
Epoch 217/400
537/537 [==============================] - ETA: 0s - loss: 0.2986 - acc: 0.863 -
0s 154us/step - loss: 0.2863 - acc: 0.8752 - val_loss: 0.7628 - val_acc: 0.7359
Epoch 218/400
537/537 [==============================] - 0s 102us/step - loss: 0.2873 - acc:
0.8771 - val_loss: 0.7644 - val_acc: 0.7100
Epoch 219/400
537/537 [==============================] - 0s 193us/step - loss: 0.2915 - acc:
0.8715 - val_loss: 0.7541 - val_acc: 0.7446
Epoch 220/400
537/537 [==============================] - 0s 124us/step - loss: 0.2912 - acc:
0.8771 - val_loss: 0.7549 - val_acc: 0.7359
Epoch 221/400
537/537 [==============================] - 0s 212us/step - loss: 0.2921 - acc:
0.8715 - val_loss: 0.7697 - val_acc: 0.7446
Epoch 222/400
537/537 [==============================] - 0s 160us/step - loss: 0.2825 - acc:
0.8808 - val_loss: 0.7965 - val_acc: 0.7446
Epoch 223/400
537/537 [==============================] - 0s 204us/step - loss: 0.2926 - acc:
0.8659 - val_loss: 0.7714 - val_acc: 0.7143
Epoch 224/400
537/537 [==============================] - 0s 249us/step - loss: 0.2917 - acc:
0.8678 - val_loss: 0.7629 - val_acc: 0.7143
Epoch 225/400
537/537 [==============================] - 0s 152us/step - loss: 0.2884 - acc:
0.8827 - val_loss: 0.7549 - val_acc: 0.7229
Epoch 226/400
537/537 [==============================] - 0s 108us/step - loss: 0.2896 - acc:
0.8696 - val_loss: 0.7614 - val_acc: 0.7229
Epoch 227/400
537/537 [==============================] - 0s 85us/step - loss: 0.2919 - acc:
0.8715 - val_loss: 0.7724 - val_acc: 0.7403
Epoch 228/400
537/537 [==============================] - 0s 154us/step - loss: 0.2885 - acc:
0.8771 - val_loss: 0.7521 - val_acc: 0.7446
Epoch 229/400
537/537 [==============================] - 0s 156us/step - loss: 0.2877 - acc:
0.8808 - val_loss: 0.7606 - val_acc: 0.7359
Epoch 230/400
537/537 [==============================] - 0s 143us/step - loss: 0.2876 - acc:
0.8845 - val_loss: 0.7539 - val_acc: 0.7273
Epoch 231/400
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537/537 [==============================] - 0s 154us/step - loss: 0.2908 - acc:
0.8678 - val_loss: 0.7734 - val_acc: 0.7532
Epoch 232/400
537/537 [==============================] - 0s 80us/step - loss: 0.2918 - acc:
0.8808 - val_loss: 0.7806 - val_acc: 0.7316
Epoch 233/400
537/537 [==============================] - 0s 71us/step - loss: 0.2962 - acc:
0.8696 - val_loss: 0.7668 - val_acc: 0.7186
Epoch 234/400
537/537 [==============================] - 0s 74us/step - loss: 0.2924 - acc:
0.8734 - val_loss: 0.7601 - val_acc: 0.7186
Epoch 235/400
537/537 [==============================] - 0s 93us/step - loss: 0.2882 - acc:
0.8715 - val_loss: 0.7573 - val_acc: 0.7316
Epoch 236/400
537/537 [==============================] - 0s 102us/step - loss: 0.2857 - acc:
0.8790 - val_loss: 0.7587 - val_acc: 0.7186
Epoch 237/400
537/537 [==============================] - 0s 124us/step - loss: 0.3052 - acc:
0.8622 - val_loss: 0.8334 - val_acc: 0.7359
Epoch 238/400
537/537 [==============================] - 0s 123us/step - loss: 0.2993 - acc:
0.8678 - val_loss: 0.7576 - val_acc: 0.7316
Epoch 239/400
537/537 [==============================] - 0s 91us/step - loss: 0.2850 - acc:
0.8752 - val_loss: 0.7681 - val_acc: 0.7359
Epoch 240/400
537/537 [==============================] - 0s 173us/step - loss: 0.2831 - acc:
0.8808 - val_loss: 0.7710 - val_acc: 0.7143
Epoch 241/400
537/537 [==============================] - 0s 100us/step - loss: 0.2974 - acc:
0.8678 - val_loss: 0.7637 - val_acc: 0.7359
Epoch 242/400
537/537 [==============================] - 0s 247us/step - loss: 0.2881 - acc:
0.8715 - val_loss: 0.7808 - val_acc: 0.7186
Epoch 243/400
537/537 [==============================] - 0s 139us/step - loss: 0.2907 - acc:
0.8715 - val_loss: 0.7614 - val_acc: 0.7403
Epoch 244/400
537/537 [==============================] - 0s 104us/step - loss: 0.2880 - acc:
0.8696 - val_loss: 0.7503 - val_acc: 0.7403
Epoch 245/400
537/537 [==============================] - 0s 113us/step - loss: 0.2918 - acc:
0.8696 - val_loss: 0.7640 - val_acc: 0.7403
Epoch 246/400
537/537 [==============================] - 0s 130us/step - loss: 0.2876 - acc:
0.8771 - val_loss: 0.7619 - val_acc: 0.7273
Epoch 247/400
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537/537 [==============================] - 0s 299us/step - loss: 0.2851 - acc:
0.8752 - val_loss: 0.7729 - val_acc: 0.7273
Epoch 248/400
537/537 [==============================] - 0s 104us/step - loss: 0.2911 - acc:
0.8715 - val_loss: 0.7582 - val_acc: 0.7100
Epoch 249/400
537/537 [==============================] - 0s 89us/step - loss: 0.2832 - acc:
0.8659 - val_loss: 0.7672 - val_acc: 0.7446
Epoch 250/400
537/537 [==============================] - 0s 106us/step - loss: 0.2858 - acc:
0.8827 - val_loss: 0.7574 - val_acc: 0.7273
Epoch 251/400
537/537 [==============================] - 0s 247us/step - loss: 0.2886 - acc:
0.8808 - val_loss: 0.7584 - val_acc: 0.7273
Epoch 252/400
537/537 [==============================] - 0s 243us/step - loss: 0.2938 - acc:
0.8790 - val_loss: 0.7679 - val_acc: 0.7273
Epoch 253/400
537/537 [==============================] - 0s 111us/step - loss: 0.2902 - acc:
0.8678 - val_loss: 0.7630 - val_acc: 0.7273
Epoch 254/400
537/537 [==============================] - 0s 286us/step - loss: 0.2894 - acc:
0.8771 - val_loss: 0.7613 - val_acc: 0.7316
Epoch 255/400
537/537 [==============================] - 0s 136us/step - loss: 0.2889 - acc:
0.8827 - val_loss: 0.7621 - val_acc: 0.7143
Epoch 256/400
537/537 [==============================] - 0s 227us/step - loss: 0.2892 - acc:
0.8678 - val_loss: 0.7565 - val_acc: 0.7273
Epoch 257/400
537/537 [==============================] - 0s 147us/step - loss: 0.2847 - acc:
0.8696 - val_loss: 0.7624 - val_acc: 0.7403
Epoch 258/400
537/537 [==============================] - 0s 139us/step - loss: 0.2826 - acc:
0.8790 - val_loss: 0.7824 - val_acc: 0.7446
Epoch 259/400
537/537 [==============================] - 0s 186us/step - loss: 0.2925 - acc:
0.8715 - val_loss: 0.7626 - val_acc: 0.7489
Epoch 260/400
537/537 [==============================] - 0s 253us/step - loss: 0.2875 - acc:
0.8845 - val_loss: 0.7853 - val_acc: 0.7446
Epoch 261/400
537/537 [==============================] - 0s 121us/step - loss: 0.2888 - acc:
0.8827 - val_loss: 0.7696 - val_acc: 0.7273
Epoch 262/400
537/537 [==============================] - 0s 229us/step - loss: 0.2817 - acc:
0.8734 - val_loss: 0.7597 - val_acc: 0.7403
Epoch 263/400
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537/537 [==============================] - 0s 154us/step - loss: 0.2880 - acc:
0.8752 - val_loss: 0.7665 - val_acc: 0.7316
Epoch 264/400
537/537 [==============================] - 0s 176us/step - loss: 0.2864 - acc:
0.8734 - val_loss: 0.7685 - val_acc: 0.7316
Epoch 265/400
537/537 [==============================] - 0s 188us/step - loss: 0.2798 - acc:
0.8808 - val_loss: 0.7760 - val_acc: 0.7359
Epoch 266/400
537/537 [==============================] - 0s 297us/step - loss: 0.2865 - acc:
0.8734 - val_loss: 0.7720 - val_acc: 0.7359
Epoch 267/400
537/537 [==============================] - 0s 126us/step - loss: 0.2876 - acc:
0.8771 - val_loss: 0.7713 - val_acc: 0.7359
Epoch 268/400
537/537 [==============================] - 0s 225us/step - loss: 0.2807 - acc:
0.8678 - val_loss: 0.7686 - val_acc: 0.7143
Epoch 269/400
537/537 [==============================] - 0s 119us/step - loss: 0.2794 - acc:
0.8864 - val_loss: 0.7885 - val_acc: 0.7273
Epoch 270/400
537/537 [==============================] - 0s 98us/step - loss: 0.2846 - acc:
0.8790 - val_loss: 0.7874 - val_acc: 0.7316
Epoch 271/400
537/537 [==============================] - 0s 100us/step - loss: 0.2894 - acc:
0.8790 - val_loss: 0.7723 - val_acc: 0.7273
Epoch 272/400
537/537 [==============================] - 0s 280us/step - loss: 0.2800 - acc:
0.8920 - val_loss: 0.7789 - val_acc: 0.7316
Epoch 273/400
537/537 [==============================] - 0s 125us/step - loss: 0.2848 - acc:
0.8715 - val_loss: 0.7739 - val_acc: 0.7403
Epoch 274/400
537/537 [==============================] - 0s 60us/step - loss: 0.2840 - acc:
0.8734 - val_loss: 0.7724 - val_acc: 0.7143
Epoch 275/400
537/537 [==============================] - 0s 63us/step - loss: 0.2861 - acc:
0.8715 - val_loss: 0.7789 - val_acc: 0.7316
Epoch 276/400
537/537 [==============================] - 0s 74us/step - loss: 0.2769 - acc:
0.8752 - val_loss: 0.7999 - val_acc: 0.7446
Epoch 277/400
537/537 [==============================] - 0s 74us/step - loss: 0.2838 - acc:
0.8771 - val_loss: 0.7729 - val_acc: 0.7316
Epoch 278/400
537/537 [==============================] - 0s 126us/step - loss: 0.2882 - acc:
0.8790 - val_loss: 0.7657 - val_acc: 0.7446
Epoch 279/400
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537/537 [==============================] - 0s 106us/step - loss: 0.2757 - acc:
0.8845 - val_loss: 0.7629 - val_acc: 0.7489
Epoch 280/400
537/537 [==============================] - 0s 72us/step - loss: 0.2825 - acc:
0.8827 - val_loss: 0.7706 - val_acc: 0.7229
Epoch 281/400
537/537 [==============================] - 0s 76us/step - loss: 0.2816 - acc:
0.8827 - val_loss: 0.7682 - val_acc: 0.7403
Epoch 282/400
537/537 [==============================] - 0s 166us/step - loss: 0.2823 - acc:
0.8827 - val_loss: 0.7776 - val_acc: 0.7359
Epoch 283/400
537/537 [==============================] - 0s 59us/step - loss: 0.2908 - acc:
0.8641 - val_loss: 0.7758 - val_acc: 0.7359
Epoch 284/400
537/537 [==============================] - 0s 141us/step - loss: 0.2796 - acc:
0.8827 - val_loss: 0.8081 - val_acc: 0.7489
Epoch 285/400
537/537 [==============================] - 0s 100us/step - loss: 0.2964 - acc:
0.8659 - val_loss: 0.7844 - val_acc: 0.7446
Epoch 286/400
537/537 [==============================] - 0s 65us/step - loss: 0.2783 - acc:
0.8790 - val_loss: 0.7663 - val_acc: 0.7489
Epoch 287/400
537/537 [==============================] - 0s 71us/step - loss: 0.2845 - acc:
0.8734 - val_loss: 0.7734 - val_acc: 0.7316
Epoch 288/400
537/537 [==============================] - 0s 141us/step - loss: 0.2786 - acc:
0.8845 - val_loss: 0.8057 - val_acc: 0.7446
Epoch 289/400
537/537 [==============================] - 0s 323us/step - loss: 0.2826 - acc:
0.8752 - val_loss: 0.7694 - val_acc: 0.7403
Epoch 290/400
537/537 [==============================] - 0s 76us/step - loss: 0.2882 - acc:
0.8678 - val_loss: 0.7787 - val_acc: 0.7403
Epoch 291/400
537/537 [==============================] - 0s 72us/step - loss: 0.2836 - acc:
0.8715 - val_loss: 0.8178 - val_acc: 0.7403
Epoch 292/400
537/537 [==============================] - 0s 65us/step - loss: 0.2802 - acc:
0.8771 - val_loss: 0.7809 - val_acc: 0.7186
Epoch 293/400
537/537 [==============================] - 0s 100us/step - loss: 0.2829 - acc:
0.8771 - val_loss: 0.7828 - val_acc: 0.7532
Epoch 294/400
537/537 [==============================] - 0s 65us/step - loss: 0.2828 - acc:
0.8845 - val_loss: 0.7743 - val_acc: 0.7403
Epoch 295/400
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537/537 [==============================] - 0s 71us/step - loss: 0.2800 - acc:
0.8808 - val_loss: 0.7779 - val_acc: 0.7359
Epoch 296/400
537/537 [==============================] - 0s 158us/step - loss: 0.2793 - acc:
0.8808 - val_loss: 0.7826 - val_acc: 0.7446
Epoch 297/400
537/537 [==============================] - 0s 74us/step - loss: 0.2746 - acc:
0.8845 - val_loss: 0.7737 - val_acc: 0.7403
Epoch 298/400
537/537 [==============================] - 0s 89us/step - loss: 0.2772 - acc:
0.8883 - val_loss: 0.7804 - val_acc: 0.7359
Epoch 299/400
537/537 [==============================] - 0s 165us/step - loss: 0.2832 - acc:
0.8752 - val_loss: 0.7834 - val_acc: 0.7229
Epoch 300/400
537/537 [==============================] - 0s 85us/step - loss: 0.2826 - acc:
0.8845 - val_loss: 0.7863 - val_acc: 0.7186
Epoch 301/400
537/537 [==============================] - 0s 65us/step - loss: 0.2779 - acc:
0.8864 - val_loss: 0.7880 - val_acc: 0.7229
Epoch 302/400
537/537 [==============================] - 0s 63us/step - loss: 0.2819 - acc:
0.8790 - val_loss: 0.7980 - val_acc: 0.7446
Epoch 303/400
537/537 [==============================] - 0s 69us/step - loss: 0.2795 - acc:
0.8790 - val_loss: 0.7978 - val_acc: 0.7359
Epoch 304/400
537/537 [==============================] - 0s 65us/step - loss: 0.2757 - acc:
0.8752 - val_loss: 0.7864 - val_acc: 0.7100
Epoch 305/400
537/537 [==============================] - 0s 63us/step - loss: 0.2755 - acc:
0.8864 - val_loss: 0.7922 - val_acc: 0.7403
Epoch 306/400
537/537 [==============================] - 0s 63us/step - loss: 0.2904 - acc:
0.8771 - val_loss: 0.7807 - val_acc: 0.7359
Epoch 307/400
537/537 [==============================] - 0s 61us/step - loss: 0.2785 - acc:
0.8883 - val_loss: 0.7807 - val_acc: 0.7489
Epoch 308/400
537/537 [==============================] - 0s 73us/step - loss: 0.2785 - acc:
0.8808 - val_loss: 0.7851 - val_acc: 0.7489
Epoch 309/400
537/537 [==============================] - 0s 67us/step - loss: 0.2772 - acc:
0.8845 - val_loss: 0.7830 - val_acc: 0.7489
Epoch 310/400
537/537 [==============================] - 0s 76us/step - loss: 0.2868 - acc:
0.8752 - val_loss: 0.7867 - val_acc: 0.7446
Epoch 311/400
```

```
537/537 [==============================] - 0s 59us/step - loss: 0.2736 - acc:
0.8827 - val_loss: 0.7890 - val_acc: 0.7273
Epoch 312/400
537/537 [==============================] - 0s 69us/step - loss: 0.2827 - acc:
0.8790 - val_loss: 0.7863 - val_acc: 0.7316
Epoch 313/400
537/537 [==============================] - 0s 58us/step - loss: 0.2795 - acc:
0.8790 - val_loss: 0.7982 - val_acc: 0.7316
Epoch 314/400
537/537 [==============================] - 0s 193us/step - loss: 0.2820 - acc:
0.8790 - val_loss: 0.7947 - val_acc: 0.7403
Epoch 315/400
537/537 [==============================] - 0s 150us/step - loss: 0.2788 - acc:
0.8864 - val_loss: 0.7982 - val_acc: 0.7316
Epoch 316/400
537/537 [==============================] - 0s 182us/step - loss: 0.2771 - acc:
0.8827 - val_loss: 0.8087 - val_acc: 0.7489
Epoch 317/400
537/537 [==============================] - 0s 208us/step - loss: 0.2751 - acc:
0.8715 - val_loss: 0.7864 - val_acc: 0.7316
Epoch 318/400
537/537 [==============================] - 0s 130us/step - loss: 0.2761 - acc:
0.8845 - val_loss: 0.7799 - val_acc: 0.7489
Epoch 319/400
537/537 [==============================] - 0s 115us/step - loss: 0.2739 - acc:
0.8957 - val_loss: 0.7893 - val_acc: 0.7359
Epoch 320/400
537/537 [==============================] - 0s 242us/step - loss: 0.2721 - acc:
0.8901 - val_loss: 0.7866 - val_acc: 0.7489
Epoch 321/400
537/537 [==============================] - 0s 195us/step - loss: 0.2750 - acc:
0.8845 - val_loss: 0.8104 - val_acc: 0.7403
Epoch 322/400
537/537 [==============================] - 0s 147us/step - loss: 0.2811 - acc:
0.8864 - val_loss: 0.8056 - val_acc: 0.7446
Epoch 323/400
537/537 [==============================] - 0s 191us/step - loss: 0.2722 - acc:
0.8827 - val_loss: 0.8013 - val_acc: 0.7489
Epoch 324/400
537/537 [==============================] - 0s 184us/step - loss: 0.2772 - acc:
0.8864 - val_loss: 0.7919 - val_acc: 0.7143
Epoch 325/400
537/537 [==============================] - 0s 176us/step - loss: 0.2749 - acc:
0.8827 - val_loss: 0.7901 - val_acc: 0.7229
Epoch 326/400
537/537 [==============================] - 0s 202us/step - loss: 0.2793 - acc:
0.8827 - val_loss: 0.7890 - val_acc: 0.7316
Epoch 327/400
```

```
537/537 [==============================] - 0s 96us/step - loss: 0.2733 - acc:
0.8901 - val_loss: 0.7894 - val_acc: 0.7359
Epoch 328/400
537/537 [==============================] - 0s 134us/step - loss: 0.2728 - acc:
0.8957 - val_loss: 0.8000 - val_acc: 0.7056
Epoch 329/400
537/537 [==============================] - 0s 197us/step - loss: 0.2725 - acc:
0.8808 - val_loss: 0.7866 - val_acc: 0.7359
Epoch 330/400
537/537 [==============================] - 0s 106us/step - loss: 0.2777 - acc:
0.8845 - val_loss: 0.7933 - val_acc: 0.7316
Epoch 331/400
537/537 [==============================] - 0s 162us/step - loss: 0.2783 - acc:
0.8883 - val_loss: 0.7989 - val_acc: 0.7619
Epoch 332/400
537/537 [==============================] - 0s 139us/step - loss: 0.2788 - acc:
0.8808 - val_loss: 0.7862 - val_acc: 0.7316
Epoch 333/400
537/537 [==============================] - 0s 95us/step - loss: 0.2775 - acc:
0.8715 - val_loss: 0.7852 - val_acc: 0.7576
Epoch 334/400
537/537 [==============================] - 0s 147us/step - loss: 0.2690 - acc:
0.8939 - val_loss: 0.7840 - val_acc: 0.7619
Epoch 335/400
537/537 [==============================] - 0s 219us/step - loss: 0.2667 - acc:
0.8939 - val_loss: 0.8066 - val_acc: 0.7316
Epoch 336/400
537/537 [==============================] - 0s 189us/step - loss: 0.2663 - acc:
0.8845 - val_loss: 0.8014 - val_acc: 0.7489
Epoch 337/400
537/537 [==============================] - 0s 104us/step - loss: 0.2798 - acc:
0.8864 - val_loss: 0.7943 - val_acc: 0.7273
Epoch 338/400
537/537 [==============================] - 0s 193us/step - loss: 0.2663 - acc:
0.8864 - val_loss: 0.7929 - val_acc: 0.7619
Epoch 339/400
537/537 [==============================] - 0s 104us/step - loss: 0.2672 - acc:
0.8920 - val_loss: 0.7901 - val_acc: 0.7576
Epoch 340/400
537/537 [==============================] - 0s 82us/step - loss: 0.2674 - acc:
0.8864 - val_loss: 0.7974 - val_acc: 0.7532
Epoch 341/400
537/537 [==============================] - 0s 139us/step - loss: 0.2740 - acc:
0.8808 - val_loss: 0.8102 - val_acc: 0.7359
Epoch 342/400
537/537 [==============================] - 0s 63us/step - loss: 0.2671 - acc:
0.8939 - val_loss: 0.7976 - val_acc: 0.7359
Epoch 343/400
```

```
537/537 [==============================] - 0s 78us/step - loss: 0.2710 - acc:
0.8864 - val_loss: 0.8294 - val_acc: 0.7359
Epoch 344/400
537/537 [==============================] - 0s 108us/step - loss: 0.2756 - acc:
0.8920 - val_loss: 0.8021 - val_acc: 0.7446
Epoch 345/400
537/537 [==============================] - 0s 67us/step - loss: 0.2700 - acc:
0.8901 - val_loss: 0.8002 - val_acc: 0.7532
Epoch 346/400
537/537 [==============================] - 0s 72us/step - loss: 0.2729 - acc:
0.8808 - val_loss: 0.8129 - val_acc: 0.7532
Epoch 347/400
537/537 [==============================] - 0s 200us/step - loss: 0.2654 - acc:
0.8864 - val_loss: 0.8197 - val_acc: 0.7403
Epoch 348/400
537/537 [==============================] - 0s 197us/step - loss: 0.2708 - acc:
0.8901 - val_loss: 0.8017 - val_acc: 0.7489
Epoch 349/400
537/537 [==============================] - 0s 87us/step - loss: 0.2672 - acc:
0.8790 - val_loss: 0.7967 - val_acc: 0.7446
Epoch 350/400
537/537 [==============================] - 0s 117us/step - loss: 0.2660 - acc:
0.8957 - val_loss: 0.8105 - val_acc: 0.7446
Epoch 351/400
537/537 [==============================] - 0s 87us/step - loss: 0.2678 - acc:
0.8976 - val_loss: 0.8090 - val_acc: 0.7316
Epoch 352/400
537/537 [==============================] - 0s 122us/step - loss: 0.2674 - acc:
0.8883 - val_loss: 0.8055 - val_acc: 0.7273
Epoch 353/400
537/537 [==============================] - 0s 206us/step - loss: 0.2673 - acc:
0.8920 - val_loss: 0.8025 - val_acc: 0.7532
Epoch 354/400
537/537 [==============================] - 0s 80us/step - loss: 0.2637 - acc:
0.8939 - val_loss: 0.8025 - val_acc: 0.7446
Epoch 355/400
537/537 [==============================] - 0s 188us/step - loss: 0.2626 - acc:
0.8976 - val_loss: 0.8057 - val_acc: 0.7316
Epoch 356/400
537/537 [==============================] - 0s 193us/step - loss: 0.2628 - acc:
0.8901 - val_loss: 0.8165 - val_acc: 0.7316
Epoch 357/400
537/537 [==============================] - 0s 175us/step - loss: 0.2680 - acc:
0.8883 - val_loss: 0.8124 - val_acc: 0.7403
Epoch 358/400
537/537 [==============================] - 0s 182us/step - loss: 0.2634 - acc:
0.8901 - val_loss: 0.8100 - val_acc: 0.7359
Epoch 359/400
```

```
537/537 [==============================] - 0s 167us/step - loss: 0.2617 - acc:
0.9013 - val_loss: 0.8270 - val_acc: 0.7273
Epoch 360/400
537/537 [==============================] - 0s 124us/step - loss: 0.2696 - acc:
0.8957 - val_loss: 0.8276 - val_acc: 0.7359
Epoch 361/400
537/537 [==============================] - 0s 182us/step - loss: 0.2611 - acc:
0.8790 - val_loss: 0.8235 - val_acc: 0.7403
Epoch 362/400
537/537 [==============================] - 0s 199us/step - loss: 0.2660 - acc:
0.8901 - val_loss: 0.8155 - val_acc: 0.7403
Epoch 363/400
537/537 [==============================] - 0s 195us/step - loss: 0.2677 - acc:
0.8994 - val_loss: 0.8252 - val_acc: 0.7403
Epoch 364/400
537/537 [==============================] - 0s 128us/step - loss: 0.2694 - acc:
0.8845 - val_loss: 0.8162 - val_acc: 0.7576
Epoch 365/400
537/537 [==============================] - 0s 163us/step - loss: 0.2586 - acc:
0.9032 - val_loss: 0.8155 - val_acc: 0.7446
Epoch 366/400
537/537 [==============================] - 0s 162us/step - loss: 0.2638 - acc:
0.8939 - val_loss: 0.8904 - val_acc: 0.7143
Epoch 367/400
537/537 [==============================] - 0s 121us/step - loss: 0.2755 - acc:
0.8883 - val_loss: 0.8634 - val_acc: 0.7273
Epoch 368/400
537/537 [==============================] - 0s 126us/step - loss: 0.2608 - acc:
0.8827 - val_loss: 0.8912 - val_acc: 0.7273
Epoch 369/400
537/537 [==============================] - 0s 119us/step - loss: 0.2668 - acc:
0.8845 - val_loss: 0.8242 - val_acc: 0.7273
Epoch 370/400
537/537 [==============================] - 0s 217us/step - loss: 0.2578 - acc:
0.9032 - val_loss: 0.8399 - val_acc: 0.7229
Epoch 371/400
537/537 [==============================] - 0s 124us/step - loss: 0.2707 - acc:
0.8939 - val_loss: 0.8398 - val_acc: 0.7489
Epoch 372/400
537/537 [==============================] - 0s 217us/step - loss: 0.2690 - acc:
0.8920 - val_loss: 0.8163 - val_acc: 0.7359
Epoch 373/400
537/537 [==============================] - 0s 108us/step - loss: 0.2638 - acc:
0.9088 - val_loss: 0.8887 - val_acc: 0.7056
Epoch 374/400
537/537 [==============================] - 0s 102us/step - loss: 0.2660 - acc:
0.8864 - val_loss: 0.8221 - val_acc: 0.7489
Epoch 375/400
```

```
537/537 [==============================] - 0s 89us/step - loss: 0.2626 - acc:
0.8976 - val_loss: 0.8318 - val_acc: 0.7273
Epoch 376/400
537/537 [==============================] - 0s 152us/step - loss: 0.2576 - acc:
0.9032 - val_loss: 0.8426 - val_acc: 0.7229
Epoch 377/400
537/537 [==============================] - 0s 132us/step - loss: 0.2598 - acc:
0.9050 - val_loss: 0.8380 - val_acc: 0.7143
Epoch 378/400
537/537 [==============================] - 0s 217us/step - loss: 0.2669 - acc:
0.8920 - val_loss: 0.8506 - val_acc: 0.7532
Epoch 379/400
537/537 [==============================] - 0s 132us/step - loss: 0.2575 - acc:
0.8994 - val_loss: 0.8260 - val_acc: 0.7359
Epoch 380/400
537/537 [==============================] - 0s 176us/step - loss: 0.2613 - acc:
0.9050 - val_loss: 0.8203 - val_acc: 0.7273
Epoch 381/400
537/537 [==============================] - 0s 124us/step - loss: 0.2578 - acc:
0.9013 - val_loss: 0.8399 - val_acc: 0.7489
Epoch 382/400
537/537 [==============================] - 0s 102us/step - loss: 0.2517 - acc:
0.9050 - val_loss: 0.8319 - val_acc: 0.7446
Epoch 383/400
537/537 [==============================] - 0s 184us/step - loss: 0.2543 - acc:
0.8994 - val_loss: 0.8199 - val_acc: 0.7576
Epoch 384/400
537/537 [==============================] - 0s 136us/step - loss: 0.2692 - acc:
0.8920 - val_loss: 0.8234 - val_acc: 0.7532
Epoch 385/400
537/537 [==============================] - 0s 139us/step - loss: 0.2643 - acc:
0.8864 - val_loss: 0.8236 - val_acc: 0.7489
Epoch 386/400
537/537 [==============================] - 0s 240us/step - loss: 0.2581 - acc:
0.8939 - val_loss: 0.8442 - val_acc: 0.7489
Epoch 387/400
537/537 [==============================] - 0s 97us/step - loss: 0.2709 - acc:
0.8994 - val_loss: 0.8328 - val_acc: 0.7403
Epoch 388/400
537/537 [==============================] - 0s 176us/step - loss: 0.2540 - acc:
0.8976 - val_loss: 0.8325 - val_acc: 0.7489
Epoch 389/400
537/537 [==============================] - 0s 212us/step - loss: 0.2579 - acc:
0.8994 - val_loss: 0.8384 - val_acc: 0.7316
Epoch 390/400
537/537 [==============================] - 0s 124us/step - loss: 0.2654 - acc:
0.9013 - val_loss: 0.8258 - val_acc: 0.7576
Epoch 391/400
```

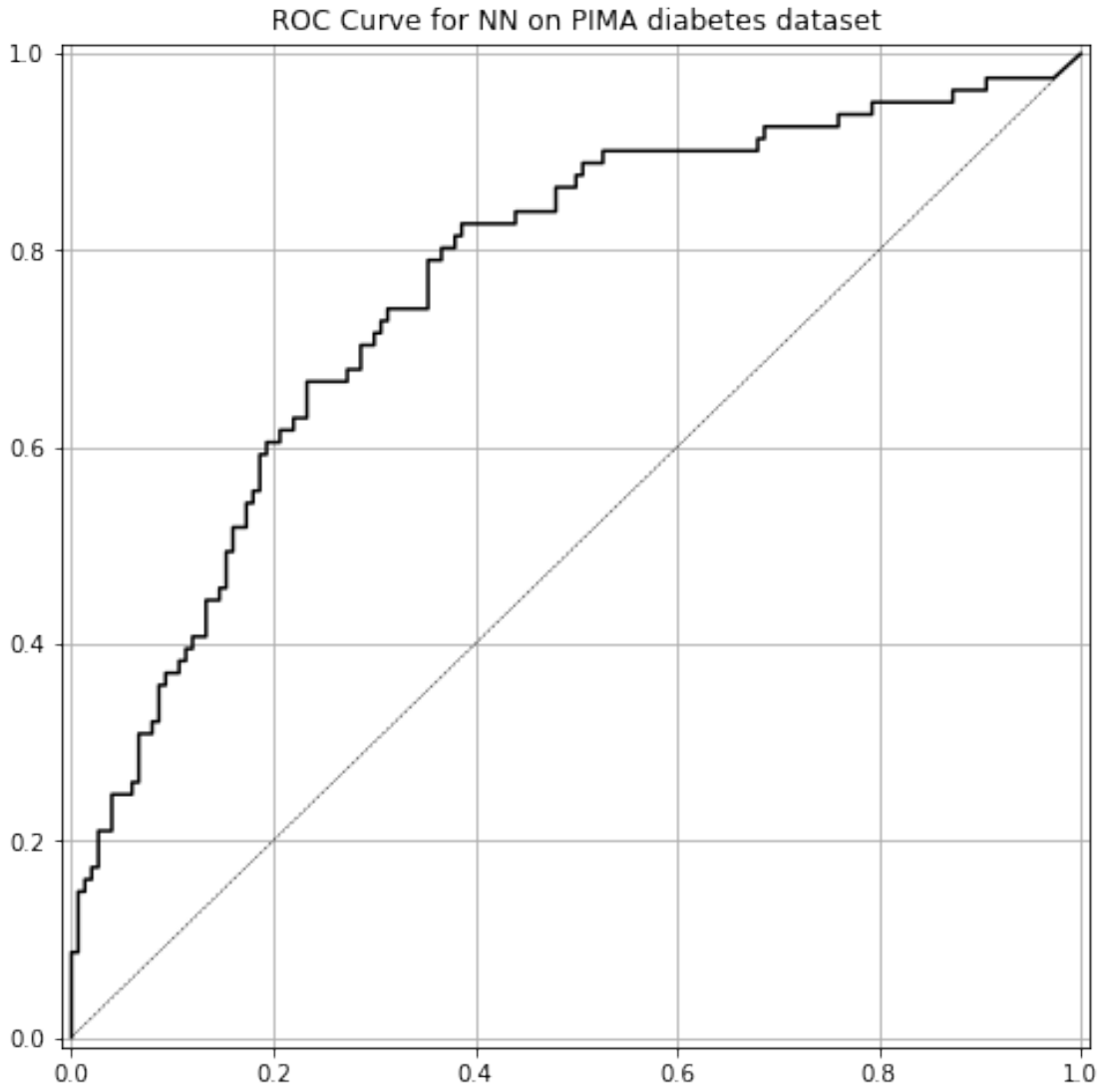
```
537/537 [==============================] - 0s 199us/step - loss: 0.2627 - acc:
0.8976 - val_loss: 0.8383 - val_acc: 0.7316
Epoch 392/400
537/537 [==============================] - 0s 145us/step - loss: 0.2574 - acc:
0.8994 - val_loss: 0.8517 - val_acc: 0.7359
Epoch 393/400
537/537 [==============================] - 0s 121us/step - loss: 0.2652 - acc:
0.9032 - val_loss: 0.8355 - val_acc: 0.7316
Epoch 394/400
537/537 [==============================] - 0s 245us/step - loss: 0.2578 - acc:
0.8920 - val_loss: 0.8299 - val_acc: 0.7532
Epoch 395/400
537/537 [==============================] - 0s 95us/step - loss: 0.2570 - acc:
0.9032 - val_loss: 0.8297 - val_acc: 0.7446
Epoch 396/400
537/537 [==============================] - 0s 212us/step - loss: 0.2521 - acc:
0.9013 - val_loss: 0.8325 - val_acc: 0.7532
Epoch 397/400
537/537 [==============================] - 0s 113us/step - loss: 0.2493 - acc:
0.9069 - val_loss: 0.8492 - val_acc: 0.7273
Epoch 398/400
537/537 [==============================] - 0s 113us/step - loss: 0.2538 - acc:
0.9032 - val_loss: 0.8357 - val_acc: 0.7532
Epoch 399/400
537/537 [==============================] - 0s 319us/step - loss: 0.2569 - acc:
0.9013 - val_loss: 0.8454 - val_acc: 0.7359
Epoch 400/400
537/537 [==============================] - 0s 173us/step - loss: 0.2572 - acc:
0.9069 - val_loss: 0.8632 - val_acc: 0.7273
```

[148]:
```
y_pred_class_nn_2 = model.predict_classes(X_test_norm)
y_pred_prob_nn_2 = model.predict(X_test_norm)
```

[149]:
```
# Print model performance and plot the roc curve
print('Accuracy is {:.3f}'.format(accuracy_score(y_test,y_pred_class_nn_2)))
print('ROC-AUC is {:.3f}'.format(roc_auc_score(y_test,y_pred_prob_nn_2)))

plot_roc(y_test, y_pred_prob_nn_2, 'NN')
```

```
Accuracy is 0.727
ROC-AUC is 0.765
```



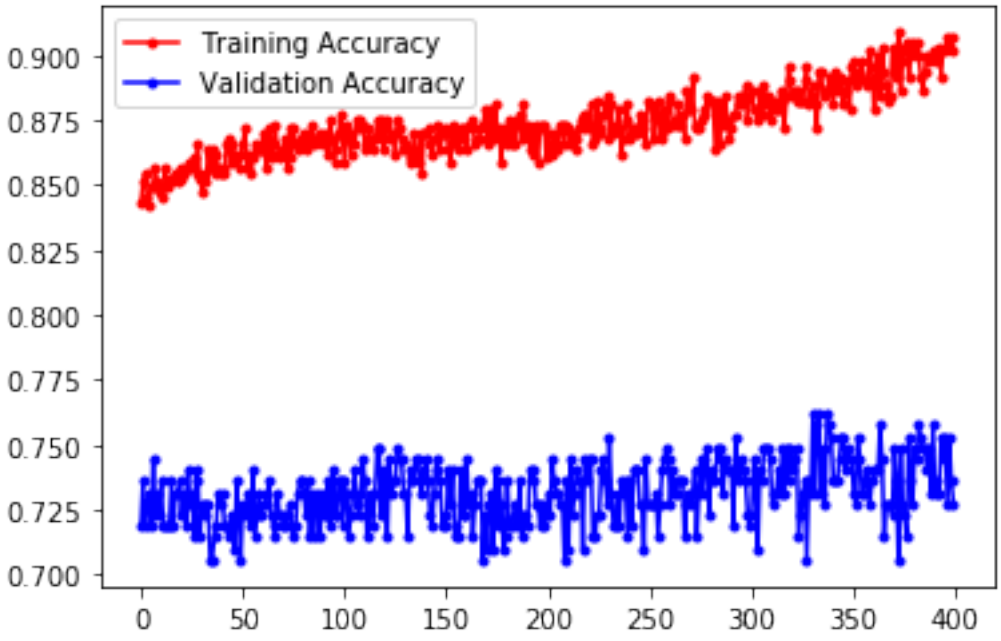
Accuracy obtained is 72.7% and AUC-ROC curve is 0.765 We see that there is a slight drop in accuracy and AUC-ROC curve.

[150]:
```
run_hist_400.history.keys()
```

[150]:
```
dict_keys(['val_loss', 'val_acc', 'loss', 'acc'])
```

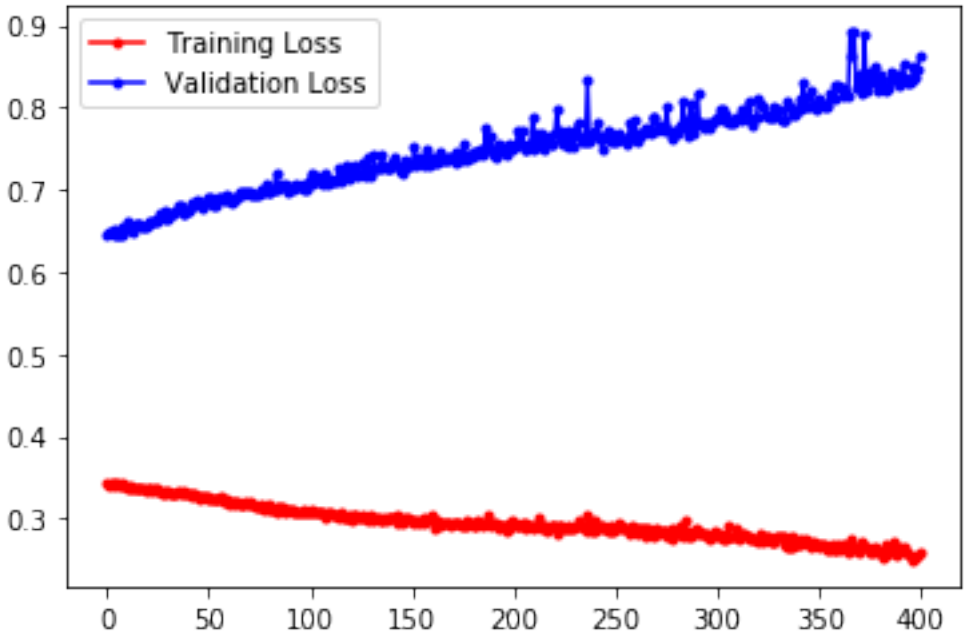
[164]:
```
#plotting the curve to check training and validation accuracy
fig, ax = plt.subplots()
ax.plot(run_hist_400.history["acc"],'r', marker='.', label="Training Accuracy")
ax.plot(run_hist_400.history["val_acc"],'b', marker='.', label="Validation␣
 ↪Accuracy")
ax.legend()
```

[164]:
```
<matplotlib.legend.Legend at 0x1c6dbf62080>
```



[165]:
```
#Plotting the curve to see the training and validation loss of the model.
fig, ax = plt.subplots()
ax.plot(run_hist_400.history["loss"],'r', marker='.', label="Training Loss")
ax.plot(run_hist_400.history["val_loss"],'b', marker='.', label="Validation␣
 ↪Loss")
ax.legend()
```

[165]:
```
<matplotlib.legend.Legend at 0x1c6dbfdc3c8>
```



Increasing the number of iterations to 600 and check the performance of the model. Lets now increase number of epochs to 600 and check the performance of the model.

[172]:
```
run_hist_600 = model.fit(X_train_norm, y_train, validation_data=(X_test_norm,␣
↪y_test), epochs=600)
```

```
Train on 537 samples, validate on 231 samples
Epoch 1/600
537/537 [==============================] - 0s 377us/step - loss: 0.0887 - acc:
0.9683 - val_loss: 1.9734 - val_acc: 0.7403
Epoch 2/600
537/537 [==============================] - 0s 65us/step - loss: 0.1212 - acc:
0.9553 - val_loss: 1.9484 - val_acc: 0.7143
Epoch 3/600
537/537 [==============================] - 0s 63us/step - loss: 0.0970 - acc:
0.9646 - val_loss: 1.9048 - val_acc: 0.7359
Epoch 4/600
537/537 [==============================] - 0s 69us/step - loss: 0.0909 - acc:
0.9758 - val_loss: 1.9194 - val_acc: 0.7229
Epoch 5/600
537/537 [==============================] - 0s 74us/step - loss: 0.0920 - acc:
0.9646 - val_loss: 1.9392 - val_acc: 0.7316
Epoch 6/600
537/537 [==============================] - 0s 63us/step - loss: 0.0859 - acc:
0.9702 - val_loss: 1.9666 - val_acc: 0.7359
Epoch 7/600
537/537 [==============================] - 0s 158us/step - loss: 0.0862 - acc:
0.9683 - val_loss: 2.0328 - val_acc: 0.7186
Epoch 8/600
537/537 [==============================] - 0s 215us/step - loss: 0.1324 - acc:
0.9423 - val_loss: 1.9576 - val_acc: 0.7273
Epoch 9/600
537/537 [==============================] - 0s 141us/step - loss: 0.0919 - acc:
0.9702 - val_loss: 2.0809 - val_acc: 0.7186
Epoch 10/600
537/537 [==============================] - 0s 202us/step - loss: 0.0981 - acc:
0.9721 - val_loss: 1.9867 - val_acc: 0.7100
Epoch 11/600
537/537 [==============================] - 0s 97us/step - loss: 0.1279 - acc:
0.9646 - val_loss: 2.0089 - val_acc: 0.7186
Epoch 12/600
537/537 [==============================] - 0s 191us/step - loss: 0.0913 - acc:
0.9646 - val_loss: 1.9371 - val_acc: 0.7186
Epoch 13/600
537/537 [==============================] - 0s 89us/step - loss: 0.0828 - acc:
```

```
0.9721 - val_loss: 1.9871 - val_acc: 0.7316
Epoch 14/600
537/537 [==============================] - 0s 318us/step - loss: 0.1345 - acc:
0.9385 - val_loss: 1.9299 - val_acc: 0.7273
Epoch 15/600
537/537 [==============================] - 0s 204us/step - loss: 0.0943 - acc:
0.9702 - val_loss: 1.9278 - val_acc: 0.7273
Epoch 16/600
537/537 [==============================] - 0s 93us/step - loss: 0.0903 - acc:
0.9702 - val_loss: 1.9496 - val_acc: 0.7100
Epoch 17/600
537/537 [==============================] - 0s 98us/step - loss: 0.0810 - acc:
0.9721 - val_loss: 1.9693 - val_acc: 0.7143
Epoch 18/600
537/537 [==============================] - 0s 150us/step - loss: 0.0849 - acc:
0.9702 - val_loss: 1.9177 - val_acc: 0.7186
Epoch 19/600
537/537 [==============================] - 0s 208us/step - loss: 0.1202 - acc:
0.9572 - val_loss: 1.9504 - val_acc: 0.7229
Epoch 20/600
537/537 [==============================] - 0s 169us/step - loss: 0.1045 - acc:
0.9572 - val_loss: 1.9507 - val_acc: 0.7186
Epoch 21/600
537/537 [==============================] - 0s 183us/step - loss: 0.0974 - acc:
0.9628 - val_loss: 1.9529 - val_acc: 0.7186
Epoch 22/600
537/537 [==============================] - 0s 161us/step - loss: 0.1208 - acc:
0.9628 - val_loss: 2.0331 - val_acc: 0.7273
Epoch 23/600
537/537 [==============================] - 0s 201us/step - loss: 0.1067 - acc:
0.9628 - val_loss: 1.9500 - val_acc: 0.7229
Epoch 24/600
537/537 [==============================] - 0s 162us/step - loss: 0.0996 - acc:
0.9590 - val_loss: 1.9958 - val_acc: 0.7186
Epoch 25/600
537/537 [==============================] - 0s 74us/step - loss: 0.1141 - acc:
0.9665 - val_loss: 2.0365 - val_acc: 0.7013
Epoch 26/600
537/537 [==============================] - 0s 54us/step - loss: 0.0977 - acc:
0.9609 - val_loss: 1.9121 - val_acc: 0.7186
Epoch 27/600
537/537 [==============================] - 0s 52us/step - loss: 0.1483 - acc:
0.9385 - val_loss: 1.9149 - val_acc: 0.7273
Epoch 28/600
537/537 [==============================] - 0s 58us/step - loss: 0.1151 - acc:
0.9553 - val_loss: 1.9765 - val_acc: 0.7143
Epoch 29/600
537/537 [==============================] - 0s 84us/step - loss: 0.1017 - acc:
```

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0.9628 - val_loss: 1.9449 - val_acc: 0.7100
Epoch 30/600
537/537 [==============================] - 0s 65us/step - loss: 0.1474 - acc:
0.9385 - val_loss: 2.0212 - val_acc: 0.6926
Epoch 31/600
537/537 [==============================] - 0s 48us/step - loss: 0.0838 - acc:
0.9683 - val_loss: 2.0017 - val_acc: 0.7143
Epoch 32/600
537/537 [==============================] - 0s 130us/step - loss: 0.0800 - acc:
0.9758 - val_loss: 1.9642 - val_acc: 0.7186
Epoch 33/600
537/537 [==============================] - 0s 113us/step - loss: 0.0884 - acc:
0.9721 - val_loss: 1.9438 - val_acc: 0.7186
Epoch 34/600
537/537 [==============================] - 0s 227us/step - loss: 0.1458 - acc:
0.9441 - val_loss: 2.1342 - val_acc: 0.6926
Epoch 35/600
537/537 [==============================] - 0s 204us/step - loss: 0.1162 - acc:
0.9516 - val_loss: 1.9714 - val_acc: 0.7143
Epoch 36/600
537/537 [==============================] - 0s 191us/step - loss: 0.0959 - acc:
0.9628 - val_loss: 2.0328 - val_acc: 0.7186
Epoch 37/600
537/537 [==============================] - 0s 188us/step - loss: 0.1039 - acc:
0.9646 - val_loss: 1.9536 - val_acc: 0.7273
Epoch 38/600
537/537 [==============================] - 0s 182us/step - loss: 0.1008 - acc:
0.9590 - val_loss: 1.9484 - val_acc: 0.7143
Epoch 39/600
537/537 [==============================] - 0s 175us/step - loss: 0.1181 - acc:
0.9534 - val_loss: 1.9631 - val_acc: 0.7143
Epoch 40/600
537/537 [==============================] - 0s 149us/step - loss: 0.0885 - acc:
0.9665 - val_loss: 1.9384 - val_acc: 0.7186
Epoch 41/600
537/537 [==============================] - 0s 277us/step - loss: 0.0926 - acc:
0.9683 - val_loss: 1.9861 - val_acc: 0.7143
Epoch 42/600
537/537 [==============================] - 0s 110us/step - loss: 0.0932 - acc:
0.9721 - val_loss: 1.9966 - val_acc: 0.7056
Epoch 43/600
537/537 [==============================] - 0s 748us/step - loss: 0.1281 - acc:
0.9590 - val_loss: 1.9804 - val_acc: 0.7229
Epoch 44/600
537/537 [==============================] - 0s 258us/step - loss: 0.1021 - acc:
0.9590 - val_loss: 1.9683 - val_acc: 0.7186
Epoch 45/600
537/537 [==============================] - 0s 449us/step - loss: 0.0859 - acc:
```

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0.9683 - val_loss: 1.9835 - val_acc: 0.7056
Epoch 46/600
537/537 [==============================] - 0s 175us/step - loss: 0.1263 - acc:
0.9497 - val_loss: 2.0083 - val_acc: 0.7056
Epoch 47/600
537/537 [==============================] - 0s 208us/step - loss: 0.0888 - acc:
0.9739 - val_loss: 1.9670 - val_acc: 0.7273
Epoch 48/600
537/537 [==============================] - 0s 212us/step - loss: 0.0902 - acc:
0.9758 - val_loss: 1.9311 - val_acc: 0.7143
Epoch 49/600
537/537 [==============================] - 0s 125us/step - loss: 0.0969 - acc:
0.9665 - val_loss: 2.0229 - val_acc: 0.7273
Epoch 50/600
537/537 [==============================] - 0s 128us/step - loss: 0.0994 - acc:
0.9665 - val_loss: 1.9519 - val_acc: 0.7229
Epoch 51/600
537/537 [==============================] - 0s 145us/step - loss: 0.1381 - acc:
0.9404 - val_loss: 1.9378 - val_acc: 0.7229
Epoch 52/600
537/537 [==============================] - 0s 210us/step - loss: 0.0970 - acc:
0.9628 - val_loss: 2.0035 - val_acc: 0.7143
Epoch 53/600
537/537 [==============================] - 0s 130us/step - loss: 0.0926 - acc:
0.9665 - val_loss: 1.9527 - val_acc: 0.7229
Epoch 54/600
537/537 [==============================] - 0s 61us/step - loss: 0.0970 - acc:
0.9646 - val_loss: 1.9333 - val_acc: 0.7143
Epoch 55/600
537/537 [==============================] - 0s 106us/step - loss: 0.0813 - acc:
0.9814 - val_loss: 1.9543 - val_acc: 0.7186
Epoch 56/600
537/537 [==============================] - 0s 137us/step - loss: 0.1229 - acc:
0.9628 - val_loss: 1.9528 - val_acc: 0.7359
Epoch 57/600
537/537 [==============================] - 0s 87us/step - loss: 0.1002 - acc:
0.9628 - val_loss: 1.9865 - val_acc: 0.7100
Epoch 58/600
537/537 [==============================] - 0s 225us/step - loss: 0.0840 - acc:
0.9758 - val_loss: 1.9389 - val_acc: 0.7229
Epoch 59/600
537/537 [==============================] - 0s 297us/step - loss: 0.0878 - acc:
0.9646 - val_loss: 1.9373 - val_acc: 0.7273
Epoch 60/600
537/537 [==============================] - 0s 74us/step - loss: 0.1221 - acc:
0.9553 - val_loss: 1.9374 - val_acc: 0.7143
Epoch 61/600
537/537 [==============================] - 0s 71us/step - loss: 0.1213 - acc:
```

```
0.9590 - val_loss: 2.2151 - val_acc: 0.6926
Epoch 62/600
537/537 [==============================] - 0s 59us/step - loss: 0.1452 - acc:
0.9460 - val_loss: 1.9782 - val_acc: 0.7316
Epoch 63/600
537/537 [==============================] - 0s 65us/step - loss: 0.1623 - acc:
0.9367 - val_loss: 2.1092 - val_acc: 0.7186
Epoch 64/600
537/537 [==============================] - 0s 61us/step - loss: 0.1235 - acc:
0.9628 - val_loss: 1.9735 - val_acc: 0.7143
Epoch 65/600
537/537 [==============================] - 0s 123us/step - loss: 0.0961 - acc:
0.9609 - val_loss: 2.0310 - val_acc: 0.7056
Epoch 66/600
537/537 [==============================] - 0s 67us/step - loss: 0.1208 - acc:
0.9609 - val_loss: 1.9706 - val_acc: 0.7143
Epoch 67/600
537/537 [==============================] - 0s 70us/step - loss: 0.1109 - acc:
0.9609 - val_loss: 2.0209 - val_acc: 0.6970
Epoch 68/600
537/537 [==============================] - 0s 89us/step - loss: 0.0980 - acc:
0.9721 - val_loss: 1.9929 - val_acc: 0.7100
Epoch 69/600
537/537 [==============================] - 0s 156us/step - loss: 0.1080 - acc:
0.9572 - val_loss: 1.9603 - val_acc: 0.7273
Epoch 70/600
537/537 [==============================] - 0s 205us/step - loss: 0.0988 - acc:
0.9646 - val_loss: 2.0314 - val_acc: 0.7100
Epoch 71/600
537/537 [==============================] - 0s 103us/step - loss: 0.0976 - acc:
0.9646 - val_loss: 1.9645 - val_acc: 0.7143
Epoch 72/600
537/537 [==============================] - 0s 91us/step - loss: 0.1140 - acc:
0.9572 - val_loss: 2.0104 - val_acc: 0.7143
Epoch 73/600
537/537 [==============================] - 0s 154us/step - loss: 0.1156 - acc:
0.9609 - val_loss: 2.0461 - val_acc: 0.7013
Epoch 74/600
537/537 [==============================] - 0s 93us/step - loss: 0.0947 - acc:
0.9739 - val_loss: 1.9790 - val_acc: 0.7100
Epoch 75/600
537/537 [==============================] - 0s 94us/step - loss: 0.0803 - acc:
0.9739 - val_loss: 1.9560 - val_acc: 0.7316
Epoch 76/600
537/537 [==============================] - 0s 141us/step - loss: 0.0943 - acc:
0.9646 - val_loss: 2.0418 - val_acc: 0.7056
Epoch 77/600
537/537 [==============================] - 0s 100us/step - loss: 0.0916 - acc:
```

```
0.9628 - val_loss: 1.9895 - val_acc: 0.7100
Epoch 78/600
537/537 [==============================] - 0s 86us/step - loss: 0.0863 - acc:
0.9665 - val_loss: 2.0069 - val_acc: 0.7186
Epoch 79/600
537/537 [==============================] - 0s 145us/step - loss: 0.0850 - acc:
0.9721 - val_loss: 2.1322 - val_acc: 0.7013
Epoch 80/600
537/537 [==============================] - 0s 162us/step - loss: 0.1349 - acc:
0.9609 - val_loss: 2.0965 - val_acc: 0.7143
Epoch 81/600
537/537 [==============================] - 0s 197us/step - loss: 0.1190 - acc:
0.9553 - val_loss: 2.0128 - val_acc: 0.6926
Epoch 82/600
537/537 [==============================] - 1s 1ms/step - loss: 0.1025 - acc:
0.9665 - val_loss: 2.0249 - val_acc: 0.6970
Epoch 83/600
537/537 [==============================] - 0s 206us/step - loss: 0.0791 - acc:
0.9777 - val_loss: 2.0285 - val_acc: 0.7056
Epoch 84/600
537/537 [==============================] - 0s 132us/step - loss: 0.0818 - acc:
0.9777 - val_loss: 2.0196 - val_acc: 0.7013
Epoch 85/600
537/537 [==============================] - 0s 113us/step - loss: 0.0848 - acc:
0.9702 - val_loss: 2.1130 - val_acc: 0.6970
Epoch 86/600
537/537 [==============================] - 0s 223us/step - loss: 0.0916 - acc:
0.9665 - val_loss: 2.0403 - val_acc: 0.7056
Epoch 87/600
537/537 [==============================] - 0s 878us/step - loss: 0.0870 - acc:
0.9739 - val_loss: 2.0037 - val_acc: 0.7143
Epoch 88/600
537/537 [==============================] - 0s 219us/step - loss: 0.0936 - acc:
0.9665 - val_loss: 2.0058 - val_acc: 0.6970
Epoch 89/600
537/537 [==============================] - 0s 104us/step - loss: 0.0919 - acc:
0.9590 - val_loss: 2.0258 - val_acc: 0.7186
Epoch 90/600
537/537 [==============================] - 0s 108us/step - loss: 0.0821 - acc:
0.9721 - val_loss: 2.0335 - val_acc: 0.7056
Epoch 91/600
537/537 [==============================] - 0s 258us/step - loss: 0.1015 - acc:
0.9609 - val_loss: 1.9930 - val_acc: 0.7100
Epoch 92/600
537/537 [==============================] - 0s 91us/step - loss: 0.0999 - acc:
0.9609 - val_loss: 2.0903 - val_acc: 0.7056
Epoch 93/600
537/537 [==============================] - 0s 202us/step - loss: 0.1086 - acc:
```

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0.9534 - val_loss: 2.0159 - val_acc: 0.6926
Epoch 94/600
537/537 [==============================] - 0s 147us/step - loss: 0.0874 - acc:
0.9739 - val_loss: 2.0039 - val_acc: 0.7186
Epoch 95/600
537/537 [==============================] - 0s 221us/step - loss: 0.0733 - acc:
0.9777 - val_loss: 2.0601 - val_acc: 0.7100
Epoch 96/600
537/537 [==============================] - 0s 111us/step - loss: 0.1765 - acc:
0.9330 - val_loss: 2.0401 - val_acc: 0.7229
Epoch 97/600
537/537 [==============================] - 0s 162us/step - loss: 0.1165 - acc:
0.9534 - val_loss: 2.0684 - val_acc: 0.7143
Epoch 98/600
537/537 [==============================] - 0s 124us/step - loss: 0.0923 - acc:
0.9665 - val_loss: 2.0828 - val_acc: 0.7229
Epoch 99/600
537/537 [==============================] - 0s 154us/step - loss: 0.1003 - acc:
0.9702 - val_loss: 2.2133 - val_acc: 0.7013
Epoch 100/600
537/537 [==============================] - 0s 158us/step - loss: 0.1051 - acc:
0.9497 - val_loss: 1.9688 - val_acc: 0.7143
Epoch 101/600
537/537 [==============================] - 0s 186us/step - loss: 0.1494 - acc:
0.9497 - val_loss: 2.0135 - val_acc: 0.7229
Epoch 102/600
537/537 [==============================] - 0s 219us/step - loss: 0.0837 - acc:
0.9683 - val_loss: 2.1541 - val_acc: 0.7316
Epoch 103/600
537/537 [==============================] - 0s 149us/step - loss: 0.1073 - acc:
0.9702 - val_loss: 2.0340 - val_acc: 0.7143
Epoch 104/600
537/537 [==============================] - 0s 121us/step - loss: 0.1032 - acc:
0.9609 - val_loss: 2.0782 - val_acc: 0.7143
Epoch 105/600
537/537 [==============================] - 0s 160us/step - loss: 0.1048 - acc:
0.9646 - val_loss: 2.0142 - val_acc: 0.7229
Epoch 106/600
537/537 [==============================] - 0s 195us/step - loss: 0.1042 - acc:
0.9628 - val_loss: 2.0566 - val_acc: 0.7100
Epoch 107/600
537/537 [==============================] - 0s 186us/step - loss: 0.0953 - acc:
0.9683 - val_loss: 1.9985 - val_acc: 0.7100
Epoch 108/600
537/537 [==============================] - 0s 132us/step - loss: 0.0795 - acc:
0.9721 - val_loss: 2.0111 - val_acc: 0.7100
Epoch 109/600
537/537 [==============================] - 0s 258us/step - loss: 0.0806 - acc:
```

```
0.9739 - val_loss: 2.0121 - val_acc: 0.7316
Epoch 110/600
537/537 [==============================] - 0s 164us/step - loss: 0.0912 - acc:
0.9646 - val_loss: 2.0379 - val_acc: 0.7056
Epoch 111/600
537/537 [==============================] - 0s 158us/step - loss: 0.0901 - acc:
0.9702 - val_loss: 2.0031 - val_acc: 0.7143
Epoch 112/600
537/537 [==============================] - 0s 219us/step - loss: 0.0930 - acc:
0.9646 - val_loss: 2.1475 - val_acc: 0.6970
Epoch 113/600
537/537 [==============================] - 0s 243us/step - loss: 0.1683 - acc:
0.9460 - val_loss: 2.0576 - val_acc: 0.7316
Epoch 114/600
537/537 [==============================] - 0s 182us/step - loss: 0.1537 - acc:
0.9497 - val_loss: 2.1539 - val_acc: 0.7186
Epoch 115/600
537/537 [==============================] - 0s 418us/step - loss: 0.0949 - acc:
0.9628 - val_loss: 2.0345 - val_acc: 0.7056
Epoch 116/600
537/537 [==============================] - 0s 254us/step - loss: 0.0846 - acc:
0.9702 - val_loss: 1.9749 - val_acc: 0.7186
Epoch 117/600
537/537 [==============================] - 0s 115us/step - loss: 0.0882 - acc:
0.9646 - val_loss: 2.0003 - val_acc: 0.7143
Epoch 118/600
537/537 [==============================] - 0s 71us/step - loss: 0.1015 - acc:
0.9609 - val_loss: 2.2052 - val_acc: 0.7143
Epoch 119/600
537/537 [==============================] - 0s 63us/step - loss: 0.1310 - acc:
0.9516 - val_loss: 2.2479 - val_acc: 0.7100
Epoch 120/600
537/537 [==============================] - 0s 206us/step - loss: 0.1156 - acc:
0.9553 - val_loss: 2.0177 - val_acc: 0.7100
Epoch 121/600
537/537 [==============================] - 0s 219us/step - loss: 0.0969 - acc:
0.9628 - val_loss: 2.0612 - val_acc: 0.7143
Epoch 122/600
537/537 [==============================] - 0s 68us/step - loss: 0.0860 - acc:
0.9739 - val_loss: 1.9917 - val_acc: 0.7229
Epoch 123/600
537/537 [==============================] - 0s 199us/step - loss: 0.2517 - acc:
0.9236 - val_loss: 2.0582 - val_acc: 0.6926
Epoch 124/600
537/537 [==============================] - 0s 182us/step - loss: 0.1069 - acc:
0.9628 - val_loss: 1.9741 - val_acc: 0.7273
Epoch 125/600
537/537 [==============================] - 0s 141us/step - loss: 0.1043 - acc:
```

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0.9590 - val_loss: 1.9577 - val_acc: 0.7229
Epoch 126/600
537/537 [==============================] - 0s 332us/step - loss: 0.1021 - acc:
0.9590 - val_loss: 2.0125 - val_acc: 0.7100
Epoch 127/600
537/537 [==============================] - 0s 109us/step - loss: 0.1327 - acc:
0.9479 - val_loss: 1.9727 - val_acc: 0.7229
Epoch 128/600
537/537 [==============================] - 0s 149us/step - loss: 0.0948 - acc:
0.9628 - val_loss: 2.0125 - val_acc: 0.7273
Epoch 129/600
537/537 [==============================] - 0s 269us/step - loss: 0.0807 - acc:
0.9665 - val_loss: 2.0286 - val_acc: 0.7143
Epoch 130/600
537/537 [==============================] - 0s 206us/step - loss: 0.1038 - acc:
0.9683 - val_loss: 1.9833 - val_acc: 0.7100
Epoch 131/600
537/537 [==============================] - 0s 102us/step - loss: 0.0860 - acc:
0.9758 - val_loss: 2.0263 - val_acc: 0.7143
Epoch 132/600
537/537 [==============================] - 0s 197us/step - loss: 0.0761 - acc:
0.9721 - val_loss: 2.0020 - val_acc: 0.7100
Epoch 133/600
537/537 [==============================] - 0s 98us/step - loss: 0.0871 - acc:
0.9646 - val_loss: 1.9945 - val_acc: 0.7186
Epoch 134/600
537/537 [==============================] - 0s 139us/step - loss: 0.1039 - acc:
0.9572 - val_loss: 2.0141 - val_acc: 0.7100
Epoch 135/600
537/537 [==============================] - 0s 295us/step - loss: 0.0974 - acc:
0.9683 - val_loss: 1.9817 - val_acc: 0.7143
Epoch 136/600
537/537 [==============================] - 0s 217us/step - loss: 0.0913 - acc:
0.9721 - val_loss: 2.0105 - val_acc: 0.7100
Epoch 137/600
537/537 [==============================] - 0s 95us/step - loss: 0.0940 - acc:
0.9665 - val_loss: 2.0653 - val_acc: 0.6970
Epoch 138/600
537/537 [==============================] - 0s 184us/step - loss: 0.1031 - acc:
0.9609 - val_loss: 1.9798 - val_acc: 0.7186
Epoch 139/600
537/537 [==============================] - 0s 323us/step - loss: 0.1035 - acc:
0.9609 - val_loss: 2.0163 - val_acc: 0.7186
Epoch 140/600
537/537 [==============================] - 0s 232us/step - loss: 0.1075 - acc:
0.9572 - val_loss: 2.0386 - val_acc: 0.7056
Epoch 141/600
537/537 [==============================] - 0s 232us/step - loss: 0.0933 - acc:
```

```
0.9683 - val_loss: 1.9944 - val_acc: 0.7229
Epoch 142/600
537/537 [==============================] - 0s 163us/step - loss: 0.1401 - acc:
0.9590 - val_loss: 1.9750 - val_acc: 0.7229
Epoch 143/600
537/537 [==============================] - 0s 132us/step - loss: 0.1086 - acc:
0.9590 - val_loss: 2.0861 - val_acc: 0.7186
Epoch 144/600
537/537 [==============================] - 0s 228us/step - loss: 0.1084 - acc:
0.9590 - val_loss: 2.0267 - val_acc: 0.7229
Epoch 145/600
537/537 [==============================] - 0s 176us/step - loss: 0.0799 - acc:
0.9683 - val_loss: 2.0248 - val_acc: 0.6970
Epoch 146/600
537/537 [==============================] - 0s 202us/step - loss: 0.0981 - acc:
0.9683 - val_loss: 1.9737 - val_acc: 0.7316
Epoch 147/600
537/537 [==============================] - 0s 130us/step - loss: 0.0793 - acc:
0.9739 - val_loss: 2.0990 - val_acc: 0.7273
Epoch 148/600
537/537 [==============================] - 0s 158us/step - loss: 0.0862 - acc:
0.9721 - val_loss: 2.0257 - val_acc: 0.7143
Epoch 149/600
537/537 [==============================] - 0s 169us/step - loss: 0.0956 - acc:
0.9665 - val_loss: 2.0080 - val_acc: 0.7186
Epoch 150/600
537/537 [==============================] - 0s 126us/step - loss: 0.1115 - acc:
0.9534 - val_loss: 1.9705 - val_acc: 0.7143
Epoch 151/600
537/537 [==============================] - 0s 217us/step - loss: 0.1418 - acc:
0.9534 - val_loss: 2.0258 - val_acc: 0.7056
Epoch 152/600
537/537 [==============================] - 0s 162us/step - loss: 0.0915 - acc:
0.9702 - val_loss: 1.9830 - val_acc: 0.7143
Epoch 153/600
537/537 [==============================] - 0s 104us/step - loss: 0.0937 - acc:
0.9758 - val_loss: 2.0083 - val_acc: 0.7229
Epoch 154/600
537/537 [==============================] - 0s 82us/step - loss: 0.0994 - acc:
0.9665 - val_loss: 2.0422 - val_acc: 0.7056
Epoch 155/600
537/537 [==============================] - 1s 1ms/step - loss: 0.0939 - acc:
0.9665 - val_loss: 2.1115 - val_acc: 0.7273
Epoch 156/600
537/537 [==============================] - 0s 175us/step - loss: 0.0844 - acc:
0.9683 - val_loss: 1.9704 - val_acc: 0.7143
Epoch 157/600
537/537 [==============================] - 0s 171us/step - loss: 0.0799 - acc:
```

```
0.9758 - val_loss: 2.1924 - val_acc: 0.7013
Epoch 158/600
537/537 [==============================] - 0s 178us/step - loss: 0.1745 - acc:
0.9441 - val_loss: 2.0554 - val_acc: 0.7056
Epoch 159/600
537/537 [==============================] - 0s 282us/step - loss: 0.1153 - acc:
0.9479 - val_loss: 2.0196 - val_acc: 0.7186
Epoch 160/600
537/537 [==============================] - 0s 349us/step - loss: 0.1100 - acc:
0.9628 - val_loss: 1.9905 - val_acc: 0.7186
Epoch 161/600
537/537 [==============================] - 0s 119us/step - loss: 0.0925 - acc:
0.9683 - val_loss: 2.0185 - val_acc: 0.7186
Epoch 162/600
537/537 [==============================] - 0s 202us/step - loss: 0.0919 - acc:
0.9609 - val_loss: 1.9969 - val_acc: 0.7100
Epoch 163/600
537/537 [==============================] - 0s 104us/step - loss: 0.1365 - acc:
0.9534 - val_loss: 2.1039 - val_acc: 0.7186
Epoch 164/600
537/537 [==============================] - 0s 124us/step - loss: 0.1147 - acc:
0.9609 - val_loss: 2.1159 - val_acc: 0.7056
Epoch 165/600
537/537 [==============================] - 0s 169us/step - loss: 0.0957 - acc:
0.9683 - val_loss: 2.1075 - val_acc: 0.7273
Epoch 166/600
537/537 [==============================] - ETA: 0s - loss: 0.1018 - acc: 0.971 -
0s 275us/step - loss: 0.1022 - acc: 0.9628 - val_loss: 2.0004 - val_acc: 0.7143
Epoch 167/600
537/537 [==============================] - 0s 145us/step - loss: 0.0933 - acc:
0.9702 - val_loss: 2.0009 - val_acc: 0.7273
Epoch 168/600
537/537 [==============================] - 0s 225us/step - loss: 0.0957 - acc:
0.9609 - val_loss: 2.0486 - val_acc: 0.7186
Epoch 169/600
537/537 [==============================] - ETA: 0s - loss: 0.2056 - acc: 0.937 -
0s 100us/step - loss: 0.1157 - acc: 0.9590 - val_loss: 2.0076 - val_acc: 0.7143
Epoch 170/600
537/537 [==============================] - 0s 214us/step - loss: 0.1284 - acc:
0.9534 - val_loss: 2.1158 - val_acc: 0.7229
Epoch 171/600
537/537 [==============================] - 0s 148us/step - loss: 0.2682 - acc:
0.9143 - val_loss: 2.1834 - val_acc: 0.7229
Epoch 172/600
537/537 [==============================] - 0s 182us/step - loss: 0.2266 - acc:
0.9404 - val_loss: 1.9512 - val_acc: 0.7229
Epoch 173/600
537/537 [==============================] - 0s 124us/step - loss: 0.1235 - acc:
```

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0.9479 - val_loss: 2.0233 - val_acc: 0.7186
Epoch 174/600
537/537 [==============================] - 0s 126us/step - loss: 0.0986 - acc:
0.9628 - val_loss: 1.9788 - val_acc: 0.7273
Epoch 175/600
537/537 [==============================] - 0s 217us/step - loss: 0.0936 - acc:
0.9683 - val_loss: 1.9813 - val_acc: 0.7186
Epoch 176/600
537/537 [==============================] - 0s 238us/step - loss: 0.0799 - acc:
0.9702 - val_loss: 2.0276 - val_acc: 0.7056
Epoch 177/600
537/537 [==============================] - 0s 191us/step - loss: 0.0993 - acc:
0.9646 - val_loss: 2.0107 - val_acc: 0.7186
Epoch 178/600
537/537 [==============================] - 0s 244us/step - loss: 0.1391 - acc:
0.9534 - val_loss: 2.0495 - val_acc: 0.7186
Epoch 179/600
537/537 [==============================] - 0s 308us/step - loss: 0.1275 - acc:
0.9572 - val_loss: 2.0481 - val_acc: 0.7143
Epoch 180/600
537/537 [==============================] - 0s 113us/step - loss: 0.0900 - acc:
0.9683 - val_loss: 2.0383 - val_acc: 0.7229
Epoch 181/600
537/537 [==============================] - 0s 152us/step - loss: 0.0973 - acc:
0.9646 - val_loss: 1.9938 - val_acc: 0.7229
Epoch 182/600
537/537 [==============================] - 0s 119us/step - loss: 0.0820 - acc:
0.9665 - val_loss: 2.0032 - val_acc: 0.7143
Epoch 183/600
537/537 [==============================] - 0s 117us/step - loss: 0.0793 - acc:
0.9758 - val_loss: 2.0208 - val_acc: 0.7229
Epoch 184/600
537/537 [==============================] - 0s 195us/step - loss: 0.0800 - acc:
0.9777 - val_loss: 1.9640 - val_acc: 0.7229
Epoch 185/600
537/537 [==============================] - 0s 321us/step - loss: 0.0962 - acc:
0.9609 - val_loss: 1.9881 - val_acc: 0.7186
Epoch 186/600
537/537 [==============================] - 0s 85us/step - loss: 0.0783 - acc:
0.9721 - val_loss: 1.9991 - val_acc: 0.7229
Epoch 187/600
537/537 [==============================] - 0s 221us/step - loss: 0.0841 - acc:
0.9739 - val_loss: 2.0108 - val_acc: 0.7186
Epoch 188/600
537/537 [==============================] - 0s 262us/step - loss: 0.0908 - acc:
0.9665 - val_loss: 2.0446 - val_acc: 0.7316
Epoch 189/600
537/537 [==============================] - 0s 195us/step - loss: 0.1659 - acc:
```

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0.9385 - val_loss: 2.0793 - val_acc: 0.7056
Epoch 190/600
537/537 [==============================] - 0s 169us/step - loss: 0.1045 - acc:
0.9572 - val_loss: 2.0509 - val_acc: 0.7013
Epoch 191/600
537/537 [==============================] - 0s 197us/step - loss: 0.0930 - acc:
0.9646 - val_loss: 2.0584 - val_acc: 0.7143
Epoch 192/600
537/537 [==============================] - 0s 221us/step - loss: 0.0886 - acc:
0.9739 - val_loss: 2.0414 - val_acc: 0.7186
Epoch 193/600
537/537 [==============================] - 0s 154us/step - loss: 0.0911 - acc:
0.9665 - val_loss: 2.0388 - val_acc: 0.7273
Epoch 194/600
537/537 [==============================] - 0s 119us/step - loss: 0.1391 - acc:
0.9590 - val_loss: 2.3041 - val_acc: 0.7056
Epoch 195/600
537/537 [==============================] - 0s 106us/step - loss: 0.1151 - acc:
0.9497 - val_loss: 2.0776 - val_acc: 0.7056
Epoch 196/600
537/537 [==============================] - 0s 104us/step - loss: 0.1402 - acc:
0.9534 - val_loss: 2.0965 - val_acc: 0.7143
Epoch 197/600
537/537 [==============================] - 0s 344us/step - loss: 0.0861 - acc:
0.9721 - val_loss: 2.3876 - val_acc: 0.7013
Epoch 198/600
537/537 [==============================] - 0s 256us/step - loss: 0.1266 - acc:
0.9534 - val_loss: 2.0265 - val_acc: 0.7273
Epoch 199/600
537/537 [==============================] - 0s 125us/step - loss: 0.1040 - acc:
0.9646 - val_loss: 2.0395 - val_acc: 0.7186
Epoch 200/600
537/537 [==============================] - 0s 150us/step - loss: 0.0812 - acc:
0.9665 - val_loss: 2.0956 - val_acc: 0.7143
Epoch 201/600
537/537 [==============================] - 0s 206us/step - loss: 0.1244 - acc:
0.9479 - val_loss: 2.0860 - val_acc: 0.7316
Epoch 202/600
537/537 [==============================] - 0s 167us/step - loss: 0.1391 - acc:
0.9497 - val_loss: 2.0405 - val_acc: 0.7229
Epoch 203/600
537/537 [==============================] - 0s 126us/step - loss: 0.0926 - acc:
0.9665 - val_loss: 2.0428 - val_acc: 0.7100
Epoch 204/600
537/537 [==============================] - 0s 241us/step - loss: 0.1147 - acc:
0.9590 - val_loss: 2.0291 - val_acc: 0.7229
Epoch 205/600
537/537 [==============================] - 0s 247us/step - loss: 0.0717 - acc:
```

```
0.9739 - val_loss: 2.0425 - val_acc: 0.7229
Epoch 206/600
537/537 [==============================] - 0s 106us/step - loss: 0.1629 - acc:
0.9385 - val_loss: 2.0362 - val_acc: 0.7186
Epoch 207/600
537/537 [==============================] - 0s 195us/step - loss: 0.0946 - acc:
0.9646 - val_loss: 2.0185 - val_acc: 0.7186
Epoch 208/600
537/537 [==============================] - 0s 152us/step - loss: 0.0873 - acc:
0.9628 - val_loss: 2.0960 - val_acc: 0.7186
Epoch 209/600
537/537 [==============================] - 0s 137us/step - loss: 0.0962 - acc:
0.9665 - val_loss: 2.1346 - val_acc: 0.7056
Epoch 210/600
537/537 [==============================] - 0s 75us/step - loss: 0.1060 - acc:
0.9665 - val_loss: 2.0188 - val_acc: 0.7273
Epoch 211/600
537/537 [==============================] - 0s 301us/step - loss: 0.1074 - acc:
0.9497 - val_loss: 2.0085 - val_acc: 0.7273
Epoch 212/600
537/537 [==============================] - 0s 76us/step - loss: 0.1027 - acc:
0.9665 - val_loss: 2.0147 - val_acc: 0.7143
Epoch 213/600
537/537 [==============================] - 0s 98us/step - loss: 0.0915 - acc:
0.9628 - val_loss: 2.1826 - val_acc: 0.7273
Epoch 214/600
537/537 [==============================] - 0s 104us/step - loss: 0.0966 - acc:
0.9572 - val_loss: 2.0650 - val_acc: 0.7273
Epoch 215/600
537/537 [==============================] - 0s 271us/step - loss: 0.1528 - acc:
0.9497 - val_loss: 2.0622 - val_acc: 0.7186
Epoch 216/600
537/537 [==============================] - 0s 269us/step - loss: 0.0891 - acc:
0.9665 - val_loss: 2.0596 - val_acc: 0.7100
Epoch 217/600
537/537 [==============================] - 0s 210us/step - loss: 0.0940 - acc:
0.9702 - val_loss: 2.0753 - val_acc: 0.7229
Epoch 218/600
537/537 [==============================] - 0s 143us/step - loss: 0.0818 - acc:
0.9739 - val_loss: 2.2205 - val_acc: 0.7186
Epoch 219/600
537/537 [==============================] - 0s 186us/step - loss: 0.1668 - acc:
0.9423 - val_loss: 2.0451 - val_acc: 0.7186
Epoch 220/600
537/537 [==============================] - 0s 340us/step - loss: 0.1017 - acc:
0.9646 - val_loss: 2.1907 - val_acc: 0.7056
Epoch 221/600
537/537 [==============================] - 0s 261us/step - loss: 0.1026 - acc:
```

```
0.9646 - val_loss: 2.0687 - val_acc: 0.7143
Epoch 222/600
537/537 [==============================] - 0s 160us/step - loss: 0.0863 - acc:
0.9683 - val_loss: 2.0201 - val_acc: 0.7186
Epoch 223/600
537/537 [==============================] - 0s 71us/step - loss: 0.0933 - acc:
0.9609 - val_loss: 2.0840 - val_acc: 0.7143
Epoch 224/600
537/537 [==============================] - 0s 158us/step - loss: 0.0880 - acc:
0.9721 - val_loss: 2.0237 - val_acc: 0.7273
Epoch 225/600
537/537 [==============================] - 0s 87us/step - loss: 0.1534 - acc:
0.9460 - val_loss: 2.0864 - val_acc: 0.7013
Epoch 226/600
537/537 [==============================] - 0s 62us/step - loss: 0.0933 - acc:
0.9702 - val_loss: 2.0201 - val_acc: 0.7229
Epoch 227/600
537/537 [==============================] - 0s 72us/step - loss: 0.1056 - acc:
0.9572 - val_loss: 2.0954 - val_acc: 0.7143
Epoch 228/600
537/537 [==============================] - 0s 106us/step - loss: 0.1041 - acc:
0.9646 - val_loss: 2.0971 - val_acc: 0.7186
Epoch 229/600
537/537 [==============================] - 0s 80us/step - loss: 0.1155 - acc:
0.9553 - val_loss: 2.0203 - val_acc: 0.7186
Epoch 230/600
537/537 [==============================] - 0s 97us/step - loss: 0.0803 - acc:
0.9777 - val_loss: 2.0718 - val_acc: 0.7186
Epoch 231/600
537/537 [==============================] - 0s 273us/step - loss: 0.0849 - acc:
0.9721 - val_loss: 2.0341 - val_acc: 0.7186
Epoch 232/600
537/537 [==============================] - 0s 86us/step - loss: 0.0850 - acc:
0.9721 - val_loss: 2.1123 - val_acc: 0.7316
Epoch 233/600
537/537 [==============================] - 0s 84us/step - loss: 0.0724 - acc:
0.9758 - val_loss: 2.0252 - val_acc: 0.7056
Epoch 234/600
537/537 [==============================] - 0s 82us/step - loss: 0.1030 - acc:
0.9665 - val_loss: 2.0320 - val_acc: 0.7186
Epoch 235/600
537/537 [==============================] - 0s 100us/step - loss: 0.0964 - acc:
0.9646 - val_loss: 2.0439 - val_acc: 0.7056
Epoch 236/600
537/537 [==============================] - 0s 178us/step - loss: 0.0946 - acc:
0.9628 - val_loss: 1.9904 - val_acc: 0.7143
Epoch 237/600
537/537 [==============================] - 0s 61us/step - loss: 0.0712 - acc:
```

```
0.9758 - val_loss: 1.9990 - val_acc: 0.7100
Epoch 238/600
537/537 [==============================] - 0s 77us/step - loss: 0.0884 - acc:
0.9702 - val_loss: 2.0437 - val_acc: 0.7056
Epoch 239/600
537/537 [==============================] - 0s 165us/step - loss: 0.0923 - acc:
0.9628 - val_loss: 2.0650 - val_acc: 0.7143
Epoch 240/600
537/537 [==============================] - 0s 178us/step - loss: 0.1044 - acc:
0.9646 - val_loss: 2.0791 - val_acc: 0.7316
Epoch 241/600
537/537 [==============================] - 0s 171us/step - loss: 0.0856 - acc:
0.9683 - val_loss: 2.1194 - val_acc: 0.7229
Epoch 242/600
537/537 [==============================] - 0s 65us/step - loss: 0.1693 - acc:
0.9330 - val_loss: 2.0249 - val_acc: 0.7316
Epoch 243/600
537/537 [==============================] - 0s 72us/step - loss: 0.1515 - acc:
0.9330 - val_loss: 2.1296 - val_acc: 0.7359
Epoch 244/600
537/537 [==============================] - 0s 69us/step - loss: 0.1752 - acc:
0.9367 - val_loss: 2.1580 - val_acc: 0.7186
Epoch 245/600
537/537 [==============================] - 0s 180us/step - loss: 0.1125 - acc:
0.9646 - val_loss: 1.9832 - val_acc: 0.7316
Epoch 246/600
537/537 [==============================] - 0s 98us/step - loss: 0.0972 - acc:
0.9609 - val_loss: 2.0070 - val_acc: 0.7186
Epoch 247/600
537/537 [==============================] - 0s 115us/step - loss: 0.0845 - acc:
0.9628 - val_loss: 2.0889 - val_acc: 0.7273
Epoch 248/600
537/537 [==============================] - 0s 125us/step - loss: 0.1133 - acc:
0.9553 - val_loss: 2.0268 - val_acc: 0.7143
Epoch 249/600
537/537 [==============================] - 0s 221us/step - loss: 0.0891 - acc:
0.9721 - val_loss: 2.1119 - val_acc: 0.7229
Epoch 250/600
537/537 [==============================] - 0s 201us/step - loss: 0.1069 - acc:
0.9646 - val_loss: 2.0713 - val_acc: 0.7229
Epoch 251/600
537/537 [==============================] - 0s 215us/step - loss: 0.0862 - acc:
0.9777 - val_loss: 2.0282 - val_acc: 0.7229
Epoch 252/600
537/537 [==============================] - 0s 128us/step - loss: 0.1041 - acc:
0.9646 - val_loss: 2.0581 - val_acc: 0.7143
Epoch 253/600
537/537 [==============================] - 0s 108us/step - loss: 0.0899 - acc:
```

```
0.9702 - val_loss: 2.0935 - val_acc: 0.7273
Epoch 254/600
537/537 [==============================] - 0s 173us/step - loss: 0.1195 - acc:
0.9628 - val_loss: 2.0145 - val_acc: 0.7316
Epoch 255/600
537/537 [==============================] - 0s 214us/step - loss: 0.1120 - acc:
0.9665 - val_loss: 2.0649 - val_acc: 0.7186
Epoch 256/600
537/537 [==============================] - 0s 258us/step - loss: 0.1016 - acc:
0.9628 - val_loss: 2.0868 - val_acc: 0.7143
Epoch 257/600
537/537 [==============================] - 0s 191us/step - loss: 0.0791 - acc:
0.9721 - val_loss: 2.0982 - val_acc: 0.7229
Epoch 258/600
537/537 [==============================] - 0s 182us/step - loss: 0.0996 - acc:
0.9646 - val_loss: 2.0504 - val_acc: 0.7229
Epoch 259/600
537/537 [==============================] - 0s 197us/step - loss: 0.1005 - acc:
0.9609 - val_loss: 2.1379 - val_acc: 0.7186
Epoch 260/600
537/537 [==============================] - 0s 204us/step - loss: 0.1740 - acc:
0.9441 - val_loss: 2.0567 - val_acc: 0.7229
Epoch 261/600
537/537 [==============================] - 0s 96us/step - loss: 0.0958 - acc:
0.9683 - val_loss: 2.0496 - val_acc: 0.7186
Epoch 262/600
537/537 [==============================] - 0s 197us/step - loss: 0.1444 - acc:
0.9497 - val_loss: 2.0404 - val_acc: 0.7316
Epoch 263/600
537/537 [==============================] - 0s 294us/step - loss: 0.1091 - acc:
0.9590 - val_loss: 2.0856 - val_acc: 0.7143
Epoch 264/600
537/537 [==============================] - 0s 82us/step - loss: 0.0857 - acc:
0.9758 - val_loss: 2.0571 - val_acc: 0.7273
Epoch 265/600
537/537 [==============================] - 0s 189us/step - loss: 0.0881 - acc:
0.9702 - val_loss: 2.1617 - val_acc: 0.7013
Epoch 266/600
537/537 [==============================] - 0s 249us/step - loss: 0.1061 - acc:
0.9665 - val_loss: 2.0503 - val_acc: 0.7229
Epoch 267/600
537/537 [==============================] - 0s 117us/step - loss: 0.1048 - acc:
0.9646 - val_loss: 2.0453 - val_acc: 0.7316
Epoch 268/600
537/537 [==============================] - 0s 110us/step - loss: 0.0839 - acc:
0.9702 - val_loss: 2.1118 - val_acc: 0.7100
Epoch 269/600
537/537 [==============================] - 0s 178us/step - loss: 0.1203 - acc:
```

```
0.9534 - val_loss: 2.1173 - val_acc: 0.7056
Epoch 270/600
537/537 [==============================] - 0s 74us/step - loss: 0.0887 - acc:
0.9702 - val_loss: 2.0284 - val_acc: 0.7229
Epoch 271/600
537/537 [==============================] - 0s 59us/step - loss: 0.0786 - acc:
0.9721 - val_loss: 2.0679 - val_acc: 0.7186
Epoch 272/600
537/537 [==============================] - 0s 78us/step - loss: 0.1595 - acc:
0.9460 - val_loss: 2.0396 - val_acc: 0.7100
Epoch 273/600
537/537 [==============================] - 0s 100us/step - loss: 0.0933 - acc:
0.9628 - val_loss: 2.3386 - val_acc: 0.6970
Epoch 274/600
537/537 [==============================] - 0s 74us/step - loss: 0.1022 - acc:
0.9646 - val_loss: 2.0489 - val_acc: 0.7229
Epoch 275/600
537/537 [==============================] - 0s 63us/step - loss: 0.0879 - acc:
0.9665 - val_loss: 2.0444 - val_acc: 0.7229
Epoch 276/600
537/537 [==============================] - 0s 67us/step - loss: 0.1052 - acc:
0.9590 - val_loss: 2.0237 - val_acc: 0.7100
Epoch 277/600
537/537 [==============================] - 0s 72us/step - loss: 0.1556 - acc:
0.9516 - val_loss: 2.1077 - val_acc: 0.7186
Epoch 278/600
537/537 [==============================] - 0s 76us/step - loss: 0.1499 - acc:
0.9479 - val_loss: 2.0766 - val_acc: 0.7143
Epoch 279/600
537/537 [==============================] - 0s 98us/step - loss: 0.0933 - acc:
0.9683 - val_loss: 2.0194 - val_acc: 0.7229
Epoch 280/600
537/537 [==============================] - 0s 82us/step - loss: 0.0918 - acc:
0.9665 - val_loss: 2.0812 - val_acc: 0.7056
Epoch 281/600
537/537 [==============================] - 0s 63us/step - loss: 0.0777 - acc:
0.9702 - val_loss: 2.0637 - val_acc: 0.7056
Epoch 282/600
537/537 [==============================] - 0s 67us/step - loss: 0.1053 - acc:
0.9665 - val_loss: 2.0464 - val_acc: 0.7056
Epoch 283/600
537/537 [==============================] - 0s 61us/step - loss: 0.0891 - acc:
0.9683 - val_loss: 2.0168 - val_acc: 0.7316
Epoch 284/600
537/537 [==============================] - 0s 72us/step - loss: 0.0835 - acc:
0.9702 - val_loss: 2.0115 - val_acc: 0.7359
Epoch 285/600
537/537 [==============================] - 0s 176us/step - loss: 0.0880 - acc:
```

```
0.9646 - val_loss: 2.0179 - val_acc: 0.7100
Epoch 286/600
537/537 [==============================] - 0s 61us/step - loss: 0.1072 - acc:
0.9460 - val_loss: 1.9784 - val_acc: 0.7359
Epoch 287/600
537/537 [==============================] - 0s 74us/step - loss: 0.1544 - acc:
0.9516 - val_loss: 2.0611 - val_acc: 0.7273
Epoch 288/600
537/537 [==============================] - 0s 66us/step - loss: 0.1233 - acc:
0.9646 - val_loss: 2.0963 - val_acc: 0.7229
Epoch 289/600
537/537 [==============================] - 0s 71us/step - loss: 0.1405 - acc:
0.9553 - val_loss: 2.1331 - val_acc: 0.7229
Epoch 290/600
537/537 [==============================] - 0s 63us/step - loss: 0.1049 - acc:
0.9628 - val_loss: 2.0589 - val_acc: 0.7186
Epoch 291/600
537/537 [==============================] - 0s 63us/step - loss: 0.1058 - acc:
0.9609 - val_loss: 2.0447 - val_acc: 0.7273
Epoch 292/600
537/537 [==============================] - 0s 65us/step - loss: 0.0876 - acc:
0.9702 - val_loss: 2.0463 - val_acc: 0.7186
Epoch 293/600
537/537 [==============================] - 0s 58us/step - loss: 0.1051 - acc:
0.9534 - val_loss: 2.0810 - val_acc: 0.7056
Epoch 294/600
537/537 [==============================] - 0s 174us/step - loss: 0.1405 - acc:
0.9497 - val_loss: 2.1405 - val_acc: 0.7056
Epoch 295/600
537/537 [==============================] - 0s 80us/step - loss: 0.0968 - acc:
0.9665 - val_loss: 2.0973 - val_acc: 0.7013
Epoch 296/600
537/537 [==============================] - 0s 137us/step - loss: 0.0922 - acc:
0.9609 - val_loss: 2.0337 - val_acc: 0.7186
Epoch 297/600
537/537 [==============================] - 0s 143us/step - loss: 0.0841 - acc:
0.9739 - val_loss: 2.0197 - val_acc: 0.7316
Epoch 298/600
537/537 [==============================] - 0s 141us/step - loss: 0.0998 - acc:
0.9572 - val_loss: 2.0343 - val_acc: 0.7143
Epoch 299/600
537/537 [==============================] - 0s 228us/step - loss: 0.0996 - acc:
0.9628 - val_loss: 2.0288 - val_acc: 0.7273
Epoch 300/600
537/537 [==============================] - ETA: 0s - loss: 0.0714 - acc: 0.972 -
0s 318us/step - loss: 0.0699 - acc: 0.9739 - val_loss: 2.0532 - val_acc: 0.7143
Epoch 301/600
537/537 [==============================] - 0s 137us/step - loss: 0.0746 - acc:
```

```
0.9702 - val_loss: 2.0788 - val_acc: 0.7186
Epoch 302/600
537/537 [==============================] - 0s 212us/step - loss: 0.0921 - acc:
0.9609 - val_loss: 2.0604 - val_acc: 0.7186
Epoch 303/600
537/537 [==============================] - 0s 173us/step - loss: 0.0831 - acc:
0.9665 - val_loss: 2.0594 - val_acc: 0.7186
Epoch 304/600
537/537 [==============================] - 0s 215us/step - loss: 0.1184 - acc:
0.9516 - val_loss: 2.1053 - val_acc: 0.7100
Epoch 305/600
537/537 [==============================] - 0s 174us/step - loss: 0.0858 - acc:
0.9739 - val_loss: 2.0296 - val_acc: 0.7143
Epoch 306/600
537/537 [==============================] - 0s 296us/step - loss: 0.1565 - acc:
0.9497 - val_loss: 2.0371 - val_acc: 0.7186
Epoch 307/600
537/537 [==============================] - 0s 115us/step - loss: 0.0968 - acc:
0.9628 - val_loss: 2.0707 - val_acc: 0.7100
Epoch 308/600
537/537 [==============================] - 0s 306us/step - loss: 0.0780 - acc:
0.9702 - val_loss: 2.0729 - val_acc: 0.7013
Epoch 309/600
537/537 [==============================] - 0s 93us/step - loss: 0.1436 - acc:
0.9553 - val_loss: 2.1060 - val_acc: 0.7143
Epoch 310/600
537/537 [==============================] - 0s 123us/step - loss: 0.1040 - acc:
0.9609 - val_loss: 2.0686 - val_acc: 0.7100
Epoch 311/600
537/537 [==============================] - 0s 191us/step - loss: 0.0843 - acc:
0.9683 - val_loss: 2.0578 - val_acc: 0.7186
Epoch 312/600
537/537 [==============================] - 0s 212us/step - loss: 0.0975 - acc:
0.9646 - val_loss: 2.0231 - val_acc: 0.7229
Epoch 313/600
537/537 [==============================] - 0s 154us/step - loss: 0.1116 - acc:
0.9665 - val_loss: 2.0752 - val_acc: 0.7273
Epoch 314/600
537/537 [==============================] - 0s 143us/step - loss: 0.1009 - acc:
0.9665 - val_loss: 2.1434 - val_acc: 0.7229
Epoch 315/600
537/537 [==============================] - 0s 295us/step - loss: 0.0970 - acc:
0.9683 - val_loss: 2.0365 - val_acc: 0.7186
Epoch 316/600
537/537 [==============================] - 0s 126us/step - loss: 0.0918 - acc:
0.9665 - val_loss: 2.0332 - val_acc: 0.7143
Epoch 317/600
537/537 [==============================] - 0s 173us/step - loss: 0.1750 - acc:
```

```
0.9534 - val_loss: 2.0592 - val_acc: 0.7273
Epoch 318/600
537/537 [==============================] - 0s 201us/step - loss: 0.1429 - acc:
0.9460 - val_loss: 2.0563 - val_acc: 0.7229
Epoch 319/600
537/537 [==============================] - 0s 292us/step - loss: 0.1322 - acc:
0.9553 - val_loss: 2.1513 - val_acc: 0.7013
Epoch 320/600
537/537 [==============================] - 0s 186us/step - loss: 0.0911 - acc:
0.9683 - val_loss: 2.0730 - val_acc: 0.7186
Epoch 321/600
537/537 [==============================] - 0s 145us/step - loss: 0.1274 - acc:
0.9646 - val_loss: 2.0685 - val_acc: 0.7186
Epoch 322/600
537/537 [==============================] - 0s 95us/step - loss: 0.1260 - acc:
0.9572 - val_loss: 2.0902 - val_acc: 0.7186
Epoch 323/600
537/537 [==============================] - 0s 258us/step - loss: 0.0822 - acc:
0.9665 - val_loss: 2.0420 - val_acc: 0.7186
Epoch 324/600
537/537 [==============================] - 0s 111us/step - loss: 0.1184 - acc:
0.9665 - val_loss: 2.0767 - val_acc: 0.7273
Epoch 325/600
537/537 [==============================] - 0s 141us/step - loss: 0.0929 - acc:
0.9683 - val_loss: 2.0839 - val_acc: 0.7229
Epoch 326/600
537/537 [==============================] - 0s 106us/step - loss: 0.0838 - acc:
0.9739 - val_loss: 2.1070 - val_acc: 0.7143
Epoch 327/600
537/537 [==============================] - 0s 193us/step - loss: 0.0811 - acc:
0.9646 - val_loss: 2.0865 - val_acc: 0.7056
Epoch 328/600
537/537 [==============================] - 0s 342us/step - loss: 0.0791 - acc:
0.9758 - val_loss: 2.0588 - val_acc: 0.7143
Epoch 329/600
537/537 [==============================] - 0s 225us/step - loss: 0.0736 - acc:
0.9721 - val_loss: 2.1234 - val_acc: 0.7013
Epoch 330/600
537/537 [==============================] - 0s 63us/step - loss: 0.1114 - acc:
0.9590 - val_loss: 2.0765 - val_acc: 0.7143
Epoch 331/600
537/537 [==============================] - 0s 236us/step - loss: 0.1073 - acc:
0.9665 - val_loss: 2.1147 - val_acc: 0.7229
Epoch 332/600
537/537 [==============================] - 0s 67us/step - loss: 0.1122 - acc:
0.9590 - val_loss: 2.0480 - val_acc: 0.7229
Epoch 333/600
537/537 [==============================] - 0s 78us/step - loss: 0.0804 - acc:
```

```
0.9665 - val_loss: 2.1780 - val_acc: 0.7186
Epoch 334/600
537/537 [==============================] - 0s 271us/step - loss: 0.1410 - acc:
0.9516 - val_loss: 2.1092 - val_acc: 0.7186
Epoch 335/600
537/537 [==============================] - 0s 193us/step - loss: 0.1079 - acc:
0.9628 - val_loss: 2.0636 - val_acc: 0.7100
Epoch 336/600
537/537 [==============================] - 0s 267us/step - loss: 0.2256 - acc:
0.9181 - val_loss: 2.1029 - val_acc: 0.7229
Epoch 337/600
537/537 [==============================] - 0s 208us/step - loss: 0.0903 - acc:
0.9702 - val_loss: 2.1095 - val_acc: 0.7143
Epoch 338/600
537/537 [==============================] - 0s 143us/step - loss: 0.0836 - acc:
0.9758 - val_loss: 2.0735 - val_acc: 0.7100
Epoch 339/600
537/537 [==============================] - 0s 69us/step - loss: 0.1034 - acc:
0.9721 - val_loss: 2.0833 - val_acc: 0.7186
Epoch 340/600
537/537 [==============================] - 0s 59us/step - loss: 0.0964 - acc:
0.9609 - val_loss: 2.1405 - val_acc: 0.7056
Epoch 341/600
537/537 [==============================] - 0s 160us/step - loss: 0.0919 - acc:
0.9572 - val_loss: 2.0823 - val_acc: 0.7143
Epoch 342/600
537/537 [==============================] - 0s 61us/step - loss: 0.0774 - acc:
0.9739 - val_loss: 2.1107 - val_acc: 0.7013
Epoch 343/600
537/537 [==============================] - 0s 67us/step - loss: 0.0975 - acc:
0.9628 - val_loss: 2.0737 - val_acc: 0.7143
Epoch 344/600
537/537 [==============================] - 0s 67us/step - loss: 0.0840 - acc:
0.9609 - val_loss: 2.1368 - val_acc: 0.7013
Epoch 345/600
537/537 [==============================] - 0s 150us/step - loss: 0.0902 - acc:
0.9590 - val_loss: 2.1116 - val_acc: 0.7056
Epoch 346/600
537/537 [==============================] - 0s 69us/step - loss: 0.0721 - acc:
0.9758 - val_loss: 2.1074 - val_acc: 0.7143
Epoch 347/600
537/537 [==============================] - 0s 148us/step - loss: 0.0793 - acc:
0.9758 - val_loss: 2.0880 - val_acc: 0.7100
Epoch 348/600
537/537 [==============================] - 0s 83us/step - loss: 0.1027 - acc:
0.9590 - val_loss: 2.0681 - val_acc: 0.7186
Epoch 349/600
537/537 [==============================] - 0s 85us/step - loss: 0.0901 - acc:
```

```
0.9665 - val_loss: 2.1016 - val_acc: 0.7229
Epoch 350/600
537/537 [==============================] - 0s 87us/step - loss: 0.0816 - acc:
0.9739 - val_loss: 2.0973 - val_acc: 0.7100
Epoch 351/600
537/537 [==============================] - 0s 85us/step - loss: 0.0817 - acc:
0.9683 - val_loss: 2.0785 - val_acc: 0.7143
Epoch 352/600
537/537 [==============================] - 0s 78us/step - loss: 0.1138 - acc:
0.9609 - val_loss: 2.1075 - val_acc: 0.7273
Epoch 353/600
537/537 [==============================] - 0s 163us/step - loss: 0.0993 - acc:
0.9683 - val_loss: 2.0634 - val_acc: 0.7186
Epoch 354/600
537/537 [==============================] - 0s 89us/step - loss: 0.0868 - acc:
0.9683 - val_loss: 2.0687 - val_acc: 0.7143
Epoch 355/600
537/537 [==============================] - 0s 175us/step - loss: 0.1236 - acc:
0.9553 - val_loss: 2.0361 - val_acc: 0.7316
Epoch 356/600
537/537 [==============================] - 0s 74us/step - loss: 0.0868 - acc:
0.9665 - val_loss: 2.0851 - val_acc: 0.7143
Epoch 357/600
537/537 [==============================] - 0s 219us/step - loss: 0.1018 - acc:
0.9702 - val_loss: 2.0724 - val_acc: 0.7273
Epoch 358/600
537/537 [==============================] - 0s 108us/step - loss: 0.0756 - acc:
0.9758 - val_loss: 2.1219 - val_acc: 0.7143
Epoch 359/600
537/537 [==============================] - 0s 58us/step - loss: 0.1234 - acc:
0.9553 - val_loss: 2.1169 - val_acc: 0.7229
Epoch 360/600
537/537 [==============================] - 0s 58us/step - loss: 0.1123 - acc:
0.9590 - val_loss: 2.0403 - val_acc: 0.7186
Epoch 361/600
537/537 [==============================] - 0s 74us/step - loss: 0.0833 - acc:
0.9665 - val_loss: 2.1100 - val_acc: 0.7316
Epoch 362/600
537/537 [==============================] - 0s 137us/step - loss: 0.0849 - acc:
0.9721 - val_loss: 2.1330 - val_acc: 0.7143
Epoch 363/600
537/537 [==============================] - 0s 106us/step - loss: 0.0788 - acc:
0.9702 - val_loss: 2.0569 - val_acc: 0.7273
Epoch 364/600
537/537 [==============================] - 0s 327us/step - loss: 0.0687 - acc:
0.9739 - val_loss: 2.0578 - val_acc: 0.7316
Epoch 365/600
537/537 [==============================] - 0s 117us/step - loss: 0.0776 - acc:
```

```
0.9777 - val_loss: 2.0895 - val_acc: 0.7186
Epoch 366/600
537/537 [==============================] - 0s 171us/step - loss: 0.0981 - acc:
0.9665 - val_loss: 2.1161 - val_acc: 0.7100
Epoch 367/600
537/537 [==============================] - 0s 381us/step - loss: 0.1052 - acc:
0.9646 - val_loss: 2.1013 - val_acc: 0.7186
Epoch 368/600
537/537 [==============================] - 0s 240us/step - loss: 0.0949 - acc:
0.9665 - val_loss: 2.0868 - val_acc: 0.7186
Epoch 369/600
537/537 [==============================] - 0s 110us/step - loss: 0.0984 - acc:
0.9665 - val_loss: 2.1468 - val_acc: 0.7100
Epoch 370/600
537/537 [==============================] - 0s 221us/step - loss: 0.0881 - acc:
0.9702 - val_loss: 2.1318 - val_acc: 0.7186
Epoch 371/600
537/537 [==============================] - 0s 130us/step - loss: 0.1527 - acc:
0.9497 - val_loss: 2.1423 - val_acc: 0.7229
Epoch 372/600
537/537 [==============================] - 0s 217us/step - loss: 0.1005 - acc:
0.9628 - val_loss: 2.1090 - val_acc: 0.7056
Epoch 373/600
537/537 [==============================] - 0s 124us/step - loss: 0.1469 - acc:
0.9423 - val_loss: 2.1614 - val_acc: 0.7186
Epoch 374/600
537/537 [==============================] - 0s 124us/step - loss: 0.1223 - acc:
0.9553 - val_loss: 2.1017 - val_acc: 0.7100
Epoch 375/600
537/537 [==============================] - 0s 134us/step - loss: 0.0895 - acc:
0.9721 - val_loss: 2.0539 - val_acc: 0.7229
Epoch 376/600
537/537 [==============================] - 0s 256us/step - loss: 0.0721 - acc:
0.9777 - val_loss: 2.0348 - val_acc: 0.7186
Epoch 377/600
537/537 [==============================] - 0s 226us/step - loss: 0.1040 - acc:
0.9572 - val_loss: 2.3012 - val_acc: 0.7143
Epoch 378/600
537/537 [==============================] - 0s 102us/step - loss: 0.1778 - acc:
0.9479 - val_loss: 2.1116 - val_acc: 0.7013
Epoch 379/600
537/537 [==============================] - 0s 69us/step - loss: 0.1035 - acc:
0.9646 - val_loss: 2.1010 - val_acc: 0.7013
Epoch 380/600
537/537 [==============================] - 0s 137us/step - loss: 0.1073 - acc:
0.9516 - val_loss: 2.7058 - val_acc: 0.6840
Epoch 381/600
537/537 [==============================] - 0s 83us/step - loss: 0.1757 - acc:
```

```
0.9367 - val_loss: 2.1728 - val_acc: 0.7100
Epoch 382/600
537/537 [==============================] - 0s 178us/step - loss: 0.1001 - acc:
0.9646 - val_loss: 2.1293 - val_acc: 0.7056
Epoch 383/600
537/537 [==============================] - 0s 63us/step - loss: 0.0866 - acc:
0.9721 - val_loss: 2.1177 - val_acc: 0.7100
Epoch 384/600
537/537 [==============================] - 0s 135us/step - loss: 0.0801 - acc:
0.9721 - val_loss: 2.1324 - val_acc: 0.7186
Epoch 385/600
537/537 [==============================] - 0s 85us/step - loss: 0.1134 - acc:
0.9534 - val_loss: 2.1393 - val_acc: 0.7446
Epoch 386/600
537/537 [==============================] - 0s 173us/step - loss: 0.0923 - acc:
0.9628 - val_loss: 2.1539 - val_acc: 0.7100
Epoch 387/600
537/537 [==============================] - 0s 185us/step - loss: 0.0756 - acc:
0.9683 - val_loss: 2.1501 - val_acc: 0.6926
Epoch 388/600
537/537 [==============================] - 0s 89us/step - loss: 0.1447 - acc:
0.9553 - val_loss: 2.1014 - val_acc: 0.7403
Epoch 389/600
537/537 [==============================] - 0s 67us/step - loss: 0.2640 - acc:
0.9404 - val_loss: 2.1864 - val_acc: 0.7186
Epoch 390/600
537/537 [==============================] - 0s 72us/step - loss: 0.1382 - acc:
0.9534 - val_loss: 2.1680 - val_acc: 0.7186
Epoch 391/600
537/537 [==============================] - 0s 69us/step - loss: 0.0795 - acc:
0.9683 - val_loss: 2.1110 - val_acc: 0.7273
Epoch 392/600
537/537 [==============================] - 0s 63us/step - loss: 0.1883 - acc:
0.9460 - val_loss: 2.4954 - val_acc: 0.7056
Epoch 393/600
537/537 [==============================] - 0s 97us/step - loss: 0.1229 - acc:
0.9534 - val_loss: 2.1488 - val_acc: 0.7186
Epoch 394/600
537/537 [==============================] - 0s 186us/step - loss: 0.1404 - acc:
0.9553 - val_loss: 2.1730 - val_acc: 0.7229
Epoch 395/600
537/537 [==============================] - 0s 72us/step - loss: 0.0941 - acc:
0.9609 - val_loss: 2.1467 - val_acc: 0.7143
Epoch 396/600
537/537 [==============================] - 0s 67us/step - loss: 0.1128 - acc:
0.9665 - val_loss: 2.1081 - val_acc: 0.7186
Epoch 397/600
537/537 [==============================] - 0s 87us/step - loss: 0.0913 - acc:
```

```
0.9665 - val_loss: 2.0978 - val_acc: 0.7100
Epoch 398/600
537/537 [==============================] - 0s 229us/step - loss: 0.0865 - acc:
0.9702 - val_loss: 2.1443 - val_acc: 0.7056
Epoch 399/600
537/537 [==============================] - 0s 72us/step - loss: 0.0821 - acc:
0.9628 - val_loss: 2.1843 - val_acc: 0.7013
Epoch 400/600
537/537 [==============================] - 0s 74us/step - loss: 0.1436 - acc:
0.9479 - val_loss: 2.0912 - val_acc: 0.7143
Epoch 401/600
537/537 [==============================] - 0s 186us/step - loss: 0.1207 - acc:
0.9497 - val_loss: 2.1422 - val_acc: 0.7100
Epoch 402/600
537/537 [==============================] - 0s 225us/step - loss: 0.0941 - acc:
0.9665 - val_loss: 2.1256 - val_acc: 0.7143
Epoch 403/600
537/537 [==============================] - 0s 213us/step - loss: 0.0995 - acc:
0.9665 - val_loss: 2.0983 - val_acc: 0.7100
Epoch 404/600
537/537 [==============================] - 0s 308us/step - loss: 0.0840 - acc:
0.9721 - val_loss: 2.1520 - val_acc: 0.7056
Epoch 405/600
537/537 [==============================] - 0s 126us/step - loss: 0.0748 - acc:
0.9758 - val_loss: 2.1695 - val_acc: 0.7056
Epoch 406/600
537/537 [==============================] - 0s 295us/step - loss: 0.0839 - acc:
0.9739 - val_loss: 2.0808 - val_acc: 0.7143
Epoch 407/600
537/537 [==============================] - 0s 134us/step - loss: 0.1330 - acc:
0.9628 - val_loss: 2.1057 - val_acc: 0.7056
Epoch 408/600
537/537 [==============================] - 0s 63us/step - loss: 0.0950 - acc:
0.9609 - val_loss: 2.2762 - val_acc: 0.7013
Epoch 409/600
537/537 [==============================] - 0s 63us/step - loss: 0.0961 - acc:
0.9646 - val_loss: 2.1038 - val_acc: 0.7186
Epoch 410/600
537/537 [==============================] - 0s 84us/step - loss: 0.1421 - acc:
0.9479 - val_loss: 2.1414 - val_acc: 0.7186
Epoch 411/600
537/537 [==============================] - 0s 84us/step - loss: 0.0879 - acc:
0.9646 - val_loss: 2.1321 - val_acc: 0.7056
Epoch 412/600
537/537 [==============================] - ETA: 0s - loss: 0.0816 - acc: 0.976 -
0s 169us/step - loss: 0.1122 - acc: 0.9683 - val_loss: 2.1097 - val_acc: 0.7229
Epoch 413/600
537/537 [==============================] - 0s 104us/step - loss: 0.1184 - acc:
```

```
0.9572 - val_loss: 2.1501 - val_acc: 0.7186
Epoch 414/600
537/537 [==============================] - 0s 76us/step - loss: 0.0834 - acc:
0.9702 - val_loss: 2.1383 - val_acc: 0.7143
Epoch 415/600
537/537 [==============================] - 0s 150us/step - loss: 0.0861 - acc:
0.9665 - val_loss: 2.1072 - val_acc: 0.7229
Epoch 416/600
537/537 [==============================] - 0s 147us/step - loss: 0.0721 - acc:
0.9739 - val_loss: 2.1135 - val_acc: 0.7186
Epoch 417/600
537/537 [==============================] - 0s 73us/step - loss: 0.0856 - acc:
0.9646 - val_loss: 2.1226 - val_acc: 0.7186
Epoch 418/600
537/537 [==============================] - 0s 113us/step - loss: 0.0846 - acc:
0.9646 - val_loss: 2.1142 - val_acc: 0.7056
Epoch 419/600
537/537 [==============================] - 0s 176us/step - loss: 0.0961 - acc:
0.9739 - val_loss: 2.2356 - val_acc: 0.7229
Epoch 420/600
537/537 [==============================] - 0s 147us/step - loss: 0.1290 - acc:
0.9572 - val_loss: 2.1111 - val_acc: 0.7056
Epoch 421/600
537/537 [==============================] - 0s 74us/step - loss: 0.0939 - acc:
0.9646 - val_loss: 2.1557 - val_acc: 0.6970
Epoch 422/600
537/537 [==============================] - 0s 283us/step - loss: 0.1348 - acc:
0.9423 - val_loss: 2.1944 - val_acc: 0.6970
Epoch 423/600
537/537 [==============================] - 0s 204us/step - loss: 0.1158 - acc:
0.9665 - val_loss: 2.1260 - val_acc: 0.7100
Epoch 424/600
537/537 [==============================] - 0s 149us/step - loss: 0.1128 - acc:
0.9646 - val_loss: 2.1121 - val_acc: 0.7229
Epoch 425/600
537/537 [==============================] - 0s 95us/step - loss: 0.1055 - acc:
0.9628 - val_loss: 2.1253 - val_acc: 0.7229
Epoch 426/600
537/537 [==============================] - 0s 176us/step - loss: 0.0853 - acc:
0.9646 - val_loss: 2.1332 - val_acc: 0.7100
Epoch 427/600
537/537 [==============================] - 0s 147us/step - loss: 0.0813 - acc:
0.9777 - val_loss: 2.1197 - val_acc: 0.7143
Epoch 428/600
537/537 [==============================] - 0s 260us/step - loss: 0.0944 - acc:
0.9683 - val_loss: 2.1149 - val_acc: 0.7186
Epoch 429/600
537/537 [==============================] - 0s 206us/step - loss: 0.0879 - acc:
```

```
0.9665 - val_loss: 2.0507 - val_acc: 0.7186
Epoch 430/600
537/537 [==============================] - 0s 210us/step - loss: 0.0809 - acc:
0.9739 - val_loss: 2.1157 - val_acc: 0.7100
Epoch 431/600
537/537 [==============================] - 0s 323us/step - loss: 0.0784 - acc:
0.9758 - val_loss: 2.1179 - val_acc: 0.7143
Epoch 432/600
537/537 [==============================] - 0s 91us/step - loss: 0.0964 - acc:
0.9683 - val_loss: 2.1565 - val_acc: 0.7229
Epoch 433/600
537/537 [==============================] - 0s 61us/step - loss: 0.0831 - acc:
0.9702 - val_loss: 2.0788 - val_acc: 0.7056
Epoch 434/600
537/537 [==============================] - 0s 63us/step - loss: 0.1010 - acc:
0.9590 - val_loss: 2.1349 - val_acc: 0.7186
Epoch 435/600
537/537 [==============================] - 0s 59us/step - loss: 0.0945 - acc:
0.9683 - val_loss: 2.1148 - val_acc: 0.7273
Epoch 436/600
537/537 [==============================] - 0s 67us/step - loss: 0.0819 - acc:
0.9665 - val_loss: 2.0752 - val_acc: 0.7186
Epoch 437/600
537/537 [==============================] - 0s 69us/step - loss: 0.0810 - acc:
0.9702 - val_loss: 2.0954 - val_acc: 0.7056
Epoch 438/600
537/537 [==============================] - 0s 59us/step - loss: 0.0738 - acc:
0.9777 - val_loss: 2.1224 - val_acc: 0.7056
Epoch 439/600
537/537 [==============================] - 0s 106us/step - loss: 0.0919 - acc:
0.9702 - val_loss: 2.0886 - val_acc: 0.7100
Epoch 440/600
537/537 [==============================] - 0s 193us/step - loss: 0.0823 - acc:
0.9702 - val_loss: 2.1055 - val_acc: 0.7013
Epoch 441/600
537/537 [==============================] - 0s 201us/step - loss: 0.0770 - acc:
0.9683 - val_loss: 2.1179 - val_acc: 0.7056
Epoch 442/600
537/537 [==============================] - 0s 119us/step - loss: 0.0798 - acc:
0.9665 - val_loss: 2.1084 - val_acc: 0.7013
Epoch 443/600
537/537 [==============================] - 0s 188us/step - loss: 0.0877 - acc:
0.9739 - val_loss: 2.1037 - val_acc: 0.7143
Epoch 444/600
537/537 [==============================] - 0s 145us/step - loss: 0.0987 - acc:
0.9665 - val_loss: 2.1870 - val_acc: 0.7229
Epoch 445/600
537/537 [==============================] - 0s 219us/step - loss: 0.1697 - acc:
```

```
0.9441 - val_loss: 2.1452 - val_acc: 0.7143
Epoch 446/600
537/537 [==============================] - 0s 191us/step - loss: 0.0917 - acc:
0.9646 - val_loss: 2.1151 - val_acc: 0.6970
Epoch 447/600
537/537 [==============================] - 0s 217us/step - loss: 0.0854 - acc:
0.9665 - val_loss: 2.1167 - val_acc: 0.7056
Epoch 448/600
537/537 [==============================] - 0s 98us/step - loss: 0.1135 - acc:
0.9702 - val_loss: 2.2602 - val_acc: 0.7013
Epoch 449/600
537/537 [==============================] - 0s 87us/step - loss: 0.0878 - acc:
0.9609 - val_loss: 2.1324 - val_acc: 0.7229
Epoch 450/600
537/537 [==============================] - 0s 240us/step - loss: 0.0914 - acc:
0.9721 - val_loss: 2.0765 - val_acc: 0.7273
Epoch 451/600
537/537 [==============================] - 0s 293us/step - loss: 0.0888 - acc:
0.9646 - val_loss: 2.1713 - val_acc: 0.7186
Epoch 452/600
537/537 [==============================] - 0s 97us/step - loss: 0.0929 - acc:
0.9665 - val_loss: 2.1458 - val_acc: 0.7186
Epoch 453/600
537/537 [==============================] - 0s 128us/step - loss: 0.0821 - acc:
0.9702 - val_loss: 2.1638 - val_acc: 0.7100
Epoch 454/600
537/537 [==============================] - 0s 186us/step - loss: 0.0850 - acc:
0.9683 - val_loss: 2.0969 - val_acc: 0.7229
Epoch 455/600
537/537 [==============================] - 0s 180us/step - loss: 0.0947 - acc:
0.9628 - val_loss: 2.1062 - val_acc: 0.7056
Epoch 456/600
537/537 [==============================] - 0s 218us/step - loss: 0.0937 - acc:
0.9665 - val_loss: 2.1558 - val_acc: 0.7186
Epoch 457/600
537/537 [==============================] - 0s 225us/step - loss: 0.1021 - acc:
0.9609 - val_loss: 2.1134 - val_acc: 0.7186
Epoch 458/600
537/537 [==============================] - 0s 178us/step - loss: 0.0995 - acc:
0.9572 - val_loss: 2.2094 - val_acc: 0.7143
Epoch 459/600
537/537 [==============================] - 0s 278us/step - loss: 0.1539 - acc:
0.9423 - val_loss: 2.1071 - val_acc: 0.7273
Epoch 460/600
537/537 [==============================] - 0s 125us/step - loss: 0.1391 - acc:
0.9553 - val_loss: 2.0946 - val_acc: 0.7316
Epoch 461/600
537/537 [==============================] - 0s 143us/step - loss: 0.0880 - acc:
```

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0.9702 - val_loss: 2.1755 - val_acc: 0.7229
Epoch 462/600
537/537 [==============================] - 0s 182us/step - loss: 0.0947 - acc:
0.9628 - val_loss: 2.2036 - val_acc: 0.7013
Epoch 463/600
537/537 [==============================] - 0s 111us/step - loss: 0.0803 - acc:
0.9683 - val_loss: 2.1054 - val_acc: 0.7186
Epoch 464/600
537/537 [==============================] - 0s 175us/step - loss: 0.0921 - acc:
0.9739 - val_loss: 2.1177 - val_acc: 0.7273
Epoch 465/600
537/537 [==============================] - 0s 331us/step - loss: 0.1125 - acc:
0.9628 - val_loss: 2.1063 - val_acc: 0.7229
Epoch 466/600
537/537 [==============================] - 0s 115us/step - loss: 0.1072 - acc:
0.9572 - val_loss: 2.0853 - val_acc: 0.7229
Epoch 467/600
537/537 [==============================] - 0s 208us/step - loss: 0.0726 - acc:
0.9758 - val_loss: 2.0843 - val_acc: 0.7143
Epoch 468/600
537/537 [==============================] - 0s 122us/step - loss: 0.0788 - acc:
0.9721 - val_loss: 2.1322 - val_acc: 0.7056
Epoch 469/600
537/537 [==============================] - 0s 99us/step - loss: 0.1637 - acc:
0.9441 - val_loss: 2.0967 - val_acc: 0.7273
Epoch 470/600
537/537 [==============================] - 0s 248us/step - loss: 0.1340 - acc:
0.9553 - val_loss: 2.1374 - val_acc: 0.7143
Epoch 471/600
537/537 [==============================] - 0s 149us/step - loss: 0.1090 - acc:
0.9646 - val_loss: 2.0835 - val_acc: 0.7229
Epoch 472/600
537/537 [==============================] - 0s 145us/step - loss: 0.0844 - acc:
0.9702 - val_loss: 2.1111 - val_acc: 0.7100
Epoch 473/600
537/537 [==============================] - 0s 102us/step - loss: 0.0977 - acc:
0.9646 - val_loss: 2.2790 - val_acc: 0.7316
Epoch 474/600
537/537 [==============================] - 0s 243us/step - loss: 0.1131 - acc:
0.9572 - val_loss: 2.1566 - val_acc: 0.7229
Epoch 475/600
537/537 [==============================] - 0s 173us/step - loss: 0.0829 - acc:
0.9777 - val_loss: 2.1382 - val_acc: 0.7100
Epoch 476/600
537/537 [==============================] - 0s 199us/step - loss: 0.0823 - acc:
0.9721 - val_loss: 2.0797 - val_acc: 0.7316
Epoch 477/600
537/537 [==============================] - 0s 159us/step - loss: 0.1337 - acc:
```

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0.9516 - val_loss: 2.0908 - val_acc: 0.7229
Epoch 478/600
537/537 [==============================] - 0s 173us/step - loss: 0.1063 - acc:
0.9609 - val_loss: 2.2249 - val_acc: 0.7273
Epoch 479/600
537/537 [==============================] - 0s 186us/step - loss: 0.2270 - acc:
0.9236 - val_loss: 2.0842 - val_acc: 0.7273
Epoch 480/600
537/537 [==============================] - 0s 95us/step - loss: 0.1851 - acc:
0.9423 - val_loss: 2.2024 - val_acc: 0.7359
Epoch 481/600
537/537 [==============================] - 0s 284us/step - loss: 0.1213 - acc:
0.9572 - val_loss: 2.2285 - val_acc: 0.7143
Epoch 482/600
537/537 [==============================] - 0s 169us/step - loss: 0.1201 - acc:
0.9665 - val_loss: 2.0968 - val_acc: 0.7186
Epoch 483/600
537/537 [==============================] - 0s 167us/step - loss: 0.0983 - acc:
0.9628 - val_loss: 2.1128 - val_acc: 0.7273
Epoch 484/600
537/537 [==============================] - 0s 108us/step - loss: 0.0865 - acc:
0.9665 - val_loss: 2.1604 - val_acc: 0.7186
Epoch 485/600
537/537 [==============================] - 0s 145us/step - loss: 0.0768 - acc:
0.9721 - val_loss: 2.0983 - val_acc: 0.7143
Epoch 486/600
537/537 [==============================] - 0s 195us/step - loss: 0.1837 - acc:
0.9423 - val_loss: 2.0630 - val_acc: 0.7359
Epoch 487/600
537/537 [==============================] - 0s 299us/step - loss: 0.0958 - acc:
0.9665 - val_loss: 2.1047 - val_acc: 0.7229
Epoch 488/600
537/537 [==============================] - 0s 84us/step - loss: 0.1365 - acc:
0.9609 - val_loss: 2.0893 - val_acc: 0.7316
Epoch 489/600
537/537 [==============================] - 0s 110us/step - loss: 0.1095 - acc:
0.9609 - val_loss: 2.1459 - val_acc: 0.7186
Epoch 490/600
537/537 [==============================] - 0s 162us/step - loss: 0.0814 - acc:
0.9721 - val_loss: 2.1133 - val_acc: 0.7359
Epoch 491/600
537/537 [==============================] - 0s 254us/step - loss: 0.1165 - acc:
0.9590 - val_loss: 2.0940 - val_acc: 0.7316
Epoch 492/600
537/537 [==============================] - 0s 280us/step - loss: 0.0901 - acc:
0.9665 - val_loss: 2.1150 - val_acc: 0.7229
Epoch 493/600
537/537 [==============================] - 0s 123us/step - loss: 0.0893 - acc:
```

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0.9665 - val_loss: 2.0926 - val_acc: 0.7273
Epoch 494/600
537/537 [==============================] - 0s 200us/step - loss: 0.0895 - acc:
0.9646 - val_loss: 2.0671 - val_acc: 0.7273
Epoch 495/600
537/537 [==============================] - 0s 158us/step - loss: 0.1036 - acc:
0.9646 - val_loss: 2.1068 - val_acc: 0.7186
Epoch 496/600
537/537 [==============================] - 0s 264us/step - loss: 0.1042 - acc:
0.9665 - val_loss: 2.0747 - val_acc: 0.7056
Epoch 497/600
537/537 [==============================] - 0s 199us/step - loss: 0.0971 - acc:
0.9646 - val_loss: 2.1398 - val_acc: 0.7100
Epoch 498/600
537/537 [==============================] - 0s 325us/step - loss: 0.0882 - acc:
0.9553 - val_loss: 2.1279 - val_acc: 0.7143
Epoch 499/600
537/537 [==============================] - 0s 206us/step - loss: 0.0706 - acc:
0.9777 - val_loss: 2.1689 - val_acc: 0.7143
Epoch 500/600
537/537 [==============================] - 0s 316us/step - loss: 0.1373 - acc:
0.9534 - val_loss: 2.5441 - val_acc: 0.6753
Epoch 501/600
537/537 [==============================] - 0s 414us/step - loss: 0.1671 - acc:
0.9348 - val_loss: 2.1274 - val_acc: 0.7229
Epoch 502/600
537/537 [==============================] - 0s 414us/step - loss: 0.0834 - acc:
0.9758 - val_loss: 2.1423 - val_acc: 0.7186
Epoch 503/600
537/537 [==============================] - 0s 282us/step - loss: 0.0913 - acc:
0.9646 - val_loss: 2.1418 - val_acc: 0.7186
Epoch 504/600
537/537 [==============================] - 0s 234us/step - loss: 0.0735 - acc:
0.9758 - val_loss: 2.1481 - val_acc: 0.7013
Epoch 505/600
537/537 [==============================] - 0s 440us/step - loss: 0.1139 - acc:
0.9572 - val_loss: 2.1338 - val_acc: 0.7056
Epoch 506/600
537/537 [==============================] - 0s 435us/step - loss: 0.0863 - acc:
0.9702 - val_loss: 2.1538 - val_acc: 0.7186
Epoch 507/600
537/537 [==============================] - 0s 199us/step - loss: 0.0897 - acc:
0.9609 - val_loss: 2.2474 - val_acc: 0.7100
Epoch 508/600
537/537 [==============================] - 0s 331us/step - loss: 0.0932 - acc:
0.9665 - val_loss: 2.1469 - val_acc: 0.6970
Epoch 509/600
537/537 [==============================] - 0s 295us/step - loss: 0.0783 - acc:
```

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0.9721 - val_loss: 2.1657 - val_acc: 0.7100
Epoch 510/600
537/537 [==============================] - 0s 275us/step - loss: 0.1366 - acc:
0.9572 - val_loss: 2.1095 - val_acc: 0.7100
Epoch 511/600
537/537 [==============================] - 0s 399us/step - loss: 0.1169 - acc:
0.9628 - val_loss: 2.1099 - val_acc: 0.7316
Epoch 512/600
537/537 [==============================] - 0s 448us/step - loss: 0.1095 - acc:
0.9572 - val_loss: 2.0734 - val_acc: 0.7403
Epoch 513/600
537/537 [==============================] - 0s 295us/step - loss: 0.1672 - acc:
0.9479 - val_loss: 2.0832 - val_acc: 0.7229
Epoch 514/600
537/537 [==============================] - 0s 266us/step - loss: 0.0992 - acc:
0.9609 - val_loss: 2.1494 - val_acc: 0.7229
Epoch 515/600
537/537 [==============================] - 0s 345us/step - loss: 0.0965 - acc:
0.9665 - val_loss: 2.1396 - val_acc: 0.7056
Epoch 516/600
537/537 [==============================] - 0s 299us/step - loss: 0.2660 - acc:
0.9330 - val_loss: 2.2960 - val_acc: 0.7186
Epoch 517/600
537/537 [==============================] - 0s 189us/step - loss: 0.1898 - acc:
0.9367 - val_loss: 2.1531 - val_acc: 0.7229
Epoch 518/600
537/537 [==============================] - ETA: 0s - loss: 0.1327 - acc: 0.943 -
0s 340us/step - loss: 0.1437 - acc: 0.9423 - val_loss: 2.1954 - val_acc: 0.7316
Epoch 519/600
537/537 [==============================] - 0s 379us/step - loss: 0.0956 - acc:
0.9628 - val_loss: 2.2910 - val_acc: 0.6970
Epoch 520/600
537/537 [==============================] - 0s 286us/step - loss: 0.1066 - acc:
0.9646 - val_loss: 2.2090 - val_acc: 0.7056
Epoch 521/600
537/537 [==============================] - 0s 397us/step - loss: 0.1083 - acc:
0.9628 - val_loss: 2.1479 - val_acc: 0.7143
Epoch 522/600
537/537 [==============================] - 0s 241us/step - loss: 0.0818 - acc:
0.9739 - val_loss: 2.1040 - val_acc: 0.7143
Epoch 523/600
537/537 [==============================] - 0s 349us/step - loss: 0.0951 - acc:
0.9646 - val_loss: 2.0958 - val_acc: 0.7229
Epoch 524/600
537/537 [==============================] - 0s 357us/step - loss: 0.0872 - acc:
0.9683 - val_loss: 2.1647 - val_acc: 0.7186
Epoch 525/600
537/537 [==============================] - 0s 245us/step - loss: 0.0974 - acc:
```

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0.9702 - val_loss: 2.2513 - val_acc: 0.7013
Epoch 526/600
537/537 [==============================] - 0s 489us/step - loss: 0.0849 - acc:
0.9758 - val_loss: 2.1369 - val_acc: 0.7186
Epoch 527/600
537/537 [==============================] - 0s 412us/step - loss: 0.0940 - acc:
0.9665 - val_loss: 2.1430 - val_acc: 0.7186
Epoch 528/600
537/537 [==============================] - ETA: 0s - loss: 0.0500 - acc: 0.982 -
0s 321us/step - loss: 0.0943 - acc: 0.9758 - val_loss: 2.1894 - val_acc: 0.7186
Epoch 529/600
537/537 [==============================] - 0s 405us/step - loss: 0.1130 - acc:
0.9572 - val_loss: 2.1173 - val_acc: 0.7273
Epoch 530/600
537/537 [==============================] - 0s 249us/step - loss: 0.0752 - acc:
0.9758 - val_loss: 2.1845 - val_acc: 0.7143
Epoch 531/600
537/537 [==============================] - 0s 392us/step - loss: 0.1008 - acc:
0.9739 - val_loss: 2.1153 - val_acc: 0.7186
Epoch 532/600
537/537 [==============================] - 0s 338us/step - loss: 0.0795 - acc:
0.9702 - val_loss: 2.1223 - val_acc: 0.7100
Epoch 533/600
537/537 [==============================] - 0s 520us/step - loss: 0.0817 - acc:
0.9739 - val_loss: 2.1087 - val_acc: 0.7316
Epoch 534/600
537/537 [==============================] - 0s 272us/step - loss: 0.1226 - acc:
0.9534 - val_loss: 2.1645 - val_acc: 0.7100
Epoch 535/600
537/537 [==============================] - 0s 316us/step - loss: 0.0997 - acc:
0.9646 - val_loss: 2.1209 - val_acc: 0.7186
Epoch 536/600
537/537 [==============================] - 0s 186us/step - loss: 0.0794 - acc:
0.9683 - val_loss: 2.1653 - val_acc: 0.7056
Epoch 537/600
537/537 [==============================] - 0s 87us/step - loss: 0.1265 - acc:
0.9590 - val_loss: 2.2465 - val_acc: 0.7143
Epoch 538/600
537/537 [==============================] - 0s 147us/step - loss: 0.1240 - acc:
0.9665 - val_loss: 2.1204 - val_acc: 0.7056
Epoch 539/600
537/537 [==============================] - 0s 188us/step - loss: 0.0842 - acc:
0.9628 - val_loss: 2.1927 - val_acc: 0.7100
Epoch 540/600
537/537 [==============================] - 0s 191us/step - loss: 0.0962 - acc:
0.9665 - val_loss: 2.1382 - val_acc: 0.7143
Epoch 541/600
537/537 [==============================] - 0s 128us/step - loss: 0.1989 - acc:
```

```
0.9367 - val_loss: 2.2932 - val_acc: 0.7143
Epoch 542/600
537/537 [==============================] - 0s 108us/step - loss: 0.0843 - acc:
0.9702 - val_loss: 2.1504 - val_acc: 0.7229
Epoch 543/600
537/537 [==============================] - 0s 117us/step - loss: 0.1179 - acc:
0.9553 - val_loss: 2.1303 - val_acc: 0.7229
Epoch 544/600
537/537 [==============================] - 0s 141us/step - loss: 0.0874 - acc:
0.9646 - val_loss: 2.1346 - val_acc: 0.7229
Epoch 545/600
537/537 [==============================] - 0s 373us/step - loss: 0.0981 - acc:
0.9590 - val_loss: 2.1783 - val_acc: 0.7273
Epoch 546/600
537/537 [==============================] - 0s 214us/step - loss: 0.1399 - acc:
0.9553 - val_loss: 2.1807 - val_acc: 0.7273
Epoch 547/600
537/537 [==============================] - 0s 83us/step - loss: 0.0988 - acc:
0.9628 - val_loss: 2.1091 - val_acc: 0.7186
Epoch 548/600
537/537 [==============================] - 0s 145us/step - loss: 0.0823 - acc:
0.9758 - val_loss: 2.1503 - val_acc: 0.7100
Epoch 549/600
537/537 [==============================] - 0s 145us/step - loss: 0.0785 - acc:
0.9795 - val_loss: 2.1272 - val_acc: 0.7229
Epoch 550/600
537/537 [==============================] - 0s 241us/step - loss: 0.0866 - acc:
0.9646 - val_loss: 2.1847 - val_acc: 0.7100
Epoch 551/600
537/537 [==============================] - 0s 652us/step - loss: 0.0975 - acc:
0.9683 - val_loss: 2.1645 - val_acc: 0.7100
Epoch 552/600
537/537 [==============================] - 0s 332us/step - loss: 0.0723 - acc:
0.9721 - val_loss: 2.1289 - val_acc: 0.7273
Epoch 553/600
537/537 [==============================] - 0s 318us/step - loss: 0.0784 - acc:
0.9721 - val_loss: 2.1597 - val_acc: 0.7056
Epoch 554/600
537/537 [==============================] - 0s 132us/step - loss: 0.0904 - acc:
0.9665 - val_loss: 2.1466 - val_acc: 0.7186
Epoch 555/600
537/537 [==============================] - 0s 228us/step - loss: 0.0851 - acc:
0.9628 - val_loss: 2.1485 - val_acc: 0.7143
Epoch 556/600
537/537 [==============================] - 0s 187us/step - loss: 0.0762 - acc:
0.9683 - val_loss: 2.1835 - val_acc: 0.7013
Epoch 557/600
537/537 [==============================] - 0s 189us/step - loss: 0.0905 - acc:
```

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0.9702 - val_loss: 2.1267 - val_acc: 0.7186
Epoch 558/600
537/537 [==============================] - 0s 232us/step - loss: 0.0863 - acc:
0.9758 - val_loss: 2.1204 - val_acc: 0.7186
Epoch 559/600
537/537 [==============================] - 0s 232us/step - loss: 0.0889 - acc:
0.9683 - val_loss: 2.1318 - val_acc: 0.7143
Epoch 560/600
537/537 [==============================] - 0s 176us/step - loss: 0.0867 - acc:
0.9683 - val_loss: 2.2071 - val_acc: 0.7186
Epoch 561/600
537/537 [==============================] - 0s 171us/step - loss: 0.1002 - acc:
0.9646 - val_loss: 2.1646 - val_acc: 0.7013
Epoch 562/600
537/537 [==============================] - 0s 212us/step - loss: 0.0835 - acc:
0.9665 - val_loss: 2.1933 - val_acc: 0.7186
Epoch 563/600
537/537 [==============================] - 0s 327us/step - loss: 0.1032 - acc:
0.9572 - val_loss: 2.1792 - val_acc: 0.7186
Epoch 564/600
537/537 [==============================] - 0s 234us/step - loss: 0.1072 - acc:
0.9497 - val_loss: 2.1431 - val_acc: 0.7273
Epoch 565/600
537/537 [==============================] - 0s 97us/step - loss: 0.0911 - acc:
0.9646 - val_loss: 2.1421 - val_acc: 0.7056
Epoch 566/600
537/537 [==============================] - 0s 126us/step - loss: 0.0842 - acc:
0.9665 - val_loss: 2.2611 - val_acc: 0.7100
Epoch 567/600
537/537 [==============================] - 0s 95us/step - loss: 0.1814 - acc:
0.9367 - val_loss: 2.1952 - val_acc: 0.7186
Epoch 568/600
537/537 [==============================] - 0s 169us/step - loss: 0.1010 - acc:
0.9628 - val_loss: 2.1224 - val_acc: 0.7186
Epoch 569/600
537/537 [==============================] - 0s 197us/step - loss: 0.0864 - acc:
0.9665 - val_loss: 2.3662 - val_acc: 0.6926
Epoch 570/600
537/537 [==============================] - 0s 232us/step - loss: 0.0886 - acc:
0.9721 - val_loss: 2.1584 - val_acc: 0.7143
Epoch 571/600
537/537 [==============================] - 0s 212us/step - loss: 0.0975 - acc:
0.9758 - val_loss: 2.1135 - val_acc: 0.7143
Epoch 572/600
537/537 [==============================] - 0s 175us/step - loss: 0.0931 - acc:
0.9646 - val_loss: 2.1076 - val_acc: 0.7186
Epoch 573/600
537/537 [==============================] - 0s 139us/step - loss: 0.1420 - acc:
```

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0.9460 - val_loss: 2.2127 - val_acc: 0.7100
Epoch 574/600
537/537 [==============================] - 0s 321us/step - loss: 0.0797 - acc:
0.9739 - val_loss: 2.1991 - val_acc: 0.7056
Epoch 575/600
537/537 [==============================] - 0s 80us/step - loss: 0.0877 - acc:
0.9739 - val_loss: 2.1529 - val_acc: 0.7229
Epoch 576/600
537/537 [==============================] - 0s 128us/step - loss: 0.0712 - acc:
0.9739 - val_loss: 2.1605 - val_acc: 0.7056
Epoch 577/600
537/537 [==============================] - 0s 317us/step - loss: 0.0706 - acc:
0.9739 - val_loss: 2.1426 - val_acc: 0.7186
Epoch 578/600
537/537 [==============================] - 0s 147us/step - loss: 0.0666 - acc:
0.9739 - val_loss: 2.1472 - val_acc: 0.7186
Epoch 579/600
537/537 [==============================] - 0s 84us/step - loss: 0.1948 - acc:
0.9385 - val_loss: 2.0925 - val_acc: 0.7229
Epoch 580/600
537/537 [==============================] - 0s 191us/step - loss: 0.1083 - acc:
0.9665 - val_loss: 2.1042 - val_acc: 0.7273
Epoch 581/600
537/537 [==============================] - 0s 72us/step - loss: 0.0894 - acc:
0.9646 - val_loss: 2.2415 - val_acc: 0.7186
Epoch 582/600
537/537 [==============================] - 0s 82us/step - loss: 0.0770 - acc:
0.9683 - val_loss: 2.2279 - val_acc: 0.7013
Epoch 583/600
537/537 [==============================] - 0s 175us/step - loss: 0.1680 - acc:
0.9404 - val_loss: 2.2676 - val_acc: 0.7186
Epoch 584/600
537/537 [==============================] - 0s 126us/step - loss: 0.1838 - acc:
0.9479 - val_loss: 2.3221 - val_acc: 0.7013
Epoch 585/600
537/537 [==============================] - 0s 215us/step - loss: 0.1750 - acc:
0.9423 - val_loss: 2.1370 - val_acc: 0.7229
Epoch 586/600
537/537 [==============================] - 0s 89us/step - loss: 0.0766 - acc:
0.9702 - val_loss: 2.1033 - val_acc: 0.7186
Epoch 587/600
537/537 [==============================] - 0s 247us/step - loss: 0.1077 - acc:
0.9646 - val_loss: 2.1451 - val_acc: 0.7100
Epoch 588/600
537/537 [==============================] - 0s 225us/step - loss: 0.0895 - acc:
0.9646 - val_loss: 2.1858 - val_acc: 0.7229
Epoch 589/600
537/537 [==============================] - 0s 305us/step - loss: 0.0877 - acc:
```

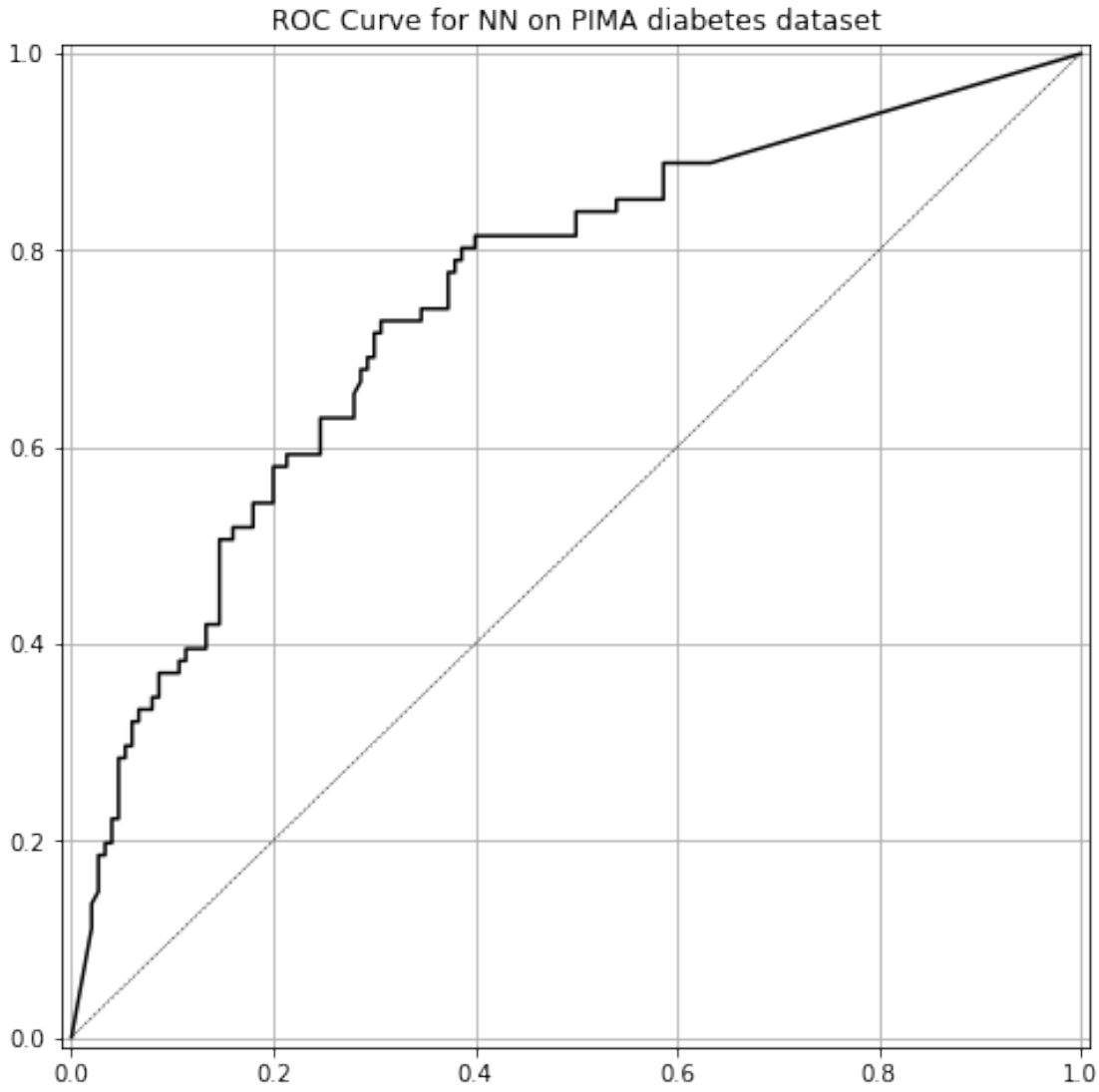
```
0.9702 - val_loss: 2.1577 - val_acc: 0.7056
Epoch 590/600
537/537 [==============================] - 0s 303us/step - loss: 0.1556 - acc:
0.9441 - val_loss: 2.1345 - val_acc: 0.7273
Epoch 591/600
537/537 [==============================] - 0s 295us/step - loss: 0.0838 - acc:
0.9702 - val_loss: 2.1403 - val_acc: 0.7143
Epoch 592/600
537/537 [==============================] - 0s 188us/step - loss: 0.0910 - acc:
0.9702 - val_loss: 2.1120 - val_acc: 0.7273
Epoch 593/600
537/537 [==============================] - ETA: 0s - loss: 0.0986 - acc: 0.966 -
0s 229us/step - loss: 0.1019 - acc: 0.9646 - val_loss: 2.1459 - val_acc: 0.7143
Epoch 594/600
537/537 [==============================] - 0s 241us/step - loss: 0.0831 - acc:
0.9721 - val_loss: 2.1490 - val_acc: 0.7186
Epoch 595/600
537/537 [==============================] - 0s 126us/step - loss: 0.0906 - acc:
0.9665 - val_loss: 2.1185 - val_acc: 0.7316
Epoch 596/600
537/537 [==============================] - 0s 123us/step - loss: 0.0741 - acc:
0.9739 - val_loss: 2.1765 - val_acc: 0.7056
Epoch 597/600
537/537 [==============================] - 0s 228us/step - loss: 0.0745 - acc:
0.9739 - val_loss: 2.1360 - val_acc: 0.7100
Epoch 598/600
537/537 [==============================] - 0s 100us/step - loss: 0.0730 - acc:
0.9758 - val_loss: 2.1301 - val_acc: 0.7273
Epoch 599/600
537/537 [==============================] - 0s 150us/step - loss: 0.0876 - acc:
0.9683 - val_loss: 2.1920 - val_acc: 0.7186
Epoch 600/600
537/537 [==============================] - 0s 160us/step - loss: 0.0943 - acc:
0.9665 - val_loss: 2.1339 - val_acc: 0.7186
```

[234]:
```
# predicting the outcome after the data is fit into the model.
y_pred_class_nn_600 = model.predict_classes(X_test_norm)
y_pred_prob_nn_600 = model.predict(X_test_norm)
```

[174]:
```
# Print model performance and plot the roc curve
print('Accuracy is {:.3f}'.format(accuracy_score(y_test,y_pred_class_nn_600)))
print('ROC-AUC is {:.3f}'.format(roc_auc_score(y_test,y_pred_prob_nn_600)))

plot_roc(y_test, y_pred_prob_nn_600, 'NN')
```

```
Accuracy is 0.719
ROC-AUC is 0.750
```



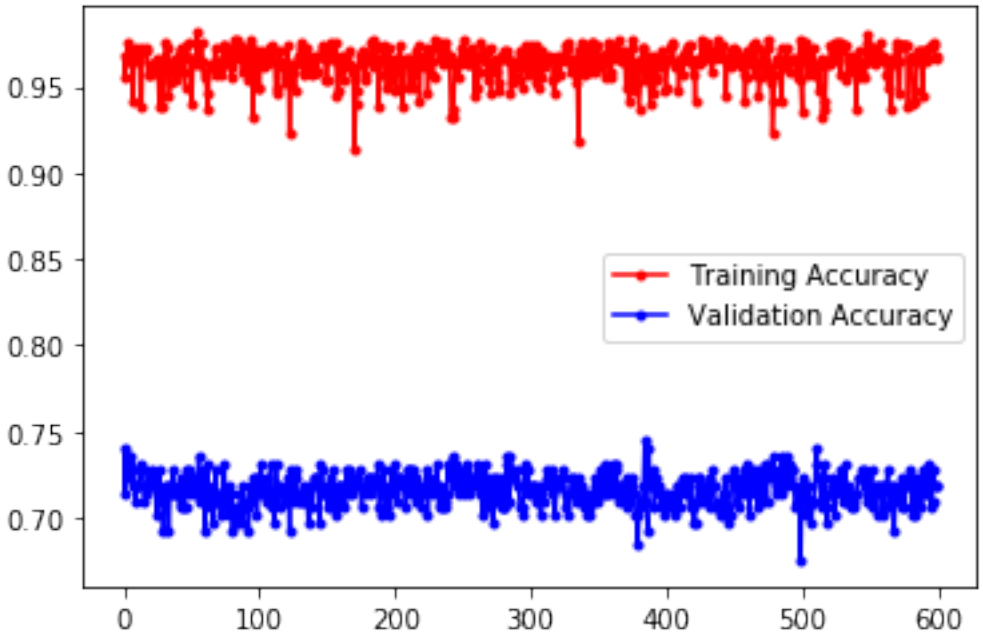
Accuracy obtained is 71.9% and AUC-ROC curve is 0.750

[175]:
```
run_hist_600.history.keys()
```

[175]:
```
dict_keys(['val_loss', 'val_acc', 'loss', 'acc'])
```

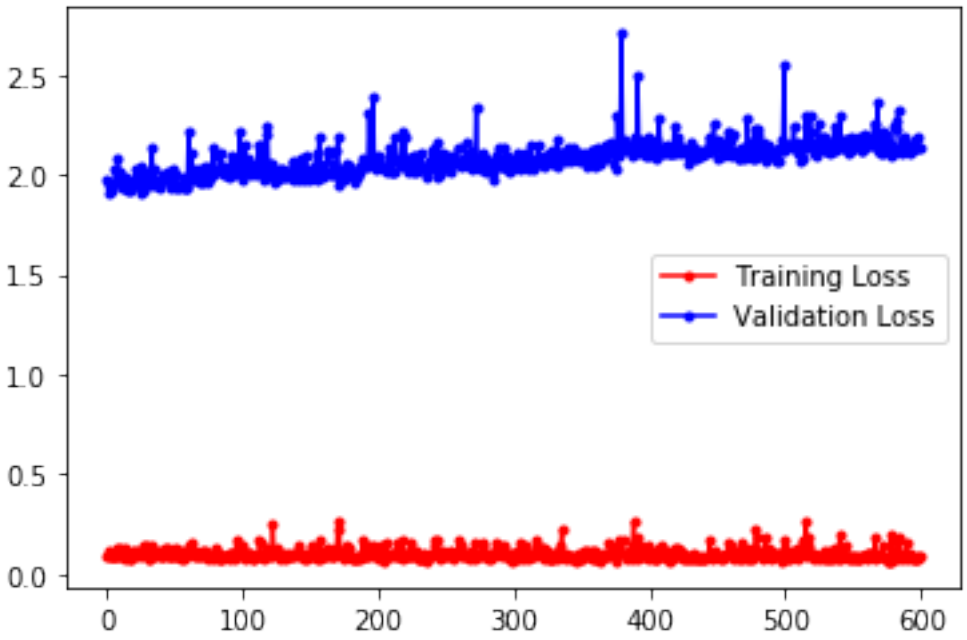
[176]:
```
#plotting the curve to check training and validation accuracy
fig, ax = plt.subplots()
ax.plot(run_hist_600.history["acc"],'r', marker='.', label="Training Accuracy")
ax.plot(run_hist_600.history["val_acc"],'b', marker='.', label="Validation␣
 ↪Accuracy")
ax.legend()
```

[176]:
```
<matplotlib.legend.Legend at 0x1c6ebf5c6d8>
```



[177]:
```
fig, ax = plt.subplots()
ax.plot(run_hist_600.history["loss"],'r', marker='.', label="Training Loss")
ax.plot(run_hist_600.history["val_loss"],'b', marker='.', label="Validation␣
 ↪Loss")
ax.legend()
```

[177]:
```
<matplotlib.legend.Legend at 0x1c6ebfd2208>
```



We see that 200 epochs in the above model gave the best accuracy, when we started increasing the number of epochs to 400 and 600 then accuracy was either constant or slightly dropped which means that model is not learning any furthur with increase in number of epochs.

Inorder to improve the model, we need to modify the learning rate to see if there is any improvement.

[433]:
```
sgd = SGD(lr=1e-3)
model.compile(loss="binary_crossentropy",optimizer=adam,␣
 ↪metrics=["accuracy"],sample_weight_mode=None)
```

[434]:
```
run_hist_200 = model.fit(X_train_norm, y_train, validation_data=(X_test_norm,␣
 ↪y_test), verbose=1, epochs=200)
```

```
Train on 537 samples, validate on 231 samples
Epoch 1/200
537/537 [==============================] - 2s 4ms/step - loss: 0.1128 - acc:
0.9683 - val_loss: 1.4446 - val_acc: 0.7273
Epoch 2/200
537/537 [==============================] - 0s 126us/step - loss: 0.1121 - acc:
0.9683 - val_loss: 1.4423 - val_acc: 0.7229
Epoch 3/200
537/537 [==============================] - 0s 357us/step - loss: 0.1120 - acc:
0.9702 - val_loss: 1.4509 - val_acc: 0.7229
Epoch 4/200
537/537 [==============================] - 0s 152us/step - loss: 0.1118 - acc:
0.9683 - val_loss: 1.4422 - val_acc: 0.7229
Epoch 5/200

C:\Users\Ashmita\Anaconda3\Anaconda_new\envs\tensorflow_cpu\lib\site-
packages\keras\callbacks.py:122: UserWarning: Method on_batch_end() is slow
compared to the batch update (0.113869). Check your callbacks.
  % delta_t_median)

537/537 [==============================] - 0s 397us/step - loss: 0.1116 - acc:
0.9683 - val_loss: 1.4482 - val_acc: 0.7229
Epoch 6/200
537/537 [==============================] - 0s 407us/step - loss: 0.1117 - acc:
0.9665 - val_loss: 1.4442 - val_acc: 0.7229
Epoch 7/200
537/537 [==============================] - 0s 212us/step - loss: 0.1107 - acc:
0.9665 - val_loss: 1.4463 - val_acc: 0.7229
Epoch 8/200
537/537 [==============================] - 0s 186us/step - loss: 0.1109 - acc:
0.9665 - val_loss: 1.4504 - val_acc: 0.7229
Epoch 9/200
537/537 [==============================] - 0s 93us/step - loss: 0.1108 - acc:
0.9665 - val_loss: 1.4499 - val_acc: 0.7229
```

```
Epoch 10/200
537/537 [==============================] - 0s 221us/step - loss: 0.1108 - acc:
0.9665 - val_loss: 1.4486 - val_acc: 0.7229
Epoch 11/200
537/537 [==============================] - 0s 110us/step - loss: 0.1108 - acc:
0.9665 - val_loss: 1.4478 - val_acc: 0.7229
Epoch 12/200
537/537 [==============================] - 0s 310us/step - loss: 0.1106 - acc:
0.9665 - val_loss: 1.4487 - val_acc: 0.7229
Epoch 13/200
537/537 [==============================] - 0s 160us/step - loss: 0.1109 - acc:
0.9665 - val_loss: 1.4478 - val_acc: 0.7229
Epoch 14/200
537/537 [==============================] - 0s 255us/step - loss: 0.1109 - acc:
0.9665 - val_loss: 1.4510 - val_acc: 0.7229
Epoch 15/200
537/537 [==============================] - 0s 318us/step - loss: 0.1106 - acc:
0.9665 - val_loss: 1.4491 - val_acc: 0.7229
Epoch 16/200
537/537 [==============================] - 0s 147us/step - loss: 0.1105 - acc:
0.9665 - val_loss: 1.4482 - val_acc: 0.7229
Epoch 17/200
537/537 [==============================] - 0s 318us/step - loss: 0.1106 - acc:
0.9665 - val_loss: 1.4495 - val_acc: 0.7229
Epoch 18/200
537/537 [==============================] - 0s 115us/step - loss: 0.1105 - acc:
0.9665 - val_loss: 1.4484 - val_acc: 0.7229
Epoch 19/200
537/537 [==============================] - 0s 93us/step - loss: 0.1106 - acc:
0.9665 - val_loss: 1.4484 - val_acc: 0.7229
Epoch 20/200
537/537 [==============================] - 0s 277us/step - loss: 0.1105 - acc:
0.9665 - val_loss: 1.4482 - val_acc: 0.7229
Epoch 21/200
537/537 [==============================] - 0s 145us/step - loss: 0.1105 - acc:
0.9665 - val_loss: 1.4496 - val_acc: 0.7229
Epoch 22/200
537/537 [==============================] - 0s 241us/step - loss: 0.1104 - acc:
0.9665 - val_loss: 1.4479 - val_acc: 0.7229
Epoch 23/200
537/537 [==============================] - 0s 163us/step - loss: 0.1104 - acc:
0.9665 - val_loss: 1.4494 - val_acc: 0.7229
Epoch 24/200
537/537 [==============================] - 0s 121us/step - loss: 0.1104 - acc:
0.9665 - val_loss: 1.4481 - val_acc: 0.7229
Epoch 25/200
537/537 [==============================] - 0s 186us/step - loss: 0.1104 - acc:
0.9665 - val_loss: 1.4483 - val_acc: 0.7229
```

```
Epoch 26/200
537/537 [==============================] - 0s 325us/step - loss: 0.1103 - acc:
0.9665 - val_loss: 1.4502 - val_acc: 0.7229
Epoch 27/200
537/537 [==============================] - 0s 199us/step - loss: 0.1104 - acc:
0.9665 - val_loss: 1.4507 - val_acc: 0.7229
Epoch 28/200
537/537 [==============================] - ETA: 0s - loss: 0.0727 - acc: 0.968 -
0s 143us/step - loss: 0.1105 - acc: 0.9665 - val_loss: 1.4503 - val_acc: 0.7229
Epoch 29/200
537/537 [==============================] - 0s 223us/step - loss: 0.1104 - acc:
0.9665 - val_loss: 1.4491 - val_acc: 0.7229
Epoch 30/200
537/537 [==============================] - 0s 86us/step - loss: 0.1103 - acc:
0.9665 - val_loss: 1.4484 - val_acc: 0.7229
Epoch 31/200
537/537 [==============================] - 0s 116us/step - loss: 0.1103 - acc:
0.9665 - val_loss: 1.4508 - val_acc: 0.7229
Epoch 32/200
537/537 [==============================] - 0s 147us/step - loss: 0.1103 - acc:
0.9665 - val_loss: 1.4518 - val_acc: 0.7229
Epoch 33/200
537/537 [==============================] - 0s 301us/step - loss: 0.1104 - acc:
0.9665 - val_loss: 1.4482 - val_acc: 0.7229
Epoch 34/200
537/537 [==============================] - 0s 160us/step - loss: 0.1101 - acc:
0.9665 - val_loss: 1.4490 - val_acc: 0.7229
Epoch 35/200
537/537 [==============================] - 0s 122us/step - loss: 0.1104 - acc:
0.9665 - val_loss: 1.4512 - val_acc: 0.7229
Epoch 36/200
537/537 [==============================] - 0s 100us/step - loss: 0.1102 - acc:
0.9665 - val_loss: 1.4501 - val_acc: 0.7229
Epoch 37/200
537/537 [==============================] - 0s 136us/step - loss: 0.1102 - acc:
0.9665 - val_loss: 1.4482 - val_acc: 0.7229
Epoch 38/200
537/537 [==============================] - 0s 206us/step - loss: 0.1102 - acc:
0.9665 - val_loss: 1.4500 - val_acc: 0.7229
Epoch 39/200
537/537 [==============================] - 0s 87us/step - loss: 0.1101 - acc:
0.9665 - val_loss: 1.4483 - val_acc: 0.7229
Epoch 40/200
537/537 [==============================] - 0s 295us/step - loss: 0.1103 - acc:
0.9665 - val_loss: 1.4495 - val_acc: 0.7229
Epoch 41/200
537/537 [==============================] - 0s 147us/step - loss: 0.1101 - acc:
0.9665 - val_loss: 1.4500 - val_acc: 0.7229
```

```
Epoch 42/200
537/537 [==============================] - 0s 128us/step - loss: 0.1101 - acc:
0.9665 - val_loss: 1.4507 - val_acc: 0.7229
Epoch 43/200
537/537 [==============================] - 0s 574us/step - loss: 0.1103 - acc:
0.9665 - val_loss: 1.4504 - val_acc: 0.7229
Epoch 44/200
537/537 [==============================] - 0s 390us/step - loss: 0.1102 - acc:
0.9665 - val_loss: 1.4505 - val_acc: 0.7229
Epoch 45/200
537/537 [==============================] - 0s 282us/step - loss: 0.1101 - acc:
0.9665 - val_loss: 1.4499 - val_acc: 0.7229
Epoch 46/200
537/537 [==============================] - 0s 204us/step - loss: 0.1103 - acc:
0.9665 - val_loss: 1.4512 - val_acc: 0.7229
Epoch 47/200
537/537 [==============================] - 0s 555us/step - loss: 0.1101 - acc:
0.9665 - val_loss: 1.4504 - val_acc: 0.7229
Epoch 48/200
537/537 [==============================] - 0s 349us/step - loss: 0.1101 - acc:
0.9665 - val_loss: 1.4510 - val_acc: 0.7229
Epoch 49/200
537/537 [==============================] - 0s 165us/step - loss: 0.1101 - acc:
0.9665 - val_loss: 1.4507 - val_acc: 0.7229
Epoch 50/200
537/537 [==============================] - 0s 557us/step - loss: 0.1104 - acc:
0.9665 - val_loss: 1.4516 - val_acc: 0.7229
Epoch 51/200
537/537 [==============================] - 0s 425us/step - loss: 0.1100 - acc:
0.9665 - val_loss: 1.4503 - val_acc: 0.7229
Epoch 52/200
537/537 [==============================] - 0s 594us/step - loss: 0.1101 - acc:
0.9665 - val_loss: 1.4500 - val_acc: 0.7229
Epoch 53/200
537/537 [==============================] - 0s 275us/step - loss: 0.1100 - acc:
0.9665 - val_loss: 1.4516 - val_acc: 0.7229
Epoch 54/200
537/537 [==============================] - 0s 178us/step - loss: 0.1101 - acc:
0.9665 - val_loss: 1.4494 - val_acc: 0.7229
Epoch 55/200
537/537 [==============================] - 0s 344us/step - loss: 0.1100 - acc:
0.9665 - val_loss: 1.4505 - val_acc: 0.7229
Epoch 56/200
537/537 [==============================] - 0s 141us/step - loss: 0.1102 - acc:
0.9665 - val_loss: 1.4521 - val_acc: 0.7229
Epoch 57/200
537/537 [==============================] - 0s 145us/step - loss: 0.1101 - acc:
0.9665 - val_loss: 1.4510 - val_acc: 0.7229
```

```
Epoch 58/200
537/537 [==============================] - 0s 308us/step - loss: 0.1100 - acc:
0.9665 - val_loss: 1.4509 - val_acc: 0.7229
Epoch 59/200
537/537 [==============================] - 0s 672us/step - loss: 0.1101 - acc:
0.9665 - val_loss: 1.4503 - val_acc: 0.7229
Epoch 60/200
537/537 [==============================] - 0s 217us/step - loss: 0.1100 - acc:
0.9665 - val_loss: 1.4512 - val_acc: 0.7229
Epoch 61/200
537/537 [==============================] - 0s 188us/step - loss: 0.1100 - acc:
0.9665 - val_loss: 1.4529 - val_acc: 0.7229
Epoch 62/200
537/537 [==============================] - 0s 648us/step - loss: 0.1099 - acc:
0.9665 - val_loss: 1.4518 - val_acc: 0.7229
Epoch 63/200
537/537 [==============================] - 0s 236us/step - loss: 0.1099 - acc:
0.9665 - val_loss: 1.4514 - val_acc: 0.7229
Epoch 64/200
537/537 [==============================] - 0s 271us/step - loss: 0.1100 - acc:
0.9665 - val_loss: 1.4512 - val_acc: 0.7229
Epoch 65/200
537/537 [==============================] - 0s 273us/step - loss: 0.1100 - acc:
0.9665 - val_loss: 1.4502 - val_acc: 0.7229
Epoch 66/200
537/537 [==============================] - 0s 144us/step - loss: 0.1099 - acc:
0.9665 - val_loss: 1.4506 - val_acc: 0.7229
Epoch 67/200
537/537 [==============================] - 0s 223us/step - loss: 0.1099 - acc:
0.9665 - val_loss: 1.4525 - val_acc: 0.7229
Epoch 68/200
537/537 [==============================] - 0s 133us/step - loss: 0.1099 - acc:
0.9665 - val_loss: 1.4512 - val_acc: 0.7229
Epoch 69/200
537/537 [==============================] - 0s 130us/step - loss: 0.1099 - acc:
0.9665 - val_loss: 1.4510 - val_acc: 0.7229
Epoch 70/200
537/537 [==============================] - 0s 108us/step - loss: 0.1099 - acc:
0.9665 - val_loss: 1.4522 - val_acc: 0.7229
Epoch 71/200
537/537 [==============================] - 0s 191us/step - loss: 0.1100 - acc:
0.9665 - val_loss: 1.4520 - val_acc: 0.7229
Epoch 72/200
537/537 [==============================] - 0s 240us/step - loss: 0.1099 - acc:
0.9665 - val_loss: 1.4529 - val_acc: 0.7229
Epoch 73/200
537/537 [==============================] - 0s 135us/step - loss: 0.1099 - acc:
0.9665 - val_loss: 1.4529 - val_acc: 0.7229
```

```
Epoch 74/200
537/537 [==============================] - 0s 165us/step - loss: 0.1098 - acc:
0.9665 - val_loss: 1.4520 - val_acc: 0.7229
Epoch 75/200
537/537 [==============================] - 0s 213us/step - loss: 0.1099 - acc:
0.9665 - val_loss: 1.4527 - val_acc: 0.7229
Epoch 76/200
537/537 [==============================] - 0s 160us/step - loss: 0.1100 - acc:
0.9665 - val_loss: 1.4517 - val_acc: 0.7229
Epoch 77/200
537/537 [==============================] - 0s 659us/step - loss: 0.1099 - acc:
0.9665 - val_loss: 1.4526 - val_acc: 0.7229
Epoch 78/200
537/537 [==============================] - 0s 274us/step - loss: 0.1099 - acc:
0.9665 - val_loss: 1.4520 - val_acc: 0.7229
Epoch 79/200
537/537 [==============================] - 0s 160us/step - loss: 0.1098 - acc:
0.9665 - val_loss: 1.4522 - val_acc: 0.7229
Epoch 80/200
537/537 [==============================] - 0s 154us/step - loss: 0.1099 - acc:
0.9665 - val_loss: 1.4520 - val_acc: 0.7229
Epoch 81/200
537/537 [==============================] - 0s 87us/step - loss: 0.1098 - acc:
0.9665 - val_loss: 1.4516 - val_acc: 0.7229
Epoch 82/200
537/537 [==============================] - 0s 93us/step - loss: 0.1098 - acc:
0.9665 - val_loss: 1.4523 - val_acc: 0.7229
Epoch 83/200
537/537 [==============================] - 0s 95us/step - loss: 0.1097 - acc:
0.9665 - val_loss: 1.4535 - val_acc: 0.7229
Epoch 84/200
537/537 [==============================] - 0s 85us/step - loss: 0.1098 - acc:
0.9665 - val_loss: 1.4528 - val_acc: 0.7229
Epoch 85/200
537/537 [==============================] - 0s 241us/step - loss: 0.1098 - acc:
0.9665 - val_loss: 1.4521 - val_acc: 0.7229
Epoch 86/200
537/537 [==============================] - 0s 225us/step - loss: 0.1097 - acc:
0.9665 - val_loss: 1.4526 - val_acc: 0.7229
Epoch 87/200
537/537 [==============================] - 0s 152us/step - loss: 0.1099 - acc:
0.9665 - val_loss: 1.4519 - val_acc: 0.7229
Epoch 88/200
537/537 [==============================] - 0s 253us/step - loss: 0.1098 - acc:
0.9665 - val_loss: 1.4530 - val_acc: 0.7229
Epoch 89/200
537/537 [==============================] - 0s 260us/step - loss: 0.1098 - acc:
0.9665 - val_loss: 1.4535 - val_acc: 0.7229
```

```
Epoch 90/200
537/537 [==============================] - 0s 184us/step - loss: 0.1097 - acc:
0.9665 - val_loss: 1.4530 - val_acc: 0.7229
Epoch 91/200
537/537 [==============================] - 0s 206us/step - loss: 0.1098 - acc:
0.9665 - val_loss: 1.4534 - val_acc: 0.7229
Epoch 92/200
537/537 [==============================] - 0s 154us/step - loss: 0.1098 - acc:
0.9665 - val_loss: 1.4522 - val_acc: 0.7229
Epoch 93/200
537/537 [==============================] - 0s 210us/step - loss: 0.1098 - acc:
0.9665 - val_loss: 1.4534 - val_acc: 0.7229
Epoch 94/200
537/537 [==============================] - 0s 176us/step - loss: 0.1098 - acc:
0.9665 - val_loss: 1.4539 - val_acc: 0.7229
Epoch 95/200
537/537 [==============================] - 0s 217us/step - loss: 0.1097 - acc:
0.9665 - val_loss: 1.4527 - val_acc: 0.7229
Epoch 96/200
537/537 [==============================] - 0s 374us/step - loss: 0.1097 - acc:
0.9665 - val_loss: 1.4530 - val_acc: 0.7229
Epoch 97/200
537/537 [==============================] - 0s 368us/step - loss: 0.1097 - acc:
0.9665 - val_loss: 1.4524 - val_acc: 0.7229
Epoch 98/200
537/537 [==============================] - 0s 189us/step - loss: 0.1097 - acc:
0.9665 - val_loss: 1.4559 - val_acc: 0.7229
Epoch 99/200
537/537 [==============================] - 0s 136us/step - loss: 0.1097 - acc:
0.9665 - val_loss: 1.4542 - val_acc: 0.7229
Epoch 100/200
537/537 [==============================] - 0s 199us/step - loss: 0.1097 - acc:
0.9665 - val_loss: 1.4534 - val_acc: 0.7229
Epoch 101/200
537/537 [==============================] - 0s 411us/step - loss: 0.1097 - acc:
0.9665 - val_loss: 1.4540 - val_acc: 0.7229
Epoch 102/200
537/537 [==============================] - 0s 286us/step - loss: 0.1096 - acc:
0.9665 - val_loss: 1.4535 - val_acc: 0.7229
Epoch 103/200
537/537 [==============================] - 0s 232us/step - loss: 0.1099 - acc:
0.9665 - val_loss: 1.4549 - val_acc: 0.7229
Epoch 104/200
537/537 [==============================] - 0s 212us/step - loss: 0.1096 - acc:
0.9665 - val_loss: 1.4538 - val_acc: 0.7229
Epoch 105/200
537/537 [==============================] - 0s 124us/step - loss: 0.1096 - acc:
0.9665 - val_loss: 1.4536 - val_acc: 0.7229
```

```
Epoch 106/200
537/537 [==============================] - 0s 260us/step - loss: 0.1097 - acc:
0.9665 - val_loss: 1.4565 - val_acc: 0.7229
Epoch 107/200
537/537 [==============================] - 0s 210us/step - loss: 0.1097 - acc:
0.9665 - val_loss: 1.4525 - val_acc: 0.7229
Epoch 108/200
537/537 [==============================] - ETA: 0s - loss: 0.1852 - acc: 0.906 -
0s 119us/step - loss: 0.1096 - acc: 0.9665 - val_loss: 1.4528 - val_acc: 0.7229
Epoch 109/200
537/537 [==============================] - 0s 117us/step - loss: 0.1096 - acc:
0.9665 - val_loss: 1.4541 - val_acc: 0.7229
Epoch 110/200
537/537 [==============================] - 0s 128us/step - loss: 0.1097 - acc:
0.9665 - val_loss: 1.4534 - val_acc: 0.7229
Epoch 111/200
537/537 [==============================] - 0s 288us/step - loss: 0.1098 - acc:
0.9665 - val_loss: 1.4544 - val_acc: 0.7229
Epoch 112/200
537/537 [==============================] - 0s 106us/step - loss: 0.1096 - acc:
0.9665 - val_loss: 1.4533 - val_acc: 0.7229
Epoch 113/200
537/537 [==============================] - 0s 243us/step - loss: 0.1096 - acc:
0.9665 - val_loss: 1.4537 - val_acc: 0.7229
Epoch 114/200
537/537 [==============================] - 0s 128us/step - loss: 0.1096 - acc:
0.9665 - val_loss: 1.4537 - val_acc: 0.7229
Epoch 115/200
537/537 [==============================] - 0s 152us/step - loss: 0.1096 - acc:
0.9665 - val_loss: 1.4536 - val_acc: 0.7229
Epoch 116/200
537/537 [==============================] - 0s 154us/step - loss: 0.1096 - acc:
0.9665 - val_loss: 1.4552 - val_acc: 0.7229
Epoch 117/200
537/537 [==============================] - 0s 167us/step - loss: 0.1096 - acc:
0.9665 - val_loss: 1.4545 - val_acc: 0.7229
Epoch 118/200
537/537 [==============================] - 0s 154us/step - loss: 0.1096 - acc:
0.9665 - val_loss: 1.4548 - val_acc: 0.7229
Epoch 119/200
537/537 [==============================] - 0s 152us/step - loss: 0.1096 - acc:
0.9665 - val_loss: 1.4572 - val_acc: 0.7229
Epoch 120/200
537/537 [==============================] - 0s 126us/step - loss: 0.1096 - acc:
0.9665 - val_loss: 1.4541 - val_acc: 0.7229
Epoch 121/200
537/537 [==============================] - 0s 143us/step - loss: 0.1096 - acc:
0.9683 - val_loss: 1.4564 - val_acc: 0.7229
```

```
Epoch 122/200
537/537 [==============================] - 0s 117us/step - loss: 0.1095 - acc:
0.9683 - val_loss: 1.4551 - val_acc: 0.7229
Epoch 123/200
537/537 [==============================] - 0s 308us/step - loss: 0.1095 - acc:
0.9665 - val_loss: 1.4548 - val_acc: 0.7229
Epoch 124/200
537/537 [==============================] - 0s 217us/step - loss: 0.1095 - acc:
0.9665 - val_loss: 1.4554 - val_acc: 0.7229
Epoch 125/200
537/537 [==============================] - 0s 230us/step - loss: 0.1096 - acc:
0.9665 - val_loss: 1.4544 - val_acc: 0.7229
Epoch 126/200
537/537 [==============================] - 0s 188us/step - loss: 0.1096 - acc:
0.9665 - val_loss: 1.4559 - val_acc: 0.7229
Epoch 127/200
537/537 [==============================] - 0s 145us/step - loss: 0.1095 - acc:
0.9665 - val_loss: 1.4553 - val_acc: 0.7229
Epoch 128/200
537/537 [==============================] - 0s 204us/step - loss: 0.1095 - acc:
0.9665 - val_loss: 1.4551 - val_acc: 0.7229
Epoch 129/200
537/537 [==============================] - 0s 171us/step - loss: 0.1096 - acc:
0.9665 - val_loss: 1.4549 - val_acc: 0.7229
Epoch 130/200
537/537 [==============================] - 0s 203us/step - loss: 0.1094 - acc:
0.9665 - val_loss: 1.4550 - val_acc: 0.7229
Epoch 131/200
537/537 [==============================] - 0s 204us/step - loss: 0.1095 - acc:
0.9665 - val_loss: 1.4557 - val_acc: 0.7229
Epoch 132/200
537/537 [==============================] - 0s 173us/step - loss: 0.1095 - acc:
0.9665 - val_loss: 1.4553 - val_acc: 0.7229
Epoch 133/200
537/537 [==============================] - 0s 212us/step - loss: 0.1095 - acc:
0.9665 - val_loss: 1.4549 - val_acc: 0.7229
Epoch 134/200
537/537 [==============================] - 0s 202us/step - loss: 0.1094 - acc:
0.9665 - val_loss: 1.4555 - val_acc: 0.7229
Epoch 135/200
537/537 [==============================] - 0s 150us/step - loss: 0.1095 - acc:
0.9665 - val_loss: 1.4553 - val_acc: 0.7229
Epoch 136/200
537/537 [==============================] - 0s 271us/step - loss: 0.1095 - acc:
0.9665 - val_loss: 1.4551 - val_acc: 0.7229
Epoch 137/200
537/537 [==============================] - 0s 644us/step - loss: 0.1095 - acc:
0.9665 - val_loss: 1.4560 - val_acc: 0.7229
```

```
Epoch 138/200
537/537 [==============================] - 0s 230us/step - loss: 0.1095 - acc:
0.9665 - val_loss: 1.4547 - val_acc: 0.7229
Epoch 139/200
537/537 [==============================] - 0s 371us/step - loss: 0.1095 - acc:
0.9665 - val_loss: 1.4589 - val_acc: 0.7229
Epoch 140/200
537/537 [==============================] - 0s 678us/step - loss: 0.1096 - acc:
0.9665 - val_loss: 1.4543 - val_acc: 0.7229
Epoch 141/200
537/537 [==============================] - 0s 299us/step - loss: 0.1095 - acc:
0.9665 - val_loss: 1.4572 - val_acc: 0.7229
Epoch 142/200
537/537 [==============================] - 0s 164us/step - loss: 0.1095 - acc:
0.9683 - val_loss: 1.4568 - val_acc: 0.7229
Epoch 143/200
537/537 [==============================] - 0s 217us/step - loss: 0.1094 - acc:
0.9665 - val_loss: 1.4550 - val_acc: 0.7229
Epoch 144/200
537/537 [==============================] - 0s 657us/step - loss: 0.1094 - acc:
0.9665 - val_loss: 1.4557 - val_acc: 0.7229
Epoch 145/200
537/537 [==============================] - 0s 196us/step - loss: 0.1094 - acc:
0.9665 - val_loss: 1.4561 - val_acc: 0.7229
Epoch 146/200
537/537 [==============================] - 0s 132us/step - loss: 0.1094 - acc:
0.9665 - val_loss: 1.4554 - val_acc: 0.7229
Epoch 147/200
537/537 [==============================] - 0s 234us/step - loss: 0.1094 - acc:
0.9665 - val_loss: 1.4542 - val_acc: 0.7229
Epoch 148/200
537/537 [==============================] - 0s 119us/step - loss: 0.1093 - acc:
0.9665 - val_loss: 1.4558 - val_acc: 0.7229
Epoch 149/200
537/537 [==============================] - 0s 151us/step - loss: 0.1094 - acc:
0.9665 - val_loss: 1.4556 - val_acc: 0.7229
Epoch 150/200
537/537 [==============================] - 0s 249us/step - loss: 0.1094 - acc:
0.9665 - val_loss: 1.4544 - val_acc: 0.7229
Epoch 151/200
537/537 [==============================] - 0s 247us/step - loss: 0.1094 - acc:
0.9665 - val_loss: 1.4548 - val_acc: 0.7229
Epoch 152/200
537/537 [==============================] - 0s 206us/step - loss: 0.1094 - acc:
0.9665 - val_loss: 1.4554 - val_acc: 0.7229
Epoch 153/200
537/537 [==============================] - 0s 115us/step - loss: 0.1094 - acc:
0.9665 - val_loss: 1.4562 - val_acc: 0.7229
```

```
Epoch 154/200
537/537 [==============================] - 0s 262us/step - loss: 0.1093 - acc:
0.9665 - val_loss: 1.4561 - val_acc: 0.7229
Epoch 155/200
537/537 [==============================] - 0s 184us/step - loss: 0.1094 - acc:
0.9665 - val_loss: 1.4580 - val_acc: 0.7229
Epoch 156/200
537/537 [==============================] - 0s 150us/step - loss: 0.1094 - acc:
0.9665 - val_loss: 1.4567 - val_acc: 0.7229
Epoch 157/200
537/537 [==============================] - 0s 199us/step - loss: 0.1094 - acc:
0.9665 - val_loss: 1.4564 - val_acc: 0.7229
Epoch 158/200
537/537 [==============================] - 0s 206us/step - loss: 0.1093 - acc:
0.9665 - val_loss: 1.4548 - val_acc: 0.7229
Epoch 159/200
537/537 [==============================] - 0s 121us/step - loss: 0.1093 - acc:
0.9665 - val_loss: 1.4540 - val_acc: 0.7229
Epoch 160/200
537/537 [==============================] - 0s 132us/step - loss: 0.1093 - acc:
0.9665 - val_loss: 1.4551 - val_acc: 0.7229
Epoch 161/200
537/537 [==============================] - ETA: 0s - loss: 0.1248 - acc: 0.957 -
0s 204us/step - loss: 0.1093 - acc: 0.9665 - val_loss: 1.4565 - val_acc: 0.7229
Epoch 162/200
537/537 [==============================] - 0s 171us/step - loss: 0.1093 - acc:
0.9665 - val_loss: 1.4565 - val_acc: 0.7229
Epoch 163/200
537/537 [==============================] - 0s 152us/step - loss: 0.1092 - acc:
0.9665 - val_loss: 1.4561 - val_acc: 0.7229
Epoch 164/200
537/537 [==============================] - 0s 316us/step - loss: 0.1094 - acc:
0.9665 - val_loss: 1.4560 - val_acc: 0.7229
Epoch 165/200
537/537 [==============================] - 0s 150us/step - loss: 0.1092 - acc:
0.9665 - val_loss: 1.4567 - val_acc: 0.7229
Epoch 166/200
537/537 [==============================] - 0s 156us/step - loss: 0.1093 - acc:
0.9665 - val_loss: 1.4566 - val_acc: 0.7229
Epoch 167/200
537/537 [==============================] - 0s 189us/step - loss: 0.1093 - acc:
0.9665 - val_loss: 1.4565 - val_acc: 0.7229
Epoch 168/200
537/537 [==============================] - 0s 149us/step - loss: 0.1093 - acc:
0.9665 - val_loss: 1.4565 - val_acc: 0.7229
Epoch 169/200
537/537 [==============================] - 0s 130us/step - loss: 0.1094 - acc:
0.9665 - val_loss: 1.4570 - val_acc: 0.7229
```

```
Epoch 170/200
537/537 [==============================] - 0s 115us/step - loss: 0.1092 - acc:
0.9665 - val_loss: 1.4564 - val_acc: 0.7229
Epoch 171/200
537/537 [==============================] - 0s 117us/step - loss: 0.1093 - acc:
0.9665 - val_loss: 1.4563 - val_acc: 0.7229
Epoch 172/200
537/537 [==============================] - 0s 113us/step - loss: 0.1092 - acc:
0.9665 - val_loss: 1.4561 - val_acc: 0.7229
Epoch 173/200
537/537 [==============================] - 0s 102us/step - loss: 0.1092 - acc:
0.9665 - val_loss: 1.4558 - val_acc: 0.7229
Epoch 174/200
537/537 [==============================] - 0s 126us/step - loss: 0.1092 - acc:
0.9665 - val_loss: 1.4595 - val_acc: 0.7229
Epoch 175/200
537/537 [==============================] - 0s 173us/step - loss: 0.1092 - acc:
0.9665 - val_loss: 1.4571 - val_acc: 0.7229
Epoch 176/200
537/537 [==============================] - 0s 158us/step - loss: 0.1093 - acc:
0.9665 - val_loss: 1.4572 - val_acc: 0.7229
Epoch 177/200
537/537 [==============================] - 0s 199us/step - loss: 0.1092 - acc:
0.9665 - val_loss: 1.4572 - val_acc: 0.7229
Epoch 178/200
537/537 [==============================] - 0s 133us/step - loss: 0.1092 - acc:
0.9665 - val_loss: 1.4579 - val_acc: 0.7229
Epoch 179/200
537/537 [==============================] - 0s 176us/step - loss: 0.1092 - acc:
0.9665 - val_loss: 1.4564 - val_acc: 0.7229
Epoch 180/200
537/537 [==============================] - 0s 253us/step - loss: 0.1092 - acc:
0.9665 - val_loss: 1.4564 - val_acc: 0.7229
Epoch 181/200
537/537 [==============================] - 0s 264us/step - loss: 0.1093 - acc:
0.9665 - val_loss: 1.4550 - val_acc: 0.7229
Epoch 182/200
537/537 [==============================] - 0s 110us/step - loss: 0.1092 - acc:
0.9665 - val_loss: 1.4562 - val_acc: 0.7229
Epoch 183/200
537/537 [==============================] - 0s 189us/step - loss: 0.1092 - acc:
0.9665 - val_loss: 1.4555 - val_acc: 0.7229
Epoch 184/200
537/537 [==============================] - 0s 165us/step - loss: 0.1093 - acc:
0.9665 - val_loss: 1.4573 - val_acc: 0.7229
Epoch 185/200
537/537 [==============================] - 0s 176us/step - loss: 0.1092 - acc:
0.9665 - val_loss: 1.4574 - val_acc: 0.7229
```

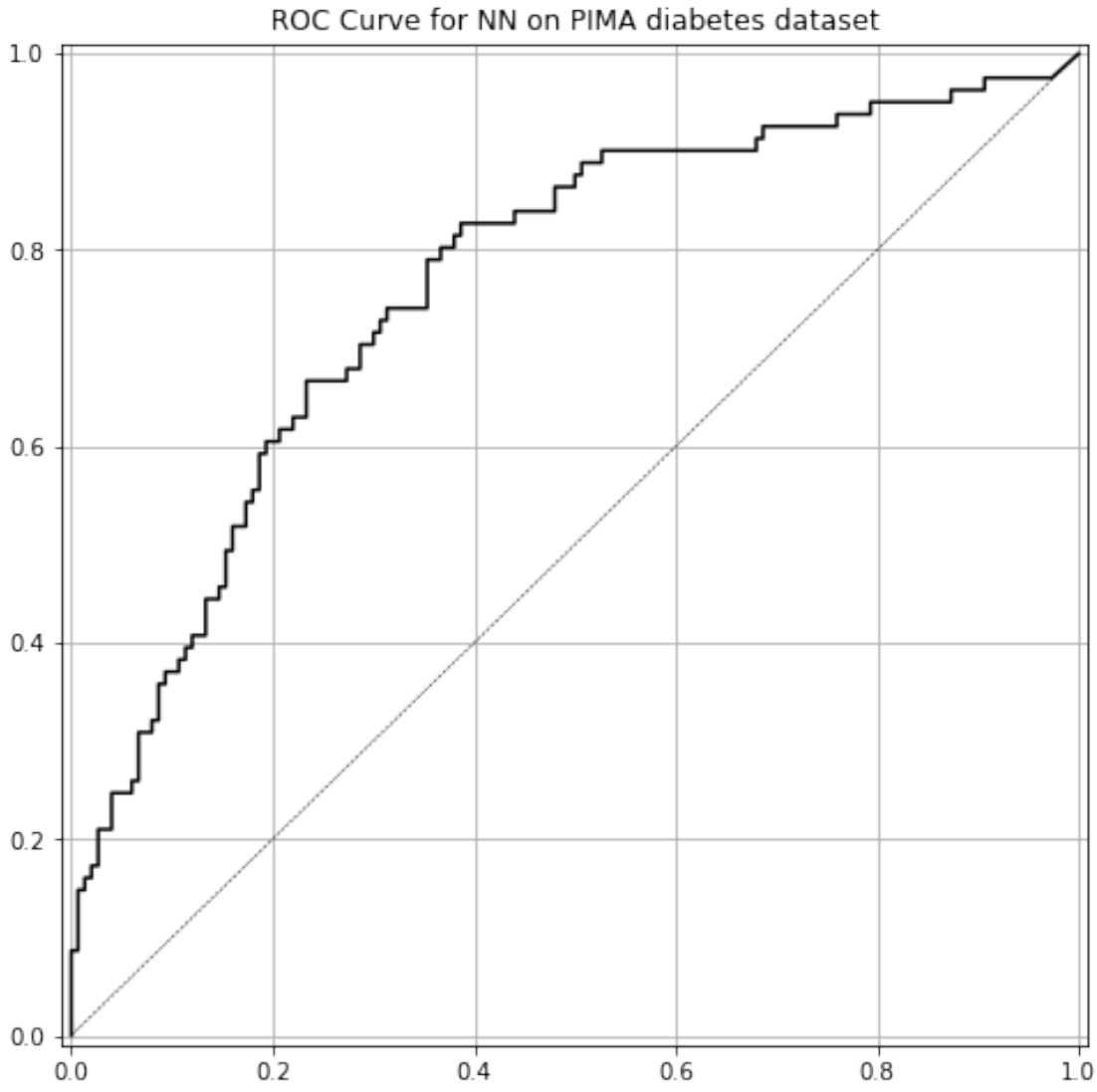
```
Epoch 186/200
537/537 [==============================] - 0s 169us/step - loss: 0.1091 - acc:
0.9665 - val_loss: 1.4573 - val_acc: 0.7229
Epoch 187/200
537/537 [==============================] - 0s 111us/step - loss: 0.1091 - acc:
0.9665 - val_loss: 1.4573 - val_acc: 0.7229
Epoch 188/200
537/537 [==============================] - 0s 121us/step - loss: 0.1091 - acc:
0.9665 - val_loss: 1.4576 - val_acc: 0.7229
Epoch 189/200
537/537 [==============================] - 0s 117us/step - loss: 0.1091 - acc:
0.9665 - val_loss: 1.4568 - val_acc: 0.7229
Epoch 190/200
537/537 [==============================] - 0s 184us/step - loss: 0.1091 - acc:
0.9665 - val_loss: 1.4573 - val_acc: 0.7229
Epoch 191/200
537/537 [==============================] - 0s 202us/step - loss: 0.1091 - acc:
0.9665 - val_loss: 1.4576 - val_acc: 0.7229
Epoch 192/200
537/537 [==============================] - 0s 115us/step - loss: 0.1092 - acc:
0.9683 - val_loss: 1.4594 - val_acc: 0.7229
Epoch 193/200
537/537 [==============================] - 0s 184us/step - loss: 0.1091 - acc:
0.9665 - val_loss: 1.4570 - val_acc: 0.7229
Epoch 194/200
537/537 [==============================] - 0s 115us/step - loss: 0.1091 - acc:
0.9665 - val_loss: 1.4575 - val_acc: 0.7229
Epoch 195/200
537/537 [==============================] - 0s 134us/step - loss: 0.1091 - acc:
0.9665 - val_loss: 1.4568 - val_acc: 0.7229
Epoch 196/200
537/537 [==============================] - 0s 204us/step - loss: 0.1092 - acc:
0.9665 - val_loss: 1.4575 - val_acc: 0.7229
Epoch 197/200
537/537 [==============================] - 0s 136us/step - loss: 0.1091 - acc:
0.9665 - val_loss: 1.4597 - val_acc: 0.7229
Epoch 198/200
537/537 [==============================] - 0s 149us/step - loss: 0.1091 - acc:
0.9665 - val_loss: 1.4579 - val_acc: 0.7229
Epoch 199/200
537/537 [==============================] - 0s 180us/step - loss: 0.1090 - acc:
0.9665 - val_loss: 1.4570 - val_acc: 0.7229
Epoch 200/200
537/537 [==============================] - 0s 195us/step - loss: 0.1090 - acc:
0.9665 - val_loss: 1.4594 - val_acc: 0.7229
```

[435]:
```
y_pred_class_nn_200 = model.predict_classes(X_test_norm)
y_pred_prob_nn_200 = model.predict(X_test_norm)
```

[436]:
```
# Print model performance and plot the roc curve
print('Accuracy is {:.3f}'.format(accuracy_score(y_test,y_pred_class_nn_200)))
print('ROC-AUC is {:.3f}'.format(roc_auc_score(y_test,y_pred_prob_nn_200)))

plot_roc(y_test, y_pred_prob_nn_2, 'NN')
```

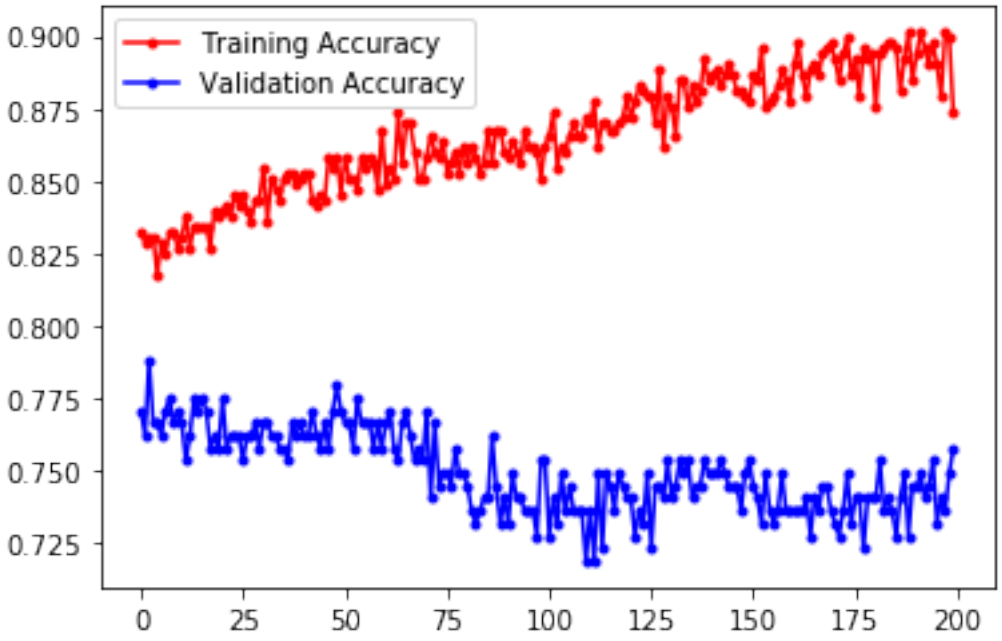
```
Accuracy is 0.723
ROC-AUC is 0.781
```



Accuracy obtained is 72.3% and ROC-AUC is 0.781 Plotting the curve for training and validation accuracy.

[437]:
```
#plotting the curve to check training and validation accuracy
fig, ax = plt.subplots()
ax.plot(run_hist_600.history["acc"],'r', marker='.', label="Training Accuracy")
ax.plot(run_hist_600.history["val_acc"],'b', marker='.', label="Validation␣
 ↪Accuracy")
ax.legend()
```

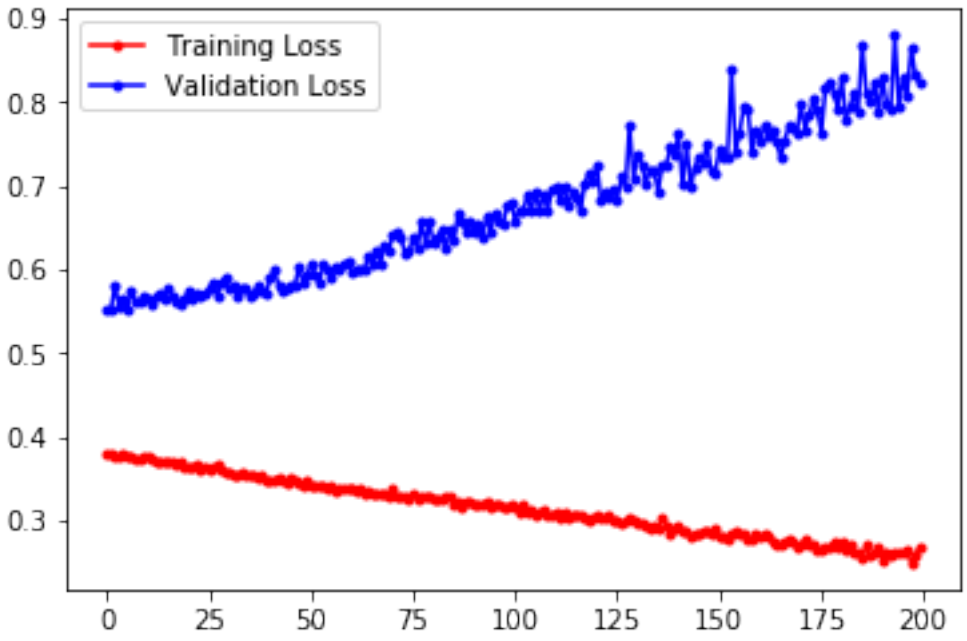
[437]:
```
<matplotlib.legend.Legend at 0x1c777118898>
```



Plotting the curve for training and validation loss of the model.

[438]:
```
fig, ax = plt.subplots()
ax.plot(run_hist_600.history["loss"],'r', marker='.', label="Training Loss")
ax.plot(run_hist_600.history["val_loss"],'b', marker='.', label="Validation␣
 ↪Loss")
ax.legend()
```

[438]:
```
<matplotlib.legend.Legend at 0x1c77d669f28>
```



We see that there is not much improvement in Accuracy and ROC-AUC curve values. Hence we need to fine tune the model to improve the performance. We need to check for different learning rates, optimizers such as adam or RMSprop or sgd if the values improve.

Now let's try developing a more complex model with more number of layers and check the performance of the model.

1.6.3 Trying to build another model with more number of hidden layers

[448]:
```
nn_model_2 = Sequential()
nn_model_2.add(Dense(64, input_shape=(8,), activation="relu"))
nn_model_2.add(Dense(32, activation="relu"))
nn_model_2.add(Dense(16, activation="relu"))
nn_model_2.add(Dense(8,  activation="relu"))
nn_model_2.add(Dense(1, activation ="sigmoid"))
```

[449]:
```
nn_model_2.summary()
```

```
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
dense_98 (Dense)             (None, 64)                576
_________________________________________________________________
dense_99 (Dense)             (None, 32)                2080
_________________________________________________________________
dense_100 (Dense)            (None, 16)                528
_________________________________________________________________
```

```
dense_101 (Dense)            (None, 8)                 136
_________________________________________________________________
dense_102 (Dense)            (None, 1)                 9
=================================================================
Total params: 3,329
Trainable params: 3,329
Non-trainable params: 0
_________________________________________________________________
```

[460]:
```
sgd = SGD(lr=1e-3, momentum=0.9)
nn_model_2.compile(loss="binary_crossentropy",␣
 ↪optimizer=sgd,metrics=["accuracy"])
run_hist_2 = nn_model_2.fit(X_train_norm, y_train,␣
 ↪validation_data=(X_test_norm, y_test), epochs=200)
```

```
Train on 537 samples, validate on 231 samples
Epoch 1/200
537/537 [==============================] - 3s 5ms/step - loss: 0.5365 - acc:
0.7076 - val_loss: 0.5408 - val_acc: 0.7316
Epoch 2/200
537/537 [==============================] - 0s 143us/step - loss: 0.5328 - acc:
0.7244 - val_loss: 0.5362 - val_acc: 0.7316
Epoch 3/200
537/537 [==============================] - 0s 208us/step - loss: 0.5281 - acc:
0.7263 - val_loss: 0.5317 - val_acc: 0.7489
Epoch 4/200
537/537 [==============================] - 0s 134us/step - loss: 0.5233 - acc:
0.7337 - val_loss: 0.5279 - val_acc: 0.7662
Epoch 5/200
537/537 [==============================] - 0s 240us/step - loss: 0.5193 - acc:
0.7374 - val_loss: 0.5235 - val_acc: 0.7749
Epoch 6/200
537/537 [==============================] - 0s 236us/step - loss: 0.5151 - acc:
0.7393 - val_loss: 0.5197 - val_acc: 0.7835
Epoch 7/200
537/537 [==============================] - 0s 100us/step - loss: 0.5109 - acc:
0.7486 - val_loss: 0.5161 - val_acc: 0.7879
Epoch 8/200
537/537 [==============================] - 0s 102us/step - loss: 0.5070 - acc:
0.7523 - val_loss: 0.5125 - val_acc: 0.7922
Epoch 9/200
537/537 [==============================] - 0s 117us/step - loss: 0.5037 - acc:
0.7505 - val_loss: 0.5087 - val_acc: 0.7792
Epoch 10/200
537/537 [==============================] - 0s 93us/step - loss: 0.5002 - acc:
0.7579 - val_loss: 0.5056 - val_acc: 0.7706
Epoch 11/200
```

```
537/537 [==============================] - 0s 310us/step - loss: 0.4966 - acc:
0.7579 - val_loss: 0.5026 - val_acc: 0.7619
Epoch 12/200
537/537 [==============================] - 0s 238us/step - loss: 0.4936 - acc:
0.7672 - val_loss: 0.5000 - val_acc: 0.7532
Epoch 13/200
537/537 [==============================] - 0s 351us/step - loss: 0.4906 - acc:
0.7672 - val_loss: 0.4972 - val_acc: 0.7532
Epoch 14/200
537/537 [==============================] - 0s 273us/step - loss: 0.4877 - acc:
0.7654 - val_loss: 0.4946 - val_acc: 0.7532
Epoch 15/200
537/537 [==============================] - 0s 178us/step - loss: 0.4853 - acc:
0.7691 - val_loss: 0.4927 - val_acc: 0.7532
Epoch 16/200
537/537 [==============================] - 0s 247us/step - loss: 0.4824 - acc:
0.7709 - val_loss: 0.4905 - val_acc: 0.7576
Epoch 17/200
537/537 [==============================] - 0s 173us/step - loss: 0.4802 - acc:
0.7709 - val_loss: 0.4882 - val_acc: 0.7532
Epoch 18/200
537/537 [==============================] - 0s 514us/step - loss: 0.4776 - acc:
0.7747 - val_loss: 0.4865 - val_acc: 0.7532
Epoch 19/200
537/537 [==============================] - 0s 102us/step - loss: 0.4753 - acc:
0.7672 - val_loss: 0.4844 - val_acc: 0.7576
Epoch 20/200
537/537 [==============================] - 0s 184us/step - loss: 0.4730 - acc:
0.7654 - val_loss: 0.4830 - val_acc: 0.7576
Epoch 21/200
537/537 [==============================] - 0s 236us/step - loss: 0.4710 - acc:
0.7691 - val_loss: 0.4814 - val_acc: 0.7576
Epoch 22/200
537/537 [==============================] - 0s 234us/step - loss: 0.4692 - acc:
0.7672 - val_loss: 0.4798 - val_acc: 0.7619
Epoch 23/200
537/537 [==============================] - 0s 336us/step - loss: 0.4673 - acc:
0.7691 - val_loss: 0.4790 - val_acc: 0.7619
Epoch 24/200
537/537 [==============================] - 0s 102us/step - loss: 0.4655 - acc:
0.7672 - val_loss: 0.4777 - val_acc: 0.7619
Epoch 25/200
537/537 [==============================] - 0s 314us/step - loss: 0.4639 - acc:
0.7616 - val_loss: 0.4769 - val_acc: 0.7576
Epoch 26/200
537/537 [==============================] - 0s 293us/step - loss: 0.4619 - acc:
0.7635 - val_loss: 0.4762 - val_acc: 0.7576
Epoch 27/200
```

```
537/537 [==============================] - 0s 269us/step - loss: 0.4604 - acc:
0.7672 - val_loss: 0.4751 - val_acc: 0.7576
Epoch 28/200
537/537 [==============================] - 0s 134us/step - loss: 0.4591 - acc:
0.7709 - val_loss: 0.4743 - val_acc: 0.7532
Epoch 29/200
537/537 [==============================] - 0s 171us/step - loss: 0.4572 - acc:
0.7672 - val_loss: 0.4739 - val_acc: 0.7576
Epoch 30/200
537/537 [==============================] - ETA: 0s - loss: 0.4527 - acc: 0.778 -
0s 299us/step - loss: 0.4565 - acc: 0.7728 - val_loss: 0.4736 - val_acc: 0.7576
Epoch 31/200
537/537 [==============================] - 0s 273us/step - loss: 0.4546 - acc:
0.7728 - val_loss: 0.4725 - val_acc: 0.7576
Epoch 32/200
537/537 [==============================] - 0s 225us/step - loss: 0.4533 - acc:
0.7728 - val_loss: 0.4719 - val_acc: 0.7489
Epoch 33/200
537/537 [==============================] - 0s 204us/step - loss: 0.4521 - acc:
0.7709 - val_loss: 0.4713 - val_acc: 0.7576
Epoch 34/200
537/537 [==============================] - 0s 334us/step - loss: 0.4505 - acc:
0.7709 - val_loss: 0.4709 - val_acc: 0.7532
Epoch 35/200
537/537 [==============================] - 0s 279us/step - loss: 0.4493 - acc:
0.7728 - val_loss: 0.4706 - val_acc: 0.7532
Epoch 36/200
537/537 [==============================] - 0s 193us/step - loss: 0.4485 - acc:
0.7728 - val_loss: 0.4700 - val_acc: 0.7532
Epoch 37/200
537/537 [==============================] - 0s 234us/step - loss: 0.4470 - acc:
0.7709 - val_loss: 0.4699 - val_acc: 0.7532
Epoch 38/200
537/537 [==============================] - 0s 215us/step - loss: 0.4460 - acc:
0.7709 - val_loss: 0.4696 - val_acc: 0.7532
Epoch 39/200
537/537 [==============================] - 0s 293us/step - loss: 0.4448 - acc:
0.7728 - val_loss: 0.4693 - val_acc: 0.7532
Epoch 40/200
537/537 [==============================] - 0s 258us/step - loss: 0.4441 - acc:
0.7728 - val_loss: 0.4692 - val_acc: 0.7532
Epoch 41/200
537/537 [==============================] - 0s 319us/step - loss: 0.4430 - acc:
0.7765 - val_loss: 0.4693 - val_acc: 0.7532
Epoch 42/200
537/537 [==============================] - 0s 373us/step - loss: 0.4418 - acc:
0.7765 - val_loss: 0.4688 - val_acc: 0.7532
Epoch 43/200
```

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537/537 [==============================] - 0s 266us/step - loss: 0.4408 - acc:
0.7821 - val_loss: 0.4691 - val_acc: 0.7532
Epoch 44/200
537/537 [==============================] - 0s 169us/step - loss: 0.4398 - acc:
0.7840 - val_loss: 0.4692 - val_acc: 0.7576
Epoch 45/200
537/537 [==============================] - 0s 318us/step - loss: 0.4387 - acc:
0.7784 - val_loss: 0.4692 - val_acc: 0.7619
Epoch 46/200
537/537 [==============================] - 0s 145us/step - loss: 0.4387 - acc:
0.7803 - val_loss: 0.4692 - val_acc: 0.7619
Epoch 47/200
537/537 [==============================] - 0s 188us/step - loss: 0.4370 - acc:
0.7840 - val_loss: 0.4697 - val_acc: 0.7662
Epoch 48/200
537/537 [==============================] - 0s 236us/step - loss: 0.4367 - acc:
0.7821 - val_loss: 0.4694 - val_acc: 0.7706
Epoch 49/200
537/537 [==============================] - 0s 147us/step - loss: 0.4352 - acc:
0.7896 - val_loss: 0.4696 - val_acc: 0.7706
Epoch 50/200
537/537 [==============================] - 0s 331us/step - loss: 0.4343 - acc:
0.7896 - val_loss: 0.4694 - val_acc: 0.7662
Epoch 51/200
537/537 [==============================] - 0s 126us/step - loss: 0.4333 - acc:
0.7858 - val_loss: 0.4699 - val_acc: 0.7706
Epoch 52/200
537/537 [==============================] - 0s 279us/step - loss: 0.4325 - acc:
0.7877 - val_loss: 0.4699 - val_acc: 0.7662
Epoch 53/200
537/537 [==============================] - 0s 223us/step - loss: 0.4319 - acc:
0.7877 - val_loss: 0.4699 - val_acc: 0.7792
Epoch 54/200
537/537 [==============================] - 0s 223us/step - loss: 0.4306 - acc:
0.7896 - val_loss: 0.4706 - val_acc: 0.7749
Epoch 55/200
537/537 [==============================] - 0s 277us/step - loss: 0.4297 - acc:
0.7896 - val_loss: 0.4706 - val_acc: 0.7749
Epoch 56/200
537/537 [==============================] - 0s 234us/step - loss: 0.4291 - acc:
0.7877 - val_loss: 0.4707 - val_acc: 0.7749
Epoch 57/200
537/537 [==============================] - 0s 189us/step - loss: 0.4280 - acc:
0.7914 - val_loss: 0.4709 - val_acc: 0.7792
Epoch 58/200
537/537 [==============================] - 0s 263us/step - loss: 0.4273 - acc:
0.7914 - val_loss: 0.4710 - val_acc: 0.7749
Epoch 59/200
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537/537 [==============================] - 0s 206us/step - loss: 0.4265 - acc:
0.7914 - val_loss: 0.4718 - val_acc: 0.7749
Epoch 60/200
537/537 [==============================] - 0s 183us/step - loss: 0.4255 - acc:
0.7914 - val_loss: 0.4718 - val_acc: 0.7792
Epoch 61/200
537/537 [==============================] - 0s 199us/step - loss: 0.4253 - acc:
0.7970 - val_loss: 0.4724 - val_acc: 0.7792
Epoch 62/200
537/537 [==============================] - 0s 243us/step - loss: 0.4239 - acc:
0.7914 - val_loss: 0.4729 - val_acc: 0.7792
Epoch 63/200
537/537 [==============================] - 0s 188us/step - loss: 0.4229 - acc:
0.7896 - val_loss: 0.4729 - val_acc: 0.7792
Epoch 64/200
537/537 [==============================] - 0s 147us/step - loss: 0.4236 - acc:
0.7933 - val_loss: 0.4739 - val_acc: 0.7835
Epoch 65/200
537/537 [==============================] - 0s 249us/step - loss: 0.4230 - acc:
0.7970 - val_loss: 0.4730 - val_acc: 0.7792
Epoch 66/200
537/537 [==============================] - 0s 150us/step - loss: 0.4206 - acc:
0.7952 - val_loss: 0.4735 - val_acc: 0.7792
Epoch 67/200
537/537 [==============================] - 0s 279us/step - loss: 0.4199 - acc:
0.7952 - val_loss: 0.4740 - val_acc: 0.7835
Epoch 68/200
537/537 [==============================] - 0s 124us/step - loss: 0.4189 - acc:
0.7970 - val_loss: 0.4746 - val_acc: 0.7879
Epoch 69/200
537/537 [==============================] - 0s 128us/step - loss: 0.4185 - acc:
0.7989 - val_loss: 0.4747 - val_acc: 0.7835
Epoch 70/200
537/537 [==============================] - 0s 186us/step - loss: 0.4172 - acc:
0.7970 - val_loss: 0.4756 - val_acc: 0.7879
Epoch 71/200
537/537 [==============================] - 0s 214us/step - loss: 0.4168 - acc:
0.7970 - val_loss: 0.4756 - val_acc: 0.7879
Epoch 72/200
537/537 [==============================] - 0s 133us/step - loss: 0.4158 - acc:
0.7989 - val_loss: 0.4764 - val_acc: 0.7879
Epoch 73/200
537/537 [==============================] - 0s 333us/step - loss: 0.4150 - acc:
0.7989 - val_loss: 0.4769 - val_acc: 0.7792
Epoch 74/200
537/537 [==============================] - 0s 431us/step - loss: 0.4143 - acc:
0.8026 - val_loss: 0.4770 - val_acc: 0.7835
Epoch 75/200
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537/537 [==============================] - 0s 225us/step - loss: 0.4143 - acc:
0.8007 - val_loss: 0.4773 - val_acc: 0.7879
Epoch 76/200
537/537 [==============================] - 0s 637us/step - loss: 0.4128 - acc:
0.8026 - val_loss: 0.4781 - val_acc: 0.7879
Epoch 77/200
537/537 [==============================] - 0s 199us/step - loss: 0.4121 - acc:
0.8026 - val_loss: 0.4786 - val_acc: 0.7879
Epoch 78/200
537/537 [==============================] - 0s 251us/step - loss: 0.4112 - acc:
0.8026 - val_loss: 0.4786 - val_acc: 0.7835
Epoch 79/200
537/537 [==============================] - 0s 798us/step - loss: 0.4105 - acc:
0.8026 - val_loss: 0.4788 - val_acc: 0.7879
Epoch 80/200
537/537 [==============================] - 0s 165us/step - loss: 0.4098 - acc:
0.8045 - val_loss: 0.4798 - val_acc: 0.7792
Epoch 81/200
537/537 [==============================] - 0s 260us/step - loss: 0.4095 - acc:
0.8007 - val_loss: 0.4805 - val_acc: 0.7792
Epoch 82/200
537/537 [==============================] - 0s 290us/step - loss: 0.4084 - acc:
0.8063 - val_loss: 0.4806 - val_acc: 0.7792
Epoch 83/200
537/537 [==============================] - 0s 306us/step - loss: 0.4079 - acc:
0.8045 - val_loss: 0.4819 - val_acc: 0.7749
Epoch 84/200
537/537 [==============================] - 0s 219us/step - loss: 0.4078 - acc:
0.8007 - val_loss: 0.4818 - val_acc: 0.7879
Epoch 85/200
537/537 [==============================] - 0s 108us/step - loss: 0.4060 - acc:
0.8045 - val_loss: 0.4825 - val_acc: 0.7792
Epoch 86/200
537/537 [==============================] - 0s 236us/step - loss: 0.4054 - acc:
0.8045 - val_loss: 0.4827 - val_acc: 0.7792
Epoch 87/200
537/537 [==============================] - 0s 187us/step - loss: 0.4051 - acc:
0.8101 - val_loss: 0.4834 - val_acc: 0.7749
Epoch 88/200
537/537 [==============================] - 0s 193us/step - loss: 0.4039 - acc:
0.8063 - val_loss: 0.4835 - val_acc: 0.7835
Epoch 89/200
537/537 [==============================] - 0s 203us/step - loss: 0.4033 - acc:
0.8026 - val_loss: 0.4844 - val_acc: 0.7879
Epoch 90/200
537/537 [==============================] - 0s 275us/step - loss: 0.4026 - acc:
0.8007 - val_loss: 0.4845 - val_acc: 0.7879
Epoch 91/200
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537/537 [==============================] - 0s 137us/step - loss: 0.4016 - acc:
0.8063 - val_loss: 0.4856 - val_acc: 0.7835
Epoch 92/200
537/537 [==============================] - 0s 264us/step - loss: 0.4014 - acc:
0.8063 - val_loss: 0.4866 - val_acc: 0.7835
Epoch 93/200
537/537 [==============================] - 0s 141us/step - loss: 0.4019 - acc:
0.8007 - val_loss: 0.4865 - val_acc: 0.7879
Epoch 94/200
537/537 [==============================] - 0s 225us/step - loss: 0.3995 - acc:
0.8045 - val_loss: 0.4873 - val_acc: 0.7835
Epoch 95/200
537/537 [==============================] - 0s 221us/step - loss: 0.4003 - acc:
0.8026 - val_loss: 0.4876 - val_acc: 0.7835
Epoch 96/200
537/537 [==============================] - 0s 260us/step - loss: 0.3981 - acc:
0.8063 - val_loss: 0.4876 - val_acc: 0.7835
Epoch 97/200
537/537 [==============================] - 0s 286us/step - loss: 0.3989 - acc:
0.8045 - val_loss: 0.4882 - val_acc: 0.7835
Epoch 98/200
537/537 [==============================] - 0s 247us/step - loss: 0.3967 - acc:
0.8082 - val_loss: 0.4886 - val_acc: 0.7835
Epoch 99/200
537/537 [==============================] - 0s 175us/step - loss: 0.3961 - acc:
0.8119 - val_loss: 0.4899 - val_acc: 0.7835
Epoch 100/200
537/537 [==============================] - 0s 192us/step - loss: 0.3956 - acc:
0.8119 - val_loss: 0.4911 - val_acc: 0.7792
Epoch 101/200
537/537 [==============================] - 0s 243us/step - loss: 0.3944 - acc:
0.8138 - val_loss: 0.4916 - val_acc: 0.7792
Epoch 102/200
537/537 [==============================] - 0s 258us/step - loss: 0.3938 - acc:
0.8138 - val_loss: 0.4918 - val_acc: 0.7879
Epoch 103/200
537/537 [==============================] - 0s 356us/step - loss: 0.3932 - acc:
0.8119 - val_loss: 0.4932 - val_acc: 0.7879
Epoch 104/200
537/537 [==============================] - 0s 136us/step - loss: 0.3920 - acc:
0.8156 - val_loss: 0.4936 - val_acc: 0.7792
Epoch 105/200
537/537 [==============================] - 0s 175us/step - loss: 0.3917 - acc:
0.8156 - val_loss: 0.4944 - val_acc: 0.7835
Epoch 106/200
537/537 [==============================] - 0s 271us/step - loss: 0.3908 - acc:
0.8156 - val_loss: 0.4947 - val_acc: 0.7792
Epoch 107/200
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537/537 [==============================] - 0s 147us/step - loss: 0.3901 - acc:
0.8156 - val_loss: 0.4960 - val_acc: 0.7792
Epoch 108/200
537/537 [==============================] - 0s 295us/step - loss: 0.3893 - acc:
0.8138 - val_loss: 0.4964 - val_acc: 0.7835
Epoch 109/200
537/537 [==============================] - 0s 162us/step - loss: 0.3887 - acc:
0.8156 - val_loss: 0.4974 - val_acc: 0.7835
Epoch 110/200
537/537 [==============================] - 0s 172us/step - loss: 0.3882 - acc:
0.8119 - val_loss: 0.4985 - val_acc: 0.7835
Epoch 111/200
537/537 [==============================] - 0s 242us/step - loss: 0.3876 - acc:
0.8175 - val_loss: 0.4988 - val_acc: 0.7835
Epoch 112/200
537/537 [==============================] - 0s 295us/step - loss: 0.3863 - acc:
0.8194 - val_loss: 0.4996 - val_acc: 0.7792
Epoch 113/200
537/537 [==============================] - 0s 225us/step - loss: 0.3859 - acc:
0.8194 - val_loss: 0.5006 - val_acc: 0.7792
Epoch 114/200
537/537 [==============================] - 0s 258us/step - loss: 0.3849 - acc:
0.8212 - val_loss: 0.5023 - val_acc: 0.7792
Epoch 115/200
537/537 [==============================] - 0s 285us/step - loss: 0.3844 - acc:
0.8194 - val_loss: 0.5026 - val_acc: 0.7792
Epoch 116/200
537/537 [==============================] - 0s 241us/step - loss: 0.3840 - acc:
0.8212 - val_loss: 0.5036 - val_acc: 0.7792
Epoch 117/200
537/537 [==============================] - 0s 295us/step - loss: 0.3835 - acc:
0.8231 - val_loss: 0.5033 - val_acc: 0.7792
Epoch 118/200
537/537 [==============================] - 0s 214us/step - loss: 0.3827 - acc:
0.8194 - val_loss: 0.5044 - val_acc: 0.7792
Epoch 119/200
537/537 [==============================] - 0s 229us/step - loss: 0.3819 - acc:
0.8194 - val_loss: 0.5054 - val_acc: 0.7792
Epoch 120/200
537/537 [==============================] - 0s 175us/step - loss: 0.3810 - acc:
0.8212 - val_loss: 0.5059 - val_acc: 0.7749
Epoch 121/200
537/537 [==============================] - 0s 195us/step - loss: 0.3807 - acc:
0.8212 - val_loss: 0.5067 - val_acc: 0.7749
Epoch 122/200
537/537 [==============================] - 0s 199us/step - loss: 0.3800 - acc:
0.8212 - val_loss: 0.5073 - val_acc: 0.7792
Epoch 123/200
```

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537/537 [==============================] - 0s 191us/step - loss: 0.3799 - acc:
0.8212 - val_loss: 0.5076 - val_acc: 0.7792
Epoch 124/200
537/537 [==============================] - 0s 176us/step - loss: 0.3782 - acc:
0.8250 - val_loss: 0.5087 - val_acc: 0.7792
Epoch 125/200
537/537 [==============================] - 0s 234us/step - loss: 0.3780 - acc:
0.8212 - val_loss: 0.5094 - val_acc: 0.7792
Epoch 126/200
537/537 [==============================] - 0s 160us/step - loss: 0.3774 - acc:
0.8231 - val_loss: 0.5100 - val_acc: 0.7792
Epoch 127/200
537/537 [==============================] - 0s 225us/step - loss: 0.3767 - acc:
0.8268 - val_loss: 0.5109 - val_acc: 0.7835
Epoch 128/200
537/537 [==============================] - 0s 223us/step - loss: 0.3763 - acc:
0.8287 - val_loss: 0.5113 - val_acc: 0.7835
Epoch 129/200
537/537 [==============================] - 0s 154us/step - loss: 0.3755 - acc:
0.8231 - val_loss: 0.5126 - val_acc: 0.7792
Epoch 130/200
537/537 [==============================] - 0s 206us/step - loss: 0.3754 - acc:
0.8305 - val_loss: 0.5125 - val_acc: 0.7835
Epoch 131/200
537/537 [==============================] - 0s 132us/step - loss: 0.3775 - acc:
0.8194 - val_loss: 0.5146 - val_acc: 0.7835
Epoch 132/200
537/537 [==============================] - 0s 117us/step - loss: 0.3751 - acc:
0.8287 - val_loss: 0.5132 - val_acc: 0.7879
Epoch 133/200
537/537 [==============================] - 0s 284us/step - loss: 0.3731 - acc:
0.8287 - val_loss: 0.5151 - val_acc: 0.7835
Epoch 134/200
537/537 [==============================] - 0s 311us/step - loss: 0.3724 - acc:
0.8287 - val_loss: 0.5165 - val_acc: 0.7792
Epoch 135/200
537/537 [==============================] - 0s 249us/step - loss: 0.3732 - acc:
0.8324 - val_loss: 0.5172 - val_acc: 0.7792
Epoch 136/200
537/537 [==============================] - 0s 193us/step - loss: 0.3711 - acc:
0.8343 - val_loss: 0.5178 - val_acc: 0.7835
Epoch 137/200
537/537 [==============================] - 0s 271us/step - loss: 0.3704 - acc:
0.8343 - val_loss: 0.5180 - val_acc: 0.7879
Epoch 138/200
537/537 [==============================] - 0s 298us/step - loss: 0.3715 - acc:
0.8361 - val_loss: 0.5182 - val_acc: 0.7835
Epoch 139/200
```

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537/537 [==============================] - 0s 410us/step - loss: 0.3687 - acc:
0.8380 - val_loss: 0.5207 - val_acc: 0.7879
Epoch 140/200
537/537 [==============================] - 0s 171us/step - loss: 0.3686 - acc:
0.8361 - val_loss: 0.5211 - val_acc: 0.7879
Epoch 141/200
537/537 [==============================] - 0s 247us/step - loss: 0.3680 - acc:
0.8436 - val_loss: 0.5212 - val_acc: 0.7792
Epoch 142/200
537/537 [==============================] - 0s 126us/step - loss: 0.3681 - acc:
0.8324 - val_loss: 0.5221 - val_acc: 0.7835
Epoch 143/200
537/537 [==============================] - 0s 226us/step - loss: 0.3670 - acc:
0.8417 - val_loss: 0.5223 - val_acc: 0.7792
Epoch 144/200
537/537 [==============================] - 0s 150us/step - loss: 0.3664 - acc:
0.8399 - val_loss: 0.5233 - val_acc: 0.7879
Epoch 145/200
537/537 [==============================] - 0s 189us/step - loss: 0.3661 - acc:
0.8305 - val_loss: 0.5240 - val_acc: 0.7879
Epoch 146/200
537/537 [==============================] - 0s 197us/step - loss: 0.3639 - acc:
0.8454 - val_loss: 0.5238 - val_acc: 0.7749
Epoch 147/200
537/537 [==============================] - 0s 165us/step - loss: 0.3646 - acc:
0.8454 - val_loss: 0.5247 - val_acc: 0.7835
Epoch 148/200
537/537 [==============================] - 0s 163us/step - loss: 0.3632 - acc:
0.8454 - val_loss: 0.5268 - val_acc: 0.7835
Epoch 149/200
537/537 [==============================] - 0s 256us/step - loss: 0.3640 - acc:
0.8399 - val_loss: 0.5279 - val_acc: 0.7792
Epoch 150/200
537/537 [==============================] - 0s 132us/step - loss: 0.3623 - acc:
0.8436 - val_loss: 0.5273 - val_acc: 0.7835
Epoch 151/200
537/537 [==============================] - 0s 204us/step - loss: 0.3623 - acc:
0.8361 - val_loss: 0.5276 - val_acc: 0.7835
Epoch 152/200
537/537 [==============================] - 0s 148us/step - loss: 0.3612 - acc:
0.8454 - val_loss: 0.5280 - val_acc: 0.7835
Epoch 153/200
537/537 [==============================] - ETA: 0s - loss: 0.3566 - acc: 0.828 -
0s 186us/step - loss: 0.3613 - acc: 0.8343 - val_loss: 0.5311 - val_acc: 0.7879
Epoch 154/200
537/537 [==============================] - 0s 213us/step - loss: 0.3594 - acc:
0.8454 - val_loss: 0.5301 - val_acc: 0.7749
Epoch 155/200
```

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537/537 [==============================] - 0s 214us/step - loss: 0.3588 - acc:
0.8492 - val_loss: 0.5307 - val_acc: 0.7792
Epoch 156/200
537/537 [==============================] - 0s 208us/step - loss: 0.3578 - acc:
0.8436 - val_loss: 0.5339 - val_acc: 0.7879
Epoch 157/200
537/537 [==============================] - 0s 297us/step - loss: 0.3579 - acc:
0.8454 - val_loss: 0.5327 - val_acc: 0.7835
Epoch 158/200
537/537 [==============================] - 0s 128us/step - loss: 0.3563 - acc:
0.8454 - val_loss: 0.5339 - val_acc: 0.7835
Epoch 159/200
537/537 [==============================] - 0s 841us/step - loss: 0.3557 - acc:
0.8454 - val_loss: 0.5354 - val_acc: 0.7879
Epoch 160/200
537/537 [==============================] - 0s 349us/step - loss: 0.3553 - acc:
0.8454 - val_loss: 0.5353 - val_acc: 0.7749
Epoch 161/200
537/537 [==============================] - 0s 312us/step - loss: 0.3553 - acc:
0.8473 - val_loss: 0.5363 - val_acc: 0.7749
Epoch 162/200
537/537 [==============================] - 0s 593us/step - loss: 0.3541 - acc:
0.8473 - val_loss: 0.5372 - val_acc: 0.7835
Epoch 163/200
537/537 [==============================] - 0s 191us/step - loss: 0.3531 - acc:
0.8454 - val_loss: 0.5378 - val_acc: 0.7835
Epoch 164/200
537/537 [==============================] - 0s 271us/step - loss: 0.3525 - acc:
0.8510 - val_loss: 0.5384 - val_acc: 0.7835
Epoch 165/200
537/537 [==============================] - 0s 325us/step - loss: 0.3518 - acc:
0.8473 - val_loss: 0.5398 - val_acc: 0.7879
Epoch 166/200
537/537 [==============================] - 0s 229us/step - loss: 0.3517 - acc:
0.8510 - val_loss: 0.5396 - val_acc: 0.7835
Epoch 167/200
537/537 [==============================] - 0s 165us/step - loss: 0.3515 - acc:
0.8454 - val_loss: 0.5412 - val_acc: 0.7835
Epoch 168/200
537/537 [==============================] - 0s 212us/step - loss: 0.3495 - acc:
0.8529 - val_loss: 0.5405 - val_acc: 0.7835
Epoch 169/200
537/537 [==============================] - 0s 232us/step - loss: 0.3488 - acc:
0.8547 - val_loss: 0.5426 - val_acc: 0.7835
Epoch 170/200
537/537 [==============================] - 0s 173us/step - loss: 0.3481 - acc:
0.8547 - val_loss: 0.5434 - val_acc: 0.7792
Epoch 171/200
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537/537 [==============================] - 0s 347us/step - loss: 0.3478 - acc:
0.8529 - val_loss: 0.5430 - val_acc: 0.7835
Epoch 172/200
537/537 [==============================] - 0s 221us/step - loss: 0.3472 - acc:
0.8529 - val_loss: 0.5439 - val_acc: 0.7706
Epoch 173/200
537/537 [==============================] - 0s 132us/step - loss: 0.3455 - acc:
0.8566 - val_loss: 0.5459 - val_acc: 0.7835
Epoch 174/200
537/537 [==============================] - 0s 274us/step - loss: 0.3455 - acc:
0.8547 - val_loss: 0.5461 - val_acc: 0.7879
Epoch 175/200
537/537 [==============================] - 0s 150us/step - loss: 0.3446 - acc:
0.8529 - val_loss: 0.5463 - val_acc: 0.7792
Epoch 176/200
537/537 [==============================] - 0s 225us/step - loss: 0.3444 - acc:
0.8529 - val_loss: 0.5472 - val_acc: 0.7835
Epoch 177/200
537/537 [==============================] - 0s 134us/step - loss: 0.3433 - acc:
0.8566 - val_loss: 0.5474 - val_acc: 0.7879
Epoch 178/200
537/537 [==============================] - 0s 284us/step - loss: 0.3421 - acc:
0.8585 - val_loss: 0.5487 - val_acc: 0.7879
Epoch 179/200
537/537 [==============================] - 0s 571us/step - loss: 0.3437 - acc:
0.8529 - val_loss: 0.5497 - val_acc: 0.7835
Epoch 180/200
537/537 [==============================] - 0s 306us/step - loss: 0.3406 - acc:
0.8566 - val_loss: 0.5493 - val_acc: 0.7792
Epoch 181/200
537/537 [==============================] - 0s 583us/step - loss: 0.3413 - acc:
0.8566 - val_loss: 0.5505 - val_acc: 0.7835
Epoch 182/200
537/537 [==============================] - 0s 556us/step - loss: 0.3401 - acc:
0.8585 - val_loss: 0.5509 - val_acc: 0.7792
Epoch 183/200
537/537 [==============================] - 0s 272us/step - loss: 0.3394 - acc:
0.8566 - val_loss: 0.5516 - val_acc: 0.7835
Epoch 184/200
537/537 [==============================] - 0s 243us/step - loss: 0.3387 - acc:
0.8622 - val_loss: 0.5528 - val_acc: 0.7749
Epoch 185/200
537/537 [==============================] - 0s 280us/step - loss: 0.3381 - acc:
0.8566 - val_loss: 0.5557 - val_acc: 0.7749
Epoch 186/200
537/537 [==============================] - 0s 686us/step - loss: 0.3361 - acc:
0.8622 - val_loss: 0.5539 - val_acc: 0.7792
Epoch 187/200
```

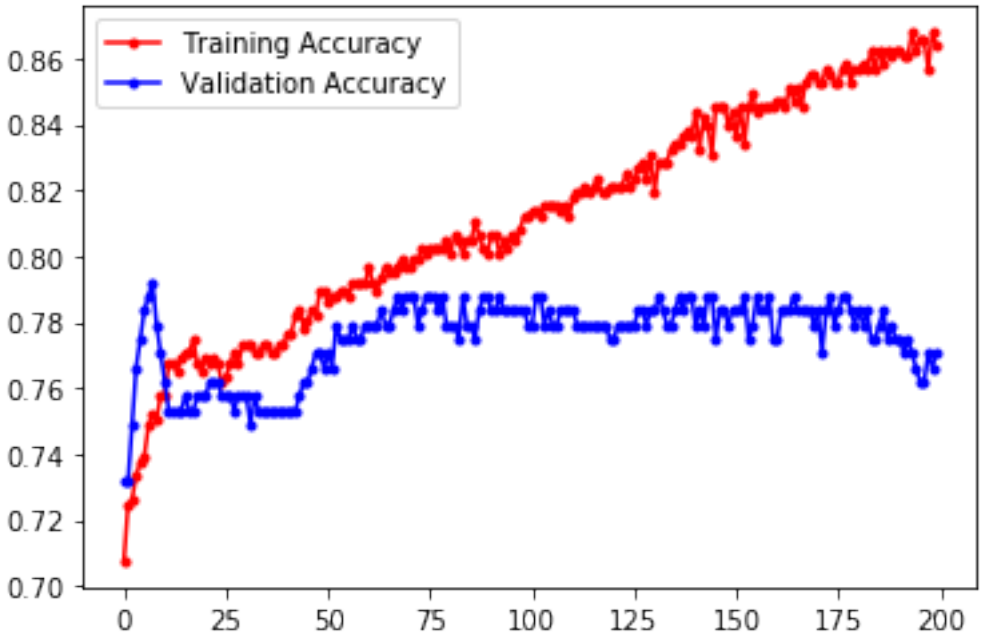
```
537/537 [==============================] - 0s 332us/step - loss: 0.3368 - acc:
0.8585 - val_loss: 0.5551 - val_acc: 0.7835
Epoch 188/200
537/537 [==============================] - 0s 248us/step - loss: 0.3350 - acc:
0.8622 - val_loss: 0.5557 - val_acc: 0.7749
Epoch 189/200
537/537 [==============================] - 0s 156us/step - loss: 0.3343 - acc:
0.8603 - val_loss: 0.5563 - val_acc: 0.7792
Epoch 190/200
537/537 [==============================] - 0s 257us/step - loss: 0.3337 - acc:
0.8622 - val_loss: 0.5582 - val_acc: 0.7749
Epoch 191/200
537/537 [==============================] - 0s 231us/step - loss: 0.3337 - acc:
0.8622 - val_loss: 0.5578 - val_acc: 0.7749
Epoch 192/200
537/537 [==============================] - 0s 164us/step - loss: 0.3327 - acc:
0.8603 - val_loss: 0.5579 - val_acc: 0.7706
Epoch 193/200
537/537 [==============================] - 0s 243us/step - loss: 0.3315 - acc:
0.8603 - val_loss: 0.5597 - val_acc: 0.7749
Epoch 194/200
537/537 [==============================] - 0s 246us/step - loss: 0.3309 - acc:
0.8678 - val_loss: 0.5602 - val_acc: 0.7706
Epoch 195/200
537/537 [==============================] - 0s 238us/step - loss: 0.3296 - acc:
0.8622 - val_loss: 0.5607 - val_acc: 0.7662
Epoch 196/200
537/537 [==============================] - 0s 204us/step - loss: 0.3295 - acc:
0.8659 - val_loss: 0.5599 - val_acc: 0.7619
Epoch 197/200
537/537 [==============================] - 0s 130us/step - loss: 0.3283 - acc:
0.8659 - val_loss: 0.5631 - val_acc: 0.7619
Epoch 198/200
537/537 [==============================] - 0s 278us/step - loss: 0.3276 - acc:
0.8566 - val_loss: 0.5616 - val_acc: 0.7706
Epoch 199/200
537/537 [==============================] - 0s 223us/step - loss: 0.3262 - acc:
0.8678 - val_loss: 0.5634 - val_acc: 0.7662
Epoch 200/200
537/537 [==============================] - 0s 160us/step - loss: 0.3269 - acc:
0.8641 - val_loss: 0.5665 - val_acc: 0.7706
```

[461]:
```
y_pred_class_nn_mod2 = model.predict_classes(X_test_norm)
y_pred_prob_nn_mod2 = model.predict(X_test_norm)
```

[462]:
```
#plotting the curve to check training and validation accuracy
fig, ax = plt.subplots()
ax.plot(run_hist_2.history["acc"],'r', marker='.', label="Training Accuracy")
```

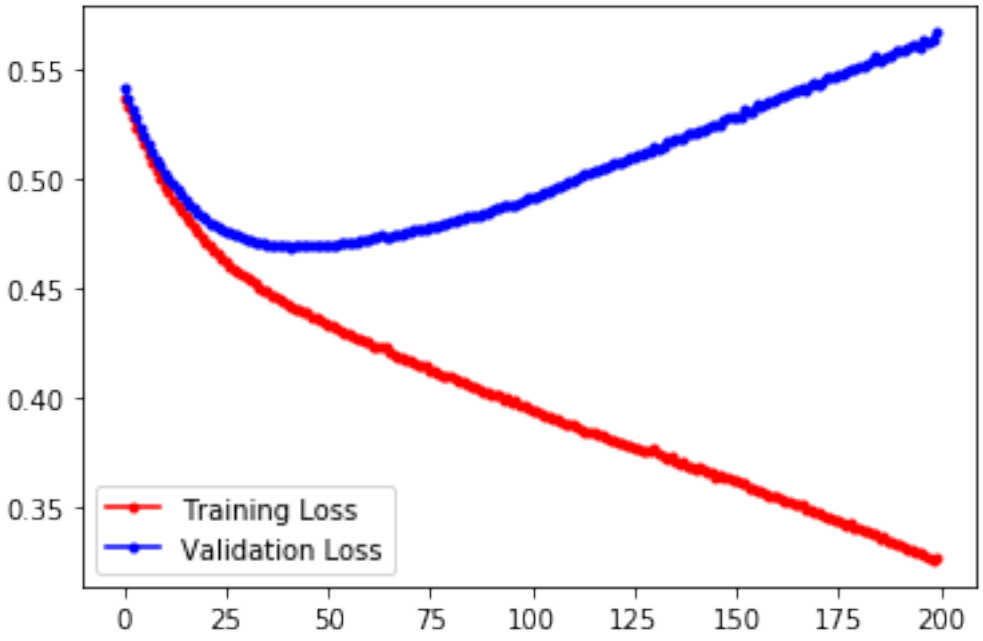
```
ax.plot(run_hist_2.history["val_acc"],'b', marker='.', label="Validation␣
 ↪Accuracy")
ax.legend()
```

[462]: `<matplotlib.legend.Legend at 0x1c7ad26eb00>`



[463]:
```
#Plotting curves for Training Loss and Validation loss
fig, ax = plt.subplots()
ax.plot(run_hist_2.history["loss"],'r', marker='.', label="Training Loss")
ax.plot(run_hist_2.history["val_loss"],'b', marker='.', label="Validation Loss")
ax.legend()
```

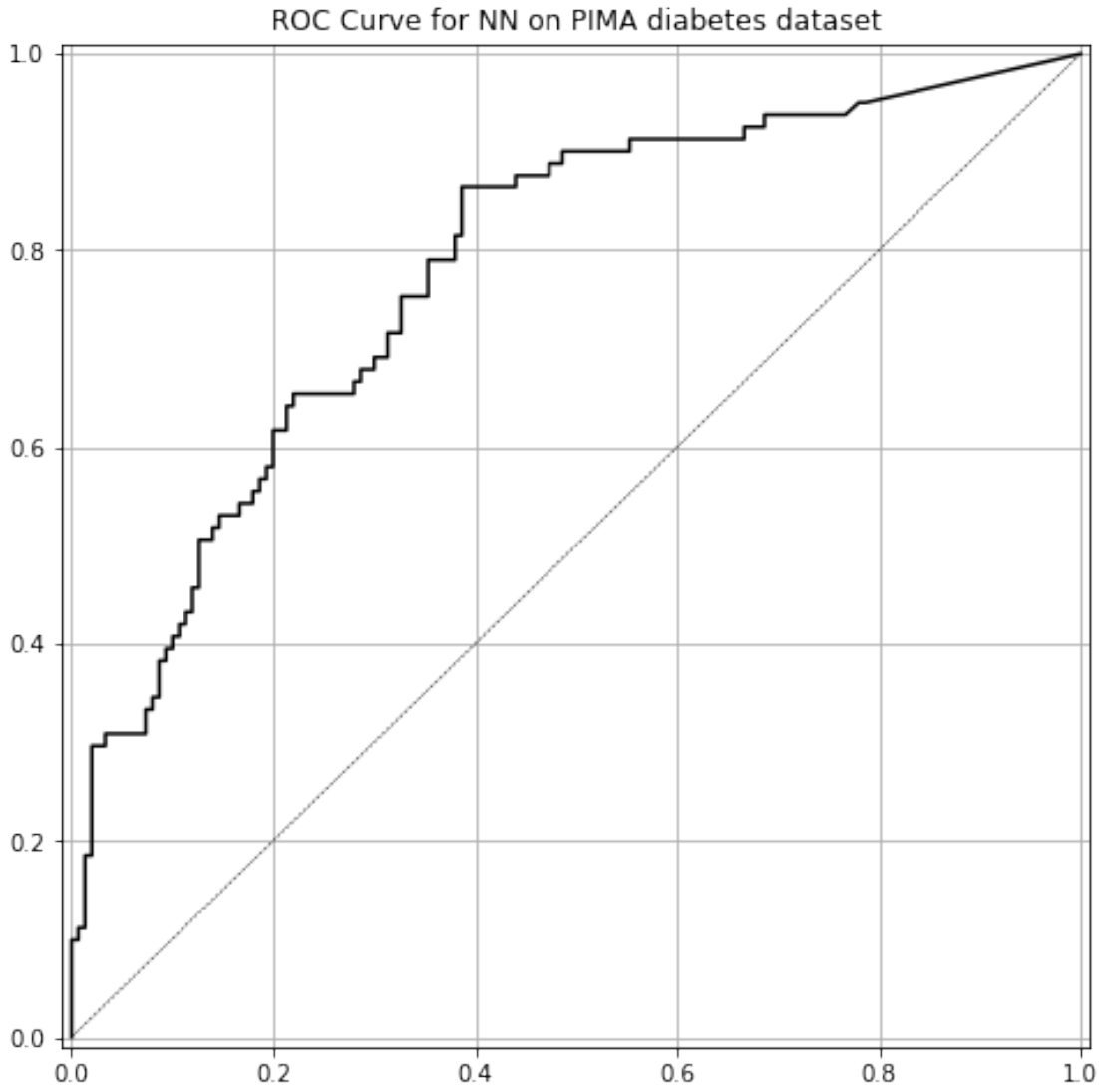
[463]: `<matplotlib.legend.Legend at 0x1c7af267978>`



[465]:
```
# Print model performance and plot the roc curve
print('accuracy is {:.3f}'.format(accuracy_score(y_test,y_pred_class_nn_mod2)))
print('roc-auc is {:.3f}'.format(roc_auc_score(y_test,y_pred_prob_nn_mod2)))

plot_roc(y_test, y_pred_prob_nn_mod2, 'NN')
```

```
accuracy is 0.723
roc-auc is 0.781
```



Accuracy obtained from this model is 72.3% for epochs=200 , learning rate=1e-3. Now let's try for 400 epochs.

[466]:
```
run_hist_400 = nn_model_2.fit(X_train_norm, y_train,␣
↪validation_data=(X_test_norm, y_test), epochs=400)
```

```
Train on 537 samples, validate on 231 samples
Epoch 1/400
537/537 [==============================] - 0s 158us/step - loss: 0.3285 - acc:
0.8547 - val_loss: 0.5635 - val_acc: 0.7662
Epoch 2/400
537/537 [==============================] - 0s 86us/step - loss: 0.3258 - acc:
0.8622 - val_loss: 0.5679 - val_acc: 0.7706
```

```
Epoch 3/400
537/537 [==============================] - 0s 80us/step - loss: 0.3259 - acc:
0.8585 - val_loss: 0.5669 - val_acc: 0.7662
Epoch 4/400
537/537 [==============================] - 0s 87us/step - loss: 0.3230 - acc:
0.8678 - val_loss: 0.5677 - val_acc: 0.7749
Epoch 5/400
537/537 [==============================] - 0s 87us/step - loss: 0.3233 - acc:
0.8603 - val_loss: 0.5673 - val_acc: 0.7662
Epoch 6/400
537/537 [==============================] - 0s 87us/step - loss: 0.3222 - acc:
0.8641 - val_loss: 0.5702 - val_acc: 0.7706
Epoch 7/400
537/537 [==============================] - 0s 100us/step - loss: 0.3206 - acc:
0.8678 - val_loss: 0.5694 - val_acc: 0.7749
Epoch 8/400
537/537 [==============================] - 0s 87us/step - loss: 0.3200 - acc:
0.8659 - val_loss: 0.5695 - val_acc: 0.7792
Epoch 9/400
537/537 [==============================] - 0s 150us/step - loss: 0.3202 - acc:
0.8641 - val_loss: 0.5701 - val_acc: 0.7706
Epoch 10/400
537/537 [==============================] - 0s 247us/step - loss: 0.3188 - acc:
0.8734 - val_loss: 0.5729 - val_acc: 0.7706
Epoch 11/400
537/537 [==============================] - 0s 338us/step - loss: 0.3170 - acc:
0.8696 - val_loss: 0.5725 - val_acc: 0.7749
Epoch 12/400
537/537 [==============================] - 0s 299us/step - loss: 0.3162 - acc:
0.8696 - val_loss: 0.5725 - val_acc: 0.7792
Epoch 13/400
537/537 [==============================] - 0s 269us/step - loss: 0.3160 - acc:
0.8678 - val_loss: 0.5728 - val_acc: 0.7792
Epoch 14/400
537/537 [==============================] - 0s 204us/step - loss: 0.3167 - acc:
0.8696 - val_loss: 0.5745 - val_acc: 0.7706
Epoch 15/400
537/537 [==============================] - 0s 340us/step - loss: 0.3144 - acc:
0.8659 - val_loss: 0.5745 - val_acc: 0.7792
Epoch 16/400
537/537 [==============================] - 0s 490us/step - loss: 0.3124 - acc:
0.8734 - val_loss: 0.5749 - val_acc: 0.7749
Epoch 17/400
537/537 [==============================] - 0s 318us/step - loss: 0.3113 - acc:
0.8771 - val_loss: 0.5758 - val_acc: 0.7792
Epoch 18/400
537/537 [==============================] - 0s 217us/step - loss: 0.3107 - acc:
0.8734 - val_loss: 0.5753 - val_acc: 0.7835
```

```
Epoch 19/400
537/537 [==============================] - 0s 260us/step - loss: 0.3104 - acc:
0.8734 - val_loss: 0.5751 - val_acc: 0.7749
Epoch 20/400
537/537 [==============================] - 0s 123us/step - loss: 0.3095 - acc:
0.8808 - val_loss: 0.5771 - val_acc: 0.7792
Epoch 21/400
537/537 [==============================] - 0s 267us/step - loss: 0.3098 - acc:
0.8696 - val_loss: 0.5803 - val_acc: 0.7835
Epoch 22/400
537/537 [==============================] - 0s 228us/step - loss: 0.3071 - acc:
0.8752 - val_loss: 0.5774 - val_acc: 0.7749
Epoch 23/400
537/537 [==============================] - 0s 492us/step - loss: 0.3060 - acc:
0.8752 - val_loss: 0.5810 - val_acc: 0.7749
Epoch 24/400
537/537 [==============================] - 0s 280us/step - loss: 0.3065 - acc:
0.8715 - val_loss: 0.5802 - val_acc: 0.7792
Epoch 25/400
537/537 [==============================] - 0s 209us/step - loss: 0.3045 - acc:
0.8771 - val_loss: 0.5820 - val_acc: 0.7749
Epoch 26/400
537/537 [==============================] - 0s 193us/step - loss: 0.3085 - acc:
0.8771 - val_loss: 0.5826 - val_acc: 0.7835
Epoch 27/400
537/537 [==============================] - 0s 251us/step - loss: 0.3044 - acc:
0.8752 - val_loss: 0.5820 - val_acc: 0.7792
Epoch 28/400
537/537 [==============================] - 0s 383us/step - loss: 0.3018 - acc:
0.8827 - val_loss: 0.5868 - val_acc: 0.7749
Epoch 29/400
537/537 [==============================] - 0s 145us/step - loss: 0.3013 - acc:
0.8808 - val_loss: 0.5841 - val_acc: 0.7706
Epoch 30/400
537/537 [==============================] - 0s 230us/step - loss: 0.3008 - acc:
0.8790 - val_loss: 0.5864 - val_acc: 0.7835
Epoch 31/400
537/537 [==============================] - 0s 243us/step - loss: 0.2996 - acc:
0.8790 - val_loss: 0.5867 - val_acc: 0.7749
Epoch 32/400
537/537 [==============================] - 0s 145us/step - loss: 0.2993 - acc:
0.8808 - val_loss: 0.5905 - val_acc: 0.7792
Epoch 33/400
537/537 [==============================] - 0s 236us/step - loss: 0.2971 - acc:
0.8771 - val_loss: 0.5886 - val_acc: 0.7792
Epoch 34/400
537/537 [==============================] - 0s 241us/step - loss: 0.2968 - acc:
0.8771 - val_loss: 0.5888 - val_acc: 0.7835
```

```
Epoch 35/400
537/537 [==============================] - 0s 271us/step - loss: 0.2957 - acc:
0.8808 - val_loss: 0.5902 - val_acc: 0.7792
Epoch 36/400
537/537 [==============================] - 0s 215us/step - loss: 0.2947 - acc:
0.8790 - val_loss: 0.5905 - val_acc: 0.7749
Epoch 37/400
537/537 [==============================] - 0s 254us/step - loss: 0.2927 - acc:
0.8845 - val_loss: 0.5924 - val_acc: 0.7749
Epoch 38/400
537/537 [==============================] - 0s 257us/step - loss: 0.2920 - acc:
0.8864 - val_loss: 0.5931 - val_acc: 0.7792
Epoch 39/400
537/537 [==============================] - 0s 147us/step - loss: 0.2920 - acc:
0.8864 - val_loss: 0.5943 - val_acc: 0.7749
Epoch 40/400
537/537 [==============================] - 0s 158us/step - loss: 0.2911 - acc:
0.8790 - val_loss: 0.5957 - val_acc: 0.7792
Epoch 41/400
537/537 [==============================] - 0s 188us/step - loss: 0.2899 - acc:
0.8864 - val_loss: 0.5944 - val_acc: 0.7749
Epoch 42/400
537/537 [==============================] - 0s 262us/step - loss: 0.2895 - acc:
0.8827 - val_loss: 0.5950 - val_acc: 0.7792
Epoch 43/400
537/537 [==============================] - 0s 323us/step - loss: 0.2884 - acc:
0.8845 - val_loss: 0.5986 - val_acc: 0.7792
Epoch 44/400
537/537 [==============================] - 0s 683us/step - loss: 0.2864 - acc:
0.8901 - val_loss: 0.5960 - val_acc: 0.7706
Epoch 45/400
537/537 [==============================] - 0s 438us/step - loss: 0.2865 - acc:
0.8864 - val_loss: 0.5983 - val_acc: 0.7749
Epoch 46/400
537/537 [==============================] - 0s 228us/step - loss: 0.2860 - acc:
0.8883 - val_loss: 0.5983 - val_acc: 0.7706
Epoch 47/400
537/537 [==============================] - 0s 880us/step - loss: 0.2846 - acc:
0.8901 - val_loss: 0.6016 - val_acc: 0.7749
Epoch 48/400
537/537 [==============================] - 0s 931us/step - loss: 0.2832 - acc:
0.8939 - val_loss: 0.6010 - val_acc: 0.7706
Epoch 49/400
537/537 [==============================] - 0s 381us/step - loss: 0.2826 - acc:
0.8939 - val_loss: 0.6040 - val_acc: 0.7706
Epoch 50/400
537/537 [==============================] - 0s 331us/step - loss: 0.2814 - acc:
0.8939 - val_loss: 0.5999 - val_acc: 0.7749
```

```
Epoch 51/400
537/537 [==============================] - 0s 369us/step - loss: 0.2844 - acc:
0.8864 - val_loss: 0.6063 - val_acc: 0.7749
Epoch 52/400
537/537 [==============================] - 0s 390us/step - loss: 0.2829 - acc:
0.8901 - val_loss: 0.6046 - val_acc: 0.7749
Epoch 53/400
537/537 [==============================] - 0s 214us/step - loss: 0.2794 - acc:
0.8957 - val_loss: 0.6034 - val_acc: 0.7835
Epoch 54/400
537/537 [==============================] - 0s 314us/step - loss: 0.2776 - acc:
0.9013 - val_loss: 0.6054 - val_acc: 0.7706
Epoch 55/400
537/537 [==============================] - 0s 154us/step - loss: 0.2792 - acc:
0.8957 - val_loss: 0.6068 - val_acc: 0.7706
Epoch 56/400
537/537 [==============================] - 0s 191us/step - loss: 0.2768 - acc:
0.9013 - val_loss: 0.6092 - val_acc: 0.7706
Epoch 57/400
537/537 [==============================] - 0s 122us/step - loss: 0.2754 - acc:
0.8994 - val_loss: 0.6119 - val_acc: 0.7749
Epoch 58/400
537/537 [==============================] - 0s 587us/step - loss: 0.2744 - acc:
0.8957 - val_loss: 0.6063 - val_acc: 0.7749
Epoch 59/400
537/537 [==============================] - 0s 162us/step - loss: 0.2736 - acc:
0.9013 - val_loss: 0.6115 - val_acc: 0.7706
Epoch 60/400
537/537 [==============================] - 0s 277us/step - loss: 0.2720 - acc:
0.8976 - val_loss: 0.6103 - val_acc: 0.7749
Epoch 61/400
537/537 [==============================] - 0s 113us/step - loss: 0.2712 - acc:
0.8994 - val_loss: 0.6138 - val_acc: 0.7749
Epoch 62/400
537/537 [==============================] - 0s 100us/step - loss: 0.2705 - acc:
0.9013 - val_loss: 0.6156 - val_acc: 0.7749
Epoch 63/400
537/537 [==============================] - 0s 108us/step - loss: 0.2700 - acc:
0.9032 - val_loss: 0.6094 - val_acc: 0.7749
Epoch 64/400
537/537 [==============================] - 0s 154us/step - loss: 0.2710 - acc:
0.9013 - val_loss: 0.6184 - val_acc: 0.7792
Epoch 65/400
537/537 [==============================] - 0s 184us/step - loss: 0.2680 - acc:
0.9032 - val_loss: 0.6148 - val_acc: 0.7706
Epoch 66/400
537/537 [==============================] - 0s 191us/step - loss: 0.2662 - acc:
0.9032 - val_loss: 0.6168 - val_acc: 0.7749
```

```
Epoch 67/400
537/537 [==============================] - 0s 141us/step - loss: 0.2679 - acc:
0.9069 - val_loss: 0.6204 - val_acc: 0.7706
Epoch 68/400
537/537 [==============================] - 0s 106us/step - loss: 0.2660 - acc:
0.9125 - val_loss: 0.6201 - val_acc: 0.7706
Epoch 69/400
537/537 [==============================] - 0s 115us/step - loss: 0.2636 - acc:
0.9032 - val_loss: 0.6236 - val_acc: 0.7749
Epoch 70/400
537/537 [==============================] - 0s 162us/step - loss: 0.2648 - acc:
0.9106 - val_loss: 0.6187 - val_acc: 0.7749
Epoch 71/400
537/537 [==============================] - 0s 135us/step - loss: 0.2625 - acc:
0.9069 - val_loss: 0.6201 - val_acc: 0.7706
Epoch 72/400
537/537 [==============================] - 0s 125us/step - loss: 0.2613 - acc:
0.9162 - val_loss: 0.6234 - val_acc: 0.7749
Epoch 73/400
537/537 [==============================] - 0s 167us/step - loss: 0.2594 - acc:
0.9125 - val_loss: 0.6222 - val_acc: 0.7749
Epoch 74/400
537/537 [==============================] - 0s 132us/step - loss: 0.2598 - acc:
0.9106 - val_loss: 0.6243 - val_acc: 0.7749
Epoch 75/400
537/537 [==============================] - 0s 110us/step - loss: 0.2584 - acc:
0.9125 - val_loss: 0.6280 - val_acc: 0.7706
Epoch 76/400
537/537 [==============================] - 0s 100us/step - loss: 0.2577 - acc:
0.9088 - val_loss: 0.6265 - val_acc: 0.7706
Epoch 77/400
537/537 [==============================] - 0s 180us/step - loss: 0.2561 - acc:
0.9088 - val_loss: 0.6256 - val_acc: 0.7749
Epoch 78/400
537/537 [==============================] - 0s 143us/step - loss: 0.2560 - acc:
0.9125 - val_loss: 0.6272 - val_acc: 0.7706
Epoch 79/400
537/537 [==============================] - 0s 111us/step - loss: 0.2547 - acc:
0.9125 - val_loss: 0.6287 - val_acc: 0.7749
Epoch 80/400
537/537 [==============================] - 0s 117us/step - loss: 0.2544 - acc:
0.9162 - val_loss: 0.6327 - val_acc: 0.7706
Epoch 81/400
537/537 [==============================] - 0s 420us/step - loss: 0.2527 - acc:
0.9069 - val_loss: 0.6273 - val_acc: 0.7706
Epoch 82/400
537/537 [==============================] - 0s 522us/step - loss: 0.2521 - acc:
0.9162 - val_loss: 0.6284 - val_acc: 0.7706
```

```
Epoch 83/400
537/537 [==============================] - 0s 788us/step - loss: 0.2510 - acc:
0.9236 - val_loss: 0.6352 - val_acc: 0.7662
Epoch 84/400
537/537 [==============================] - 0s 206us/step - loss: 0.2494 - acc:
0.9218 - val_loss: 0.6369 - val_acc: 0.7706
Epoch 85/400
537/537 [==============================] - 0s 254us/step - loss: 0.2489 - acc:
0.9125 - val_loss: 0.6300 - val_acc: 0.7706
Epoch 86/400
537/537 [==============================] - 0s 241us/step - loss: 0.2466 - acc:
0.9218 - val_loss: 0.6362 - val_acc: 0.7706
Epoch 87/400
537/537 [==============================] - 0s 789us/step - loss: 0.2464 - acc:
0.9106 - val_loss: 0.6359 - val_acc: 0.7749
Epoch 88/400
537/537 [==============================] - 0s 230us/step - loss: 0.2450 - acc:
0.9274 - val_loss: 0.6377 - val_acc: 0.7706
Epoch 89/400
537/537 [==============================] - 0s 639us/step - loss: 0.2427 - acc:
0.9181 - val_loss: 0.6357 - val_acc: 0.7706
Epoch 90/400
537/537 [==============================] - 0s 399us/step - loss: 0.2430 - acc:
0.9255 - val_loss: 0.6417 - val_acc: 0.7662
Epoch 91/400
537/537 [==============================] - 0s 253us/step - loss: 0.2436 - acc:
0.9181 - val_loss: 0.6398 - val_acc: 0.7662
Epoch 92/400
537/537 [==============================] - 1s 982us/step - loss: 0.2418 - acc:
0.9218 - val_loss: 0.6447 - val_acc: 0.7792
Epoch 93/400
537/537 [==============================] - 0s 318us/step - loss: 0.2402 - acc:
0.9181 - val_loss: 0.6445 - val_acc: 0.7619
Epoch 94/400
537/537 [==============================] - 0s 488us/step - loss: 0.2404 - acc:
0.9218 - val_loss: 0.6459 - val_acc: 0.7619
Epoch 95/400
537/537 [==============================] - 0s 427us/step - loss: 0.2427 - acc:
0.9181 - val_loss: 0.6535 - val_acc: 0.7749
Epoch 96/400
537/537 [==============================] - 0s 314us/step - loss: 0.2409 - acc:
0.9125 - val_loss: 0.6395 - val_acc: 0.7749
Epoch 97/400
537/537 [==============================] - 0s 631us/step - loss: 0.2362 - acc:
0.9292 - val_loss: 0.6571 - val_acc: 0.7749
Epoch 98/400
537/537 [==============================] - 0s 284us/step - loss: 0.2396 - acc:
0.9143 - val_loss: 0.6409 - val_acc: 0.7662
```

```
Epoch 99/400
537/537 [==============================] - 0s 838us/step - loss: 0.2342 - acc:
0.9292 - val_loss: 0.6605 - val_acc: 0.7749
Epoch 100/400
537/537 [==============================] - 0s 150us/step - loss: 0.2340 - acc:
0.9236 - val_loss: 0.6459 - val_acc: 0.7706
Epoch 101/400
537/537 [==============================] - 0s 190us/step - loss: 0.2329 - acc:
0.9181 - val_loss: 0.6550 - val_acc: 0.7706
Epoch 102/400
537/537 [==============================] - 0s 210us/step - loss: 0.2309 - acc:
0.9330 - val_loss: 0.6511 - val_acc: 0.7706
Epoch 103/400
537/537 [==============================] - 0s 217us/step - loss: 0.2307 - acc:
0.9255 - val_loss: 0.6549 - val_acc: 0.7706
Epoch 104/400
537/537 [==============================] - 0s 292us/step - loss: 0.2304 - acc:
0.9218 - val_loss: 0.6530 - val_acc: 0.7662
Epoch 105/400
537/537 [==============================] - 0s 178us/step - loss: 0.2295 - acc:
0.9292 - val_loss: 0.6609 - val_acc: 0.7662
Epoch 106/400
537/537 [==============================] - 0s 152us/step - loss: 0.2269 - acc:
0.9348 - val_loss: 0.6564 - val_acc: 0.7662
Epoch 107/400
537/537 [==============================] - 0s 286us/step - loss: 0.2312 - acc:
0.9218 - val_loss: 0.6640 - val_acc: 0.7662
Epoch 108/400
537/537 [==============================] - 0s 267us/step - loss: 0.2277 - acc:
0.9181 - val_loss: 0.6653 - val_acc: 0.7706
Epoch 109/400
537/537 [==============================] - 0s 213us/step - loss: 0.2235 - acc:
0.9292 - val_loss: 0.6586 - val_acc: 0.7619
Epoch 110/400
537/537 [==============================] - 0s 154us/step - loss: 0.2222 - acc:
0.9330 - val_loss: 0.6665 - val_acc: 0.7619
Epoch 111/400
537/537 [==============================] - 0s 227us/step - loss: 0.2235 - acc:
0.9292 - val_loss: 0.6660 - val_acc: 0.7619
Epoch 112/400
537/537 [==============================] - 0s 286us/step - loss: 0.2204 - acc:
0.9274 - val_loss: 0.6645 - val_acc: 0.7619
Epoch 113/400
537/537 [==============================] - 0s 251us/step - loss: 0.2209 - acc:
0.9330 - val_loss: 0.6697 - val_acc: 0.7662
Epoch 114/400
537/537 [==============================] - 0s 240us/step - loss: 0.2209 - acc:
0.9236 - val_loss: 0.6621 - val_acc: 0.7576
```

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Epoch 115/400
537/537 [==============================] - 0s 132us/step - loss: 0.2175 - acc:
0.9330 - val_loss: 0.6745 - val_acc: 0.7619
Epoch 116/400
537/537 [==============================] - 0s 507us/step - loss: 0.2207 - acc:
0.9292 - val_loss: 0.6650 - val_acc: 0.7576
Epoch 117/400
537/537 [==============================] - 0s 249us/step - loss: 0.2185 - acc:
0.9330 - val_loss: 0.6699 - val_acc: 0.7619
Epoch 118/400
537/537 [==============================] - 0s 273us/step - loss: 0.2153 - acc:
0.9348 - val_loss: 0.6660 - val_acc: 0.7662
Epoch 119/400
537/537 [==============================] - 0s 318us/step - loss: 0.2121 - acc:
0.9348 - val_loss: 0.6780 - val_acc: 0.7619
Epoch 120/400
537/537 [==============================] - 0s 186us/step - loss: 0.2127 - acc:
0.9404 - val_loss: 0.6868 - val_acc: 0.7619
Epoch 121/400
537/537 [==============================] - 0s 247us/step - loss: 0.2111 - acc:
0.9385 - val_loss: 0.6813 - val_acc: 0.7619
Epoch 122/400
537/537 [==============================] - 0s 199us/step - loss: 0.2091 - acc:
0.9385 - val_loss: 0.6863 - val_acc: 0.7576
Epoch 123/400
537/537 [==============================] - 0s 143us/step - loss: 0.2080 - acc:
0.9292 - val_loss: 0.6766 - val_acc: 0.7619
Epoch 124/400
537/537 [==============================] - 0s 237us/step - loss: 0.2179 - acc:
0.9311 - val_loss: 0.7190 - val_acc: 0.7576
Epoch 125/400
537/537 [==============================] - 0s 297us/step - loss: 0.2120 - acc:
0.9311 - val_loss: 0.6869 - val_acc: 0.7662
Epoch 126/400
537/537 [==============================] - 0s 262us/step - loss: 0.2039 - acc:
0.9348 - val_loss: 0.6827 - val_acc: 0.7576
Epoch 127/400
537/537 [==============================] - 0s 165us/step - loss: 0.2056 - acc:
0.9441 - val_loss: 0.7006 - val_acc: 0.7662
Epoch 128/400
537/537 [==============================] - 0s 264us/step - loss: 0.2074 - acc:
0.9367 - val_loss: 0.6801 - val_acc: 0.7619
Epoch 129/400
537/537 [==============================] - 0s 126us/step - loss: 0.2048 - acc:
0.9348 - val_loss: 0.7019 - val_acc: 0.7619
Epoch 130/400
537/537 [==============================] - 0s 162us/step - loss: 0.2008 - acc:
0.9423 - val_loss: 0.6941 - val_acc: 0.7532
```

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Epoch 131/400
537/537 [==============================] - 0s 232us/step - loss: 0.1998 - acc:
0.9441 - val_loss: 0.7136 - val_acc: 0.7619
Epoch 132/400
537/537 [==============================] - 0s 136us/step - loss: 0.2022 - acc:
0.9367 - val_loss: 0.6953 - val_acc: 0.7532
Epoch 133/400
537/537 [==============================] - 0s 227us/step - loss: 0.2018 - acc:
0.9292 - val_loss: 0.6891 - val_acc: 0.7273
Epoch 134/400
537/537 [==============================] - 0s 130us/step - loss: 0.2078 - acc:
0.9218 - val_loss: 0.7633 - val_acc: 0.7446
Epoch 135/400
537/537 [==============================] - 0s 173us/step - loss: 0.2063 - acc:
0.9218 - val_loss: 0.7107 - val_acc: 0.7619
Epoch 136/400
537/537 [==============================] - 0s 212us/step - loss: 0.1955 - acc:
0.9404 - val_loss: 0.7076 - val_acc: 0.7489
Epoch 137/400
537/537 [==============================] - 0s 373us/step - loss: 0.1951 - acc:
0.9385 - val_loss: 0.7050 - val_acc: 0.7489
Epoch 138/400
537/537 [==============================] - 0s 163us/step - loss: 0.1918 - acc:
0.9404 - val_loss: 0.7095 - val_acc: 0.7619
Epoch 139/400
537/537 [==============================] - 0s 249us/step - loss: 0.1937 - acc:
0.9441 - val_loss: 0.7022 - val_acc: 0.7576
Epoch 140/400
537/537 [==============================] - 0s 137us/step - loss: 0.1932 - acc:
0.9404 - val_loss: 0.7157 - val_acc: 0.7489
Epoch 141/400
537/537 [==============================] - 0s 256us/step - loss: 0.1918 - acc:
0.9441 - val_loss: 0.7092 - val_acc: 0.7532
Epoch 142/400
537/537 [==============================] - 0s 256us/step - loss: 0.1921 - acc:
0.9441 - val_loss: 0.7428 - val_acc: 0.7532
Epoch 143/400
537/537 [==============================] - 0s 212us/step - loss: 0.2005 - acc:
0.9348 - val_loss: 0.7492 - val_acc: 0.7403
Epoch 144/400
537/537 [==============================] - 0s 162us/step - loss: 0.2032 - acc:
0.9218 - val_loss: 0.7176 - val_acc: 0.7186
Epoch 145/400
537/537 [==============================] - 0s 279us/step - loss: 0.2055 - acc:
0.9311 - val_loss: 0.7415 - val_acc: 0.7489
Epoch 146/400
537/537 [==============================] - 0s 132us/step - loss: 0.1910 - acc:
0.9441 - val_loss: 0.7226 - val_acc: 0.7532
```

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Epoch 147/400
537/537 [==============================] - 0s 357us/step - loss: 0.1838 - acc:
0.9479 - val_loss: 0.7134 - val_acc: 0.7576
Epoch 148/400
537/537 [==============================] - 0s 236us/step - loss: 0.1827 - acc:
0.9441 - val_loss: 0.7339 - val_acc: 0.7446
Epoch 149/400
537/537 [==============================] - 0s 286us/step - loss: 0.1875 - acc:
0.9441 - val_loss: 0.7338 - val_acc: 0.7403
Epoch 150/400
537/537 [==============================] - 0s 236us/step - loss: 0.1850 - acc:
0.9441 - val_loss: 0.7162 - val_acc: 0.7446
Epoch 151/400
537/537 [==============================] - 0s 219us/step - loss: 0.1818 - acc:
0.9441 - val_loss: 0.7261 - val_acc: 0.7446
Epoch 152/400
537/537 [==============================] - 0s 303us/step - loss: 0.1822 - acc:
0.9404 - val_loss: 0.7541 - val_acc: 0.7446
Epoch 153/400
537/537 [==============================] - 0s 405us/step - loss: 0.1788 - acc:
0.9460 - val_loss: 0.7411 - val_acc: 0.7403
Epoch 154/400
537/537 [==============================] - 0s 344us/step - loss: 0.1758 - acc:
0.9460 - val_loss: 0.7385 - val_acc: 0.7446
Epoch 155/400
537/537 [==============================] - 0s 119us/step - loss: 0.1763 - acc:
0.9460 - val_loss: 0.7384 - val_acc: 0.7489
Epoch 156/400
537/537 [==============================] - 0s 409us/step - loss: 0.1749 - acc:
0.9516 - val_loss: 0.7309 - val_acc: 0.7532
Epoch 157/400
537/537 [==============================] - 0s 318us/step - loss: 0.1824 - acc:
0.9441 - val_loss: 0.7331 - val_acc: 0.7316
Epoch 158/400
537/537 [==============================] - 0s 167us/step - loss: 0.1891 - acc:
0.9367 - val_loss: 0.7898 - val_acc: 0.7403
Epoch 159/400
537/537 [==============================] - 0s 226us/step - loss: 0.1761 - acc:
0.9479 - val_loss: 0.7640 - val_acc: 0.7489
Epoch 160/400
537/537 [==============================] - 0s 373us/step - loss: 0.1702 - acc:
0.9460 - val_loss: 0.7406 - val_acc: 0.7489
Epoch 161/400
537/537 [==============================] - 0s 182us/step - loss: 0.1740 - acc:
0.9479 - val_loss: 0.7438 - val_acc: 0.7489
Epoch 162/400
537/537 [==============================] - 1s 2ms/step - loss: 0.1759 - acc:
0.9423 - val_loss: 0.7630 - val_acc: 0.7446
```

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Epoch 163/400
537/537 [==============================] - 0s 663us/step - loss: 0.1671 - acc:
0.9497 - val_loss: 0.7658 - val_acc: 0.7489
Epoch 164/400
537/537 [==============================] - 0s 217us/step - loss: 0.1703 - acc:
0.9460 - val_loss: 0.7701 - val_acc: 0.7446
Epoch 165/400
537/537 [==============================] - 0s 338us/step - loss: 0.1699 - acc:
0.9460 - val_loss: 0.7700 - val_acc: 0.7446
Epoch 166/400
537/537 [==============================] - 0s 232us/step - loss: 0.1638 - acc:
0.9516 - val_loss: 0.7558 - val_acc: 0.7359
Epoch 167/400
537/537 [==============================] - 0s 173us/step - loss: 0.1665 - acc:
0.9479 - val_loss: 0.7934 - val_acc: 0.7403
Epoch 168/400
537/537 [==============================] - 0s 175us/step - loss: 0.1640 - acc:
0.9534 - val_loss: 0.7764 - val_acc: 0.7403
Epoch 169/400
537/537 [==============================] - 0s 274us/step - loss: 0.1621 - acc:
0.9534 - val_loss: 0.7650 - val_acc: 0.7446
Epoch 170/400
537/537 [==============================] - 0s 130us/step - loss: 0.1603 - acc:
0.9460 - val_loss: 0.7748 - val_acc: 0.7446
Epoch 171/400
537/537 [==============================] - 0s 223us/step - loss: 0.1604 - acc:
0.9497 - val_loss: 0.7811 - val_acc: 0.7403
Epoch 172/400
537/537 [==============================] - 0s 186us/step - loss: 0.1582 - acc:
0.9497 - val_loss: 0.7778 - val_acc: 0.7403
Epoch 173/400
537/537 [==============================] - 0s 921us/step - loss: 0.1642 - acc:
0.9479 - val_loss: 0.7732 - val_acc: 0.7316
Epoch 174/400
537/537 [==============================] - 0s 579us/step - loss: 0.1587 - acc:
0.9590 - val_loss: 0.7792 - val_acc: 0.7489
Epoch 175/400
537/537 [==============================] - 0s 330us/step - loss: 0.1587 - acc:
0.9534 - val_loss: 0.7771 - val_acc: 0.7403
Epoch 176/400
537/537 [==============================] - 0s 318us/step - loss: 0.1575 - acc:
0.9460 - val_loss: 0.7811 - val_acc: 0.7489
Epoch 177/400
537/537 [==============================] - 0s 306us/step - loss: 0.1545 - acc:
0.9534 - val_loss: 0.7959 - val_acc: 0.7489
Epoch 178/400
537/537 [==============================] - 0s 299us/step - loss: 0.1563 - acc:
0.9534 - val_loss: 0.8041 - val_acc: 0.7359
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Epoch 179/400
537/537 [==============================] - 0s 214us/step - loss: 0.1554 - acc:
0.9516 - val_loss: 0.8240 - val_acc: 0.7446
Epoch 180/400
537/537 [==============================] - 0s 182us/step - loss: 0.1531 - acc:
0.9516 - val_loss: 0.8001 - val_acc: 0.7446
Epoch 181/400
537/537 [==============================] - 0s 431us/step - loss: 0.1495 - acc:
0.9534 - val_loss: 0.8108 - val_acc: 0.7316
Epoch 182/400
537/537 [==============================] - 1s 1ms/step - loss: 0.1490 - acc:
0.9497 - val_loss: 0.8019 - val_acc: 0.7403
Epoch 183/400
537/537 [==============================] - 0s 241us/step - loss: 0.1516 - acc:
0.9516 - val_loss: 0.8055 - val_acc: 0.7359
Epoch 184/400
537/537 [==============================] - 0s 158us/step - loss: 0.1480 - acc:
0.9497 - val_loss: 0.8100 - val_acc: 0.7359
Epoch 185/400
537/537 [==============================] - 0s 226us/step - loss: 0.1450 - acc:
0.9534 - val_loss: 0.8077 - val_acc: 0.7316
Epoch 186/400
537/537 [==============================] - 0s 141us/step - loss: 0.1456 - acc:
0.9572 - val_loss: 0.8091 - val_acc: 0.7446
Epoch 187/400
537/537 [==============================] - 0s 292us/step - loss: 0.1466 - acc:
0.9516 - val_loss: 0.8142 - val_acc: 0.7359
Epoch 188/400
537/537 [==============================] - 0s 273us/step - loss: 0.1410 - acc:
0.9534 - val_loss: 0.8048 - val_acc: 0.7359
Epoch 189/400
537/537 [==============================] - 0s 195us/step - loss: 0.1449 - acc:
0.9609 - val_loss: 0.8195 - val_acc: 0.7316
Epoch 190/400
537/537 [==============================] - 0s 251us/step - loss: 0.1398 - acc:
0.9590 - val_loss: 0.8405 - val_acc: 0.7403
Epoch 191/400
537/537 [==============================] - 0s 247us/step - loss: 0.1382 - acc:
0.9609 - val_loss: 0.8129 - val_acc: 0.7273
Epoch 192/400
537/537 [==============================] - 0s 286us/step - loss: 0.1388 - acc:
0.9553 - val_loss: 0.8576 - val_acc: 0.7316
Epoch 193/400
537/537 [==============================] - 0s 197us/step - loss: 0.1457 - acc:
0.9516 - val_loss: 0.8518 - val_acc: 0.7316
Epoch 194/400
537/537 [==============================] - 0s 136us/step - loss: 0.1399 - acc:
0.9590 - val_loss: 0.8296 - val_acc: 0.7403
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Epoch 195/400
537/537 [==============================] - 0s 310us/step - loss: 0.1408 - acc:
0.9572 - val_loss: 0.8624 - val_acc: 0.7359
Epoch 196/400
537/537 [==============================] - 0s 189us/step - loss: 0.1400 - acc:
0.9572 - val_loss: 0.8247 - val_acc: 0.7273
Epoch 197/400
537/537 [==============================] - 0s 306us/step - loss: 0.1358 - acc:
0.9609 - val_loss: 0.8241 - val_acc: 0.7359
Epoch 198/400
537/537 [==============================] - 0s 307us/step - loss: 0.1326 - acc:
0.9609 - val_loss: 0.8270 - val_acc: 0.7446
Epoch 199/400
537/537 [==============================] - 0s 163us/step - loss: 0.1329 - acc:
0.9683 - val_loss: 0.8502 - val_acc: 0.7359
Epoch 200/400
537/537 [==============================] - 0s 290us/step - loss: 0.1308 - acc:
0.9609 - val_loss: 0.8295 - val_acc: 0.7446
Epoch 201/400
537/537 [==============================] - 0s 384us/step - loss: 0.1288 - acc:
0.9590 - val_loss: 0.8510 - val_acc: 0.7316
Epoch 202/400
537/537 [==============================] - 0s 168us/step - loss: 0.1284 - acc:
0.9628 - val_loss: 0.8266 - val_acc: 0.7403
Epoch 203/400
537/537 [==============================] - 0s 263us/step - loss: 0.1294 - acc:
0.9628 - val_loss: 0.8227 - val_acc: 0.7316
Epoch 204/400
537/537 [==============================] - 0s 162us/step - loss: 0.1343 - acc:
0.9609 - val_loss: 0.8413 - val_acc: 0.7316
Epoch 205/400
537/537 [==============================] - 0s 275us/step - loss: 0.1343 - acc:
0.9534 - val_loss: 0.8388 - val_acc: 0.7273
Epoch 206/400
537/537 [==============================] - 0s 308us/step - loss: 0.1311 - acc:
0.9646 - val_loss: 0.9128 - val_acc: 0.7229
Epoch 207/400
537/537 [==============================] - 0s 299us/step - loss: 0.1309 - acc:
0.9609 - val_loss: 0.8608 - val_acc: 0.7316
Epoch 208/400
537/537 [==============================] - 0s 256us/step - loss: 0.1259 - acc:
0.9590 - val_loss: 0.8715 - val_acc: 0.7186
Epoch 209/400
537/537 [==============================] - 0s 356us/step - loss: 0.1236 - acc:
0.9665 - val_loss: 0.8391 - val_acc: 0.7446
Epoch 210/400
537/537 [==============================] - 0s 201us/step - loss: 0.1258 - acc:
0.9665 - val_loss: 0.8419 - val_acc: 0.7316
```

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Epoch 211/400
537/537 [==============================] - 0s 303us/step - loss: 0.1300 - acc:
0.9609 - val_loss: 0.8733 - val_acc: 0.7273
Epoch 212/400
537/537 [==============================] - 0s 186us/step - loss: 0.1291 - acc:
0.9590 - val_loss: 0.8773 - val_acc: 0.7229
Epoch 213/400
537/537 [==============================] - 0s 258us/step - loss: 0.1225 - acc:
0.9665 - val_loss: 0.8836 - val_acc: 0.7316
Epoch 214/400
537/537 [==============================] - 0s 191us/step - loss: 0.1195 - acc:
0.9665 - val_loss: 0.8579 - val_acc: 0.7403
Epoch 215/400
537/537 [==============================] - 0s 299us/step - loss: 0.1176 - acc:
0.9739 - val_loss: 0.8811 - val_acc: 0.7316
Epoch 216/400
537/537 [==============================] - 0s 210us/step - loss: 0.1193 - acc:
0.9683 - val_loss: 0.8668 - val_acc: 0.7316
Epoch 217/400
537/537 [==============================] - 0s 230us/step - loss: 0.1192 - acc:
0.9628 - val_loss: 0.8744 - val_acc: 0.7316
Epoch 218/400
537/537 [==============================] - 0s 137us/step - loss: 0.1157 - acc:
0.9683 - val_loss: 0.8980 - val_acc: 0.7186
Epoch 219/400
537/537 [==============================] - 0s 214us/step - loss: 0.1188 - acc:
0.9646 - val_loss: 0.8636 - val_acc: 0.7359
Epoch 220/400
537/537 [==============================] - 0s 200us/step - loss: 0.1134 - acc:
0.9739 - val_loss: 0.8915 - val_acc: 0.7273
Epoch 221/400
537/537 [==============================] - 0s 266us/step - loss: 0.1137 - acc:
0.9683 - val_loss: 0.8607 - val_acc: 0.7446
Epoch 222/400
537/537 [==============================] - 0s 200us/step - loss: 0.1150 - acc:
0.9683 - val_loss: 0.8652 - val_acc: 0.7316
Epoch 223/400
537/537 [==============================] - 0s 171us/step - loss: 0.1163 - acc:
0.9702 - val_loss: 0.8615 - val_acc: 0.7359
Epoch 224/400
537/537 [==============================] - 0s 215us/step - loss: 0.1143 - acc:
0.9702 - val_loss: 0.8951 - val_acc: 0.7316
Epoch 225/400
537/537 [==============================] - 0s 221us/step - loss: 0.1237 - acc:
0.9572 - val_loss: 0.9155 - val_acc: 0.7273
Epoch 226/400
537/537 [==============================] - 0s 269us/step - loss: 0.1156 - acc:
0.9628 - val_loss: 0.8866 - val_acc: 0.7359
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Epoch 227/400
537/537 [==============================] - 0s 264us/step - loss: 0.1115 - acc:
0.9646 - val_loss: 0.8718 - val_acc: 0.7316
Epoch 228/400
537/537 [==============================] - 0s 215us/step - loss: 0.1108 - acc:
0.9683 - val_loss: 0.8682 - val_acc: 0.7316
Epoch 229/400
537/537 [==============================] - 0s 408us/step - loss: 0.1106 - acc:
0.9721 - val_loss: 0.8773 - val_acc: 0.7359
Epoch 230/400
537/537 [==============================] - 0s 108us/step - loss: 0.1101 - acc:
0.9702 - val_loss: 0.8901 - val_acc: 0.7273
Epoch 231/400
537/537 [==============================] - 0s 254us/step - loss: 0.1083 - acc:
0.9702 - val_loss: 0.8644 - val_acc: 0.7359
Epoch 232/400
537/537 [==============================] - 0s 283us/step - loss: 0.1088 - acc:
0.9721 - val_loss: 0.8781 - val_acc: 0.7359
Epoch 233/400
537/537 [==============================] - 0s 329us/step - loss: 0.1059 - acc:
0.9721 - val_loss: 0.8893 - val_acc: 0.7359
Epoch 234/400
537/537 [==============================] - 0s 121us/step - loss: 0.1024 - acc:
0.9702 - val_loss: 0.9261 - val_acc: 0.7316
Epoch 235/400
537/537 [==============================] - 0s 224us/step - loss: 0.1030 - acc:
0.9758 - val_loss: 0.8934 - val_acc: 0.7359
Epoch 236/400
537/537 [==============================] - 0s 184us/step - loss: 0.1032 - acc:
0.9702 - val_loss: 0.9723 - val_acc: 0.7273
Epoch 237/400
537/537 [==============================] - 0s 249us/step - loss: 0.1052 - acc:
0.9739 - val_loss: 0.9487 - val_acc: 0.7186
Epoch 238/400
537/537 [==============================] - 0s 405us/step - loss: 0.1061 - acc:
0.9721 - val_loss: 0.9113 - val_acc: 0.7359
Epoch 239/400
537/537 [==============================] - 0s 223us/step - loss: 0.1002 - acc:
0.9795 - val_loss: 0.9070 - val_acc: 0.7403
Epoch 240/400
537/537 [==============================] - 0s 269us/step - loss: 0.1027 - acc:
0.9721 - val_loss: 0.9162 - val_acc: 0.7359
Epoch 241/400
537/537 [==============================] - 0s 111us/step - loss: 0.1001 - acc:
0.9795 - val_loss: 0.9264 - val_acc: 0.7403
Epoch 242/400
537/537 [==============================] - 0s 172us/step - loss: 0.1008 - acc:
0.9739 - val_loss: 0.9039 - val_acc: 0.7403
```

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Epoch 243/400
537/537 [==============================] - 0s 245us/step - loss: 0.0950 - acc:
0.9777 - val_loss: 0.9116 - val_acc: 0.7446
Epoch 244/400
537/537 [==============================] - 0s 203us/step - loss: 0.1072 - acc:
0.9628 - val_loss: 0.9059 - val_acc: 0.7403
Epoch 245/400
537/537 [==============================] - 0s 260us/step - loss: 0.1062 - acc:
0.9702 - val_loss: 0.9040 - val_acc: 0.7446
Epoch 246/400
537/537 [==============================] - 0s 221us/step - loss: 0.0979 - acc:
0.9739 - val_loss: 0.9256 - val_acc: 0.7186
Epoch 247/400
537/537 [==============================] - 0s 150us/step - loss: 0.0960 - acc:
0.9758 - val_loss: 0.9130 - val_acc: 0.7446
Epoch 248/400
537/537 [==============================] - 0s 173us/step - loss: 0.1001 - acc:
0.9683 - val_loss: 0.9204 - val_acc: 0.7403
Epoch 249/400
537/537 [==============================] - 0s 241us/step - loss: 0.0930 - acc:
0.9777 - val_loss: 0.9475 - val_acc: 0.7316
Epoch 250/400
537/537 [==============================] - 0s 364us/step - loss: 0.0916 - acc:
0.9795 - val_loss: 0.9371 - val_acc: 0.7359
Epoch 251/400
537/537 [==============================] - 0s 247us/step - loss: 0.0922 - acc:
0.9758 - val_loss: 1.0020 - val_acc: 0.7273
Epoch 252/400
537/537 [==============================] - 0s 290us/step - loss: 0.0975 - acc:
0.9739 - val_loss: 0.9486 - val_acc: 0.7273
Epoch 253/400
537/537 [==============================] - 0s 137us/step - loss: 0.0977 - acc:
0.9739 - val_loss: 0.9457 - val_acc: 0.7359
Epoch 254/400
537/537 [==============================] - 0s 163us/step - loss: 0.0918 - acc:
0.9739 - val_loss: 0.9941 - val_acc: 0.7229
Epoch 255/400
537/537 [==============================] - 0s 208us/step - loss: 0.0888 - acc:
0.9777 - val_loss: 0.9326 - val_acc: 0.7316
Epoch 256/400
537/537 [==============================] - 0s 232us/step - loss: 0.0883 - acc:
0.9777 - val_loss: 0.9767 - val_acc: 0.7403
Epoch 257/400
537/537 [==============================] - 0s 260us/step - loss: 0.0909 - acc:
0.9777 - val_loss: 0.9534 - val_acc: 0.7273
Epoch 258/400
537/537 [==============================] - 0s 238us/step - loss: 0.0909 - acc:
0.9758 - val_loss: 0.9468 - val_acc: 0.7359
```

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Epoch 259/400
537/537 [==============================] - 0s 163us/step - loss: 0.0955 - acc:
0.9721 - val_loss: 0.9403 - val_acc: 0.7446
Epoch 260/400
537/537 [==============================] - 0s 332us/step - loss: 0.0868 - acc:
0.9777 - val_loss: 0.9677 - val_acc: 0.7316
Epoch 261/400
537/537 [==============================] - 0s 217us/step - loss: 0.0880 - acc:
0.9777 - val_loss: 0.9812 - val_acc: 0.7359
Epoch 262/400
537/537 [==============================] - 0s 247us/step - loss: 0.0910 - acc:
0.9777 - val_loss: 1.0209 - val_acc: 0.7316
Epoch 263/400
537/537 [==============================] - 0s 225us/step - loss: 0.0979 - acc:
0.9721 - val_loss: 0.9738 - val_acc: 0.7186
Epoch 264/400
537/537 [==============================] - 0s 186us/step - loss: 0.0867 - acc:
0.9758 - val_loss: 1.0131 - val_acc: 0.7316
Epoch 265/400
537/537 [==============================] - 0s 175us/step - loss: 0.0899 - acc:
0.9758 - val_loss: 0.9729 - val_acc: 0.7359
Epoch 266/400
537/537 [==============================] - 0s 206us/step - loss: 0.0987 - acc:
0.9683 - val_loss: 1.0042 - val_acc: 0.7229
Epoch 267/400
537/537 [==============================] - 0s 171us/step - loss: 0.0913 - acc:
0.9795 - val_loss: 1.0482 - val_acc: 0.7273
Epoch 268/400
537/537 [==============================] - 0s 329us/step - loss: 0.0888 - acc:
0.9739 - val_loss: 1.0045 - val_acc: 0.7273
Epoch 269/400
537/537 [==============================] - 0s 132us/step - loss: 0.0843 - acc:
0.9814 - val_loss: 0.9468 - val_acc: 0.7316
Epoch 270/400
537/537 [==============================] - 0s 262us/step - loss: 0.0858 - acc:
0.9795 - val_loss: 0.9778 - val_acc: 0.7316
Epoch 271/400
537/537 [==============================] - 0s 253us/step - loss: 0.0800 - acc:
0.9795 - val_loss: 0.9500 - val_acc: 0.7316
Epoch 272/400
537/537 [==============================] - 0s 173us/step - loss: 0.0826 - acc:
0.9777 - val_loss: 0.9625 - val_acc: 0.7316
Epoch 273/400
537/537 [==============================] - 0s 342us/step - loss: 0.0865 - acc:
0.9777 - val_loss: 0.9643 - val_acc: 0.7359
Epoch 274/400
537/537 [==============================] - 0s 301us/step - loss: 0.0802 - acc:
0.9851 - val_loss: 1.0173 - val_acc: 0.7273
```

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Epoch 275/400
537/537 [==============================] - 0s 152us/step - loss: 0.0878 - acc:
0.9758 - val_loss: 1.0073 - val_acc: 0.7273
Epoch 276/400
537/537 [==============================] - 0s 192us/step - loss: 0.0871 - acc:
0.9777 - val_loss: 1.0118 - val_acc: 0.7316
Epoch 277/400
537/537 [==============================] - 0s 243us/step - loss: 0.0801 - acc:
0.9814 - val_loss: 1.0019 - val_acc: 0.7446
Epoch 278/400
537/537 [==============================] - 0s 305us/step - loss: 0.0756 - acc:
0.9832 - val_loss: 1.0093 - val_acc: 0.7229
Epoch 279/400
537/537 [==============================] - 0s 269us/step - loss: 0.0755 - acc:
0.9832 - val_loss: 0.9931 - val_acc: 0.7359
Epoch 280/400
537/537 [==============================] - 0s 316us/step - loss: 0.0749 - acc:
0.9851 - val_loss: 1.0299 - val_acc: 0.7273
Epoch 281/400
537/537 [==============================] - 0s 323us/step - loss: 0.0799 - acc:
0.9739 - val_loss: 1.0252 - val_acc: 0.7229
Epoch 282/400
537/537 [==============================] - 0s 368us/step - loss: 0.0751 - acc:
0.9814 - val_loss: 1.0250 - val_acc: 0.7229
Epoch 283/400
537/537 [==============================] - 0s 228us/step - loss: 0.0759 - acc:
0.9851 - val_loss: 1.0381 - val_acc: 0.7316
Epoch 284/400
537/537 [==============================] - 0s 186us/step - loss: 0.0715 - acc:
0.9851 - val_loss: 1.0153 - val_acc: 0.7316
Epoch 285/400
537/537 [==============================] - 0s 240us/step - loss: 0.0719 - acc:
0.9870 - val_loss: 1.0623 - val_acc: 0.7229
Epoch 286/400
537/537 [==============================] - 0s 126us/step - loss: 0.0748 - acc:
0.9814 - val_loss: 1.0523 - val_acc: 0.7186
Epoch 287/400
537/537 [==============================] - 0s 238us/step - loss: 0.0719 - acc:
0.9832 - val_loss: 0.9979 - val_acc: 0.7359
Epoch 288/400
537/537 [==============================] - 0s 436us/step - loss: 0.0728 - acc:
0.9758 - val_loss: 1.0300 - val_acc: 0.7273
Epoch 289/400
537/537 [==============================] - 0s 119us/step - loss: 0.0707 - acc:
0.9851 - val_loss: 1.0218 - val_acc: 0.7359
Epoch 290/400
537/537 [==============================] - 0s 249us/step - loss: 0.0723 - acc:
0.9832 - val_loss: 1.0490 - val_acc: 0.7403
```

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Epoch 291/400
537/537 [==============================] - 0s 190us/step - loss: 0.0694 - acc:
0.9851 - val_loss: 1.0403 - val_acc: 0.7229
Epoch 292/400
537/537 [==============================] - 0s 420us/step - loss: 0.0720 - acc:
0.9870 - val_loss: 1.1133 - val_acc: 0.7273
Epoch 293/400
537/537 [==============================] - 0s 353us/step - loss: 0.0738 - acc:
0.9832 - val_loss: 1.1054 - val_acc: 0.7273
Epoch 294/400
537/537 [==============================] - 0s 262us/step - loss: 0.0790 - acc:
0.9777 - val_loss: 1.0716 - val_acc: 0.7186
Epoch 295/400
537/537 [==============================] - 0s 150us/step - loss: 0.0726 - acc:
0.9814 - val_loss: 1.0493 - val_acc: 0.7359
Epoch 296/400
537/537 [==============================] - 0s 139us/step - loss: 0.0666 - acc:
0.9888 - val_loss: 1.0815 - val_acc: 0.7186
Epoch 297/400
537/537 [==============================] - 0s 150us/step - loss: 0.0678 - acc:
0.9870 - val_loss: 1.0673 - val_acc: 0.7229
Epoch 298/400
537/537 [==============================] - 0s 212us/step - loss: 0.0671 - acc:
0.9888 - val_loss: 1.0382 - val_acc: 0.7359
Epoch 299/400
537/537 [==============================] - 0s 204us/step - loss: 0.0646 - acc:
0.9870 - val_loss: 1.0574 - val_acc: 0.7316
Epoch 300/400
537/537 [==============================] - 0s 297us/step - loss: 0.0634 - acc:
0.9907 - val_loss: 1.0640 - val_acc: 0.7359
Epoch 301/400
537/537 [==============================] - 0s 143us/step - loss: 0.0623 - acc:
0.9870 - val_loss: 1.0616 - val_acc: 0.7316
Epoch 302/400
537/537 [==============================] - 0s 162us/step - loss: 0.0620 - acc:
0.9870 - val_loss: 1.0948 - val_acc: 0.7273
Epoch 303/400
537/537 [==============================] - 0s 169us/step - loss: 0.0648 - acc:
0.9851 - val_loss: 1.0450 - val_acc: 0.7273
Epoch 304/400
537/537 [==============================] - 0s 303us/step - loss: 0.0632 - acc:
0.9888 - val_loss: 1.0597 - val_acc: 0.7316
Epoch 305/400
537/537 [==============================] - 0s 165us/step - loss: 0.0655 - acc:
0.9888 - val_loss: 1.0847 - val_acc: 0.7403
Epoch 306/400
537/537 [==============================] - 0s 264us/step - loss: 0.0647 - acc:
0.9870 - val_loss: 1.0686 - val_acc: 0.7273
```

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Epoch 307/400
537/537 [==============================] - 0s 205us/step - loss: 0.0613 - acc:
0.9888 - val_loss: 1.0874 - val_acc: 0.7359
Epoch 308/400
537/537 [==============================] - 0s 143us/step - loss: 0.0604 - acc:
0.9888 - val_loss: 1.0813 - val_acc: 0.7316
Epoch 309/400
537/537 [==============================] - 0s 306us/step - loss: 0.0614 - acc:
0.9870 - val_loss: 1.0907 - val_acc: 0.7403
Epoch 310/400
537/537 [==============================] - 0s 268us/step - loss: 0.0624 - acc:
0.9888 - val_loss: 1.0935 - val_acc: 0.7403
Epoch 311/400
537/537 [==============================] - 0s 206us/step - loss: 0.0593 - acc:
0.9888 - val_loss: 1.0648 - val_acc: 0.7359
Epoch 312/400
537/537 [==============================] - 0s 334us/step - loss: 0.0594 - acc:
0.9870 - val_loss: 1.0616 - val_acc: 0.7316
Epoch 313/400
537/537 [==============================] - 0s 254us/step - loss: 0.0579 - acc:
0.9888 - val_loss: 1.0839 - val_acc: 0.7403
Epoch 314/400
537/537 [==============================] - 0s 179us/step - loss: 0.0570 - acc:
0.9907 - val_loss: 1.1042 - val_acc: 0.7316
Epoch 315/400
537/537 [==============================] - 0s 358us/step - loss: 0.0582 - acc:
0.9907 - val_loss: 1.0893 - val_acc: 0.7359
Epoch 316/400
537/537 [==============================] - 0s 165us/step - loss: 0.0582 - acc:
0.9888 - val_loss: 1.1352 - val_acc: 0.7273
Epoch 317/400
537/537 [==============================] - 0s 236us/step - loss: 0.0595 - acc:
0.9888 - val_loss: 1.1030 - val_acc: 0.7316
Epoch 318/400
537/537 [==============================] - 0s 223us/step - loss: 0.0569 - acc:
0.9907 - val_loss: 1.1427 - val_acc: 0.7229
Epoch 319/400
537/537 [==============================] - 0s 195us/step - loss: 0.0611 - acc:
0.9870 - val_loss: 1.1422 - val_acc: 0.7316
Epoch 320/400
537/537 [==============================] - 0s 214us/step - loss: 0.0597 - acc:
0.9907 - val_loss: 1.1348 - val_acc: 0.7273
Epoch 321/400
537/537 [==============================] - 0s 199us/step - loss: 0.0568 - acc:
0.9870 - val_loss: 1.1144 - val_acc: 0.7359
Epoch 322/400
537/537 [==============================] - 0s 171us/step - loss: 0.0578 - acc:
0.9888 - val_loss: 1.0890 - val_acc: 0.7359
```

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Epoch 323/400
537/537 [==============================] - 0s 266us/step - loss: 0.0543 - acc:
0.9907 - val_loss: 1.1182 - val_acc: 0.7403
Epoch 324/400
537/537 [==============================] - 0s 132us/step - loss: 0.0528 - acc:
0.9907 - val_loss: 1.0985 - val_acc: 0.7273
Epoch 325/400
537/537 [==============================] - 0s 152us/step - loss: 0.0539 - acc:
0.9907 - val_loss: 1.1020 - val_acc: 0.7273
Epoch 326/400
537/537 [==============================] - 0s 154us/step - loss: 0.0553 - acc:
0.9907 - val_loss: 1.0957 - val_acc: 0.7316
Epoch 327/400
537/537 [==============================] - 0s 308us/step - loss: 0.0530 - acc:
0.9907 - val_loss: 1.0952 - val_acc: 0.7359
Epoch 328/400
537/537 [==============================] - 0s 187us/step - loss: 0.0532 - acc:
0.9907 - val_loss: 1.1452 - val_acc: 0.7316
Epoch 329/400
537/537 [==============================] - 0s 256us/step - loss: 0.0502 - acc:
0.9907 - val_loss: 1.1043 - val_acc: 0.7359
Epoch 330/400
537/537 [==============================] - 0s 163us/step - loss: 0.0506 - acc:
0.9907 - val_loss: 1.1654 - val_acc: 0.7359
Epoch 331/400
537/537 [==============================] - 0s 295us/step - loss: 0.0512 - acc:
0.9907 - val_loss: 1.1356 - val_acc: 0.7403
Epoch 332/400
537/537 [==============================] - 0s 438us/step - loss: 0.0542 - acc:
0.9907 - val_loss: 1.1478 - val_acc: 0.7359
Epoch 333/400
537/537 [==============================] - 0s 145us/step - loss: 0.0525 - acc:
0.9888 - val_loss: 1.1066 - val_acc: 0.7316
Epoch 334/400
537/537 [==============================] - 0s 193us/step - loss: 0.0576 - acc:
0.9888 - val_loss: 1.1077 - val_acc: 0.7273
Epoch 335/400
537/537 [==============================] - 0s 219us/step - loss: 0.0616 - acc:
0.9870 - val_loss: 1.0854 - val_acc: 0.7273
Epoch 336/400
537/537 [==============================] - 0s 270us/step - loss: 0.0609 - acc:
0.9870 - val_loss: 1.1570 - val_acc: 0.7229
Epoch 337/400
537/537 [==============================] - 0s 201us/step - loss: 0.0579 - acc:
0.9851 - val_loss: 1.1420 - val_acc: 0.7273
Epoch 338/400
537/537 [==============================] - 0s 171us/step - loss: 0.0519 - acc:
0.9888 - val_loss: 1.1520 - val_acc: 0.7229
```

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Epoch 339/400
537/537 [==============================] - 0s 273us/step - loss: 0.0527 - acc:
0.9907 - val_loss: 1.2004 - val_acc: 0.7316
Epoch 340/400
537/537 [==============================] - 0s 195us/step - loss: 0.0508 - acc:
0.9907 - val_loss: 1.1586 - val_acc: 0.7359
Epoch 341/400
537/537 [==============================] - 0s 221us/step - loss: 0.0482 - acc:
0.9907 - val_loss: 1.1720 - val_acc: 0.7359
Epoch 342/400
537/537 [==============================] - 0s 203us/step - loss: 0.0487 - acc:
0.9907 - val_loss: 1.2028 - val_acc: 0.7316
Epoch 343/400
537/537 [==============================] - 0s 290us/step - loss: 0.0479 - acc:
0.9907 - val_loss: 1.1685 - val_acc: 0.7273
Epoch 344/400
537/537 [==============================] - 0s 182us/step - loss: 0.0497 - acc:
0.9870 - val_loss: 1.1470 - val_acc: 0.7359
Epoch 345/400
537/537 [==============================] - 0s 249us/step - loss: 0.0470 - acc:
0.9907 - val_loss: 1.1609 - val_acc: 0.7316
Epoch 346/400
537/537 [==============================] - 0s 186us/step - loss: 0.0460 - acc:
0.9907 - val_loss: 1.1793 - val_acc: 0.7359
Epoch 347/400
537/537 [==============================] - 0s 349us/step - loss: 0.0452 - acc:
0.9907 - val_loss: 1.1691 - val_acc: 0.7316
Epoch 348/400
537/537 [==============================] - 0s 124us/step - loss: 0.0452 - acc:
0.9888 - val_loss: 1.1534 - val_acc: 0.7316
Epoch 349/400
537/537 [==============================] - 0s 195us/step - loss: 0.0490 - acc:
0.9907 - val_loss: 1.1809 - val_acc: 0.7316
Epoch 350/400
537/537 [==============================] - 0s 224us/step - loss: 0.0470 - acc:
0.9907 - val_loss: 1.1752 - val_acc: 0.7359
Epoch 351/400
537/537 [==============================] - 0s 141us/step - loss: 0.0448 - acc:
0.9907 - val_loss: 1.1435 - val_acc: 0.7273
Epoch 352/400
537/537 [==============================] - 0s 137us/step - loss: 0.0512 - acc:
0.9907 - val_loss: 1.1548 - val_acc: 0.7359
Epoch 353/400
537/537 [==============================] - 0s 256us/step - loss: 0.0470 - acc:
0.9907 - val_loss: 1.2204 - val_acc: 0.7446
Epoch 354/400
537/537 [==============================] - 0s 228us/step - loss: 0.0456 - acc:
0.9888 - val_loss: 1.1961 - val_acc: 0.7359
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Epoch 355/400
537/537 [==============================] - 0s 186us/step - loss: 0.0471 - acc:
0.9907 - val_loss: 1.2097 - val_acc: 0.7359
Epoch 356/400
537/537 [==============================] - 0s 231us/step - loss: 0.0433 - acc:
0.9907 - val_loss: 1.1830 - val_acc: 0.7273
Epoch 357/400
537/537 [==============================] - 0s 219us/step - loss: 0.0460 - acc:
0.9907 - val_loss: 1.2097 - val_acc: 0.7273
Epoch 358/400
537/537 [==============================] - 0s 156us/step - loss: 0.0457 - acc:
0.9907 - val_loss: 1.2106 - val_acc: 0.7403
Epoch 359/400
537/537 [==============================] - 0s 240us/step - loss: 0.0422 - acc:
0.9907 - val_loss: 1.2048 - val_acc: 0.7273
Epoch 360/400
537/537 [==============================] - 0s 217us/step - loss: 0.0421 - acc:
0.9907 - val_loss: 1.2041 - val_acc: 0.7359
Epoch 361/400
537/537 [==============================] - 0s 118us/step - loss: 0.0420 - acc:
0.9888 - val_loss: 1.2350 - val_acc: 0.7273
Epoch 362/400
537/537 [==============================] - 0s 286us/step - loss: 0.0431 - acc:
0.9907 - val_loss: 1.1923 - val_acc: 0.7273
Epoch 363/400
537/537 [==============================] - 0s 201us/step - loss: 0.0459 - acc:
0.9907 - val_loss: 1.2487 - val_acc: 0.7273
Epoch 364/400
537/537 [==============================] - 0s 178us/step - loss: 0.0500 - acc:
0.9832 - val_loss: 1.1796 - val_acc: 0.7229
Epoch 365/400
537/537 [==============================] - 0s 304us/step - loss: 0.0477 - acc:
0.9870 - val_loss: 1.2648 - val_acc: 0.7359
Epoch 366/400
537/537 [==============================] - 0s 212us/step - loss: 0.0419 - acc:
0.9870 - val_loss: 1.2157 - val_acc: 0.7316
Epoch 367/400
537/537 [==============================] - 0s 208us/step - loss: 0.0425 - acc:
0.9888 - val_loss: 1.2208 - val_acc: 0.7446
Epoch 368/400
537/537 [==============================] - 0s 117us/step - loss: 0.0392 - acc:
0.9907 - val_loss: 1.2102 - val_acc: 0.7359
Epoch 369/400
537/537 [==============================] - 0s 128us/step - loss: 0.0394 - acc:
0.9907 - val_loss: 1.2106 - val_acc: 0.7359
Epoch 370/400
537/537 [==============================] - 0s 191us/step - loss: 0.0390 - acc:
0.9907 - val_loss: 1.2027 - val_acc: 0.7403
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Epoch 371/400
537/537 [==============================] - 0s 256us/step - loss: 0.0413 - acc:
0.9888 - val_loss: 1.1988 - val_acc: 0.7316
Epoch 372/400
537/537 [==============================] - 0s 182us/step - loss: 0.0612 - acc:
0.9795 - val_loss: 1.1610 - val_acc: 0.7143
Epoch 373/400
537/537 [==============================] - 0s 224us/step - loss: 0.0765 - acc:
0.9758 - val_loss: 1.2006 - val_acc: 0.7403
Epoch 374/400
537/537 [==============================] - 0s 136us/step - loss: 0.0554 - acc:
0.9870 - val_loss: 1.1875 - val_acc: 0.7186
Epoch 375/400
537/537 [==============================] - 0s 282us/step - loss: 0.0577 - acc:
0.9795 - val_loss: 1.2235 - val_acc: 0.7056
Epoch 376/400
537/537 [==============================] - 0s 215us/step - loss: 0.0784 - acc:
0.9758 - val_loss: 1.2308 - val_acc: 0.7316
Epoch 377/400
537/537 [==============================] - 0s 219us/step - loss: 0.0444 - acc:
0.9888 - val_loss: 1.2900 - val_acc: 0.7316
Epoch 378/400
537/537 [==============================] - 0s 139us/step - loss: 0.0396 - acc:
0.9888 - val_loss: 1.2029 - val_acc: 0.7316
Epoch 379/400
537/537 [==============================] - 0s 282us/step - loss: 0.0427 - acc:
0.9907 - val_loss: 1.1998 - val_acc: 0.7359
Epoch 380/400
537/537 [==============================] - 0s 123us/step - loss: 0.0420 - acc:
0.9907 - val_loss: 1.3122 - val_acc: 0.7229
Epoch 381/400
537/537 [==============================] - 0s 265us/step - loss: 0.0401 - acc:
0.9907 - val_loss: 1.2912 - val_acc: 0.7186
Epoch 382/400
537/537 [==============================] - 0s 154us/step - loss: 0.0385 - acc:
0.9907 - val_loss: 1.2494 - val_acc: 0.7316
Epoch 383/400
537/537 [==============================] - 0s 312us/step - loss: 0.0380 - acc:
0.9907 - val_loss: 1.2321 - val_acc: 0.7273
Epoch 384/400
537/537 [==============================] - 0s 189us/step - loss: 0.0365 - acc:
0.9907 - val_loss: 1.2433 - val_acc: 0.7359
Epoch 385/400
537/537 [==============================] - 0s 262us/step - loss: 0.0372 - acc:
0.9907 - val_loss: 1.2675 - val_acc: 0.7316
Epoch 386/400
537/537 [==============================] - 0s 262us/step - loss: 0.0359 - acc:
0.9907 - val_loss: 1.2436 - val_acc: 0.7403
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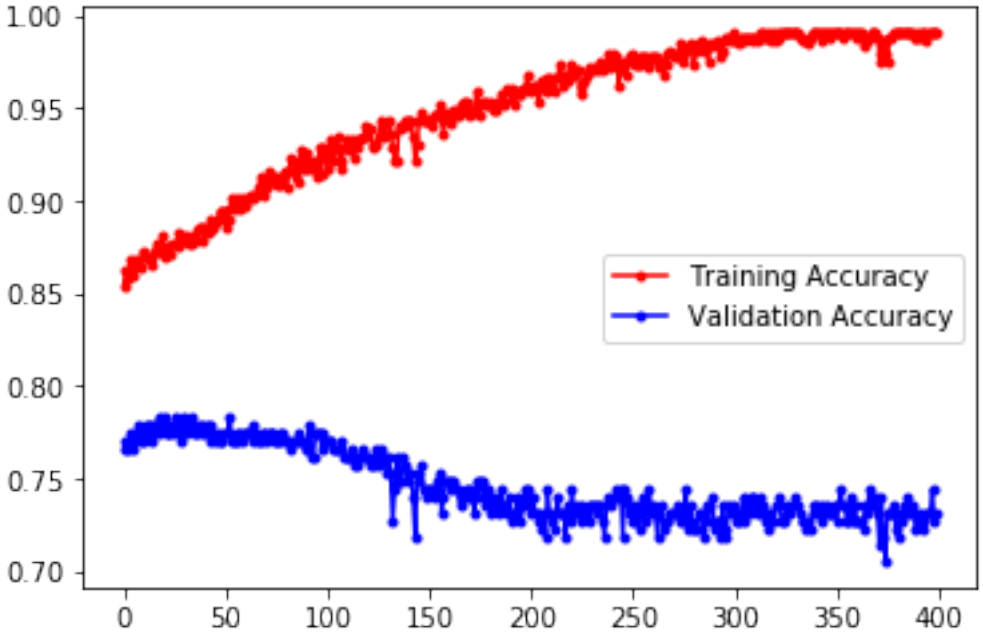
Epoch 387/400
537/537 [==============================] - 0s 175us/step - loss: 0.0355 - acc:
0.9907 - val_loss: 1.2831 - val_acc: 0.7316
Epoch 388/400
537/537 [==============================] - 0s 188us/step - loss: 0.0356 - acc:
0.9907 - val_loss: 1.2567 - val_acc: 0.7359
Epoch 389/400
537/537 [==============================] - 0s 307us/step - loss: 0.0382 - acc:
0.9888 - val_loss: 1.2533 - val_acc: 0.7316
Epoch 390/400
537/537 [==============================] - 0s 226us/step - loss: 0.0373 - acc:
0.9888 - val_loss: 1.2936 - val_acc: 0.7229
Epoch 391/400
537/537 [==============================] - 0s 353us/step - loss: 0.0375 - acc:
0.9907 - val_loss: 1.2908 - val_acc: 0.7273
Epoch 392/400
537/537 [==============================] - 0s 282us/step - loss: 0.0395 - acc:
0.9888 - val_loss: 1.3052 - val_acc: 0.7316
Epoch 393/400
537/537 [==============================] - 0s 123us/step - loss: 0.0360 - acc:
0.9907 - val_loss: 1.3512 - val_acc: 0.7273
Epoch 394/400
537/537 [==============================] - 0s 286us/step - loss: 0.0381 - acc:
0.9907 - val_loss: 1.3177 - val_acc: 0.7229
Epoch 395/400
537/537 [==============================] - 0s 516us/step - loss: 0.0408 - acc:
0.9870 - val_loss: 1.3038 - val_acc: 0.7316
Epoch 396/400
537/537 [==============================] - 0s 236us/step - loss: 0.0352 - acc:
0.9907 - val_loss: 1.2734 - val_acc: 0.7316
Epoch 397/400
537/537 [==============================] - 0s 280us/step - loss: 0.0333 - acc:
0.9907 - val_loss: 1.2897 - val_acc: 0.7316
Epoch 398/400
537/537 [==============================] - 0s 332us/step - loss: 0.0330 - acc:
0.9907 - val_loss: 1.2727 - val_acc: 0.7446
Epoch 399/400
537/537 [==============================] - 0s 227us/step - loss: 0.0330 - acc:
0.9907 - val_loss: 1.3006 - val_acc: 0.7273
Epoch 400/400
537/537 [==============================] - 0s 161us/step - loss: 0.0330 - acc:
0.9907 - val_loss: 1.3114 - val_acc: 0.7316
```

[467]:
```
y_pred_class_nn_400 = nn_model_2.predict_classes(X_test_norm)
y_pred_prob_nn_400 = nn_model_2.predict(X_test_norm)
```

[468]:
```
#plotting the curve to check training and validation accuracy
fig, ax = plt.subplots()
```

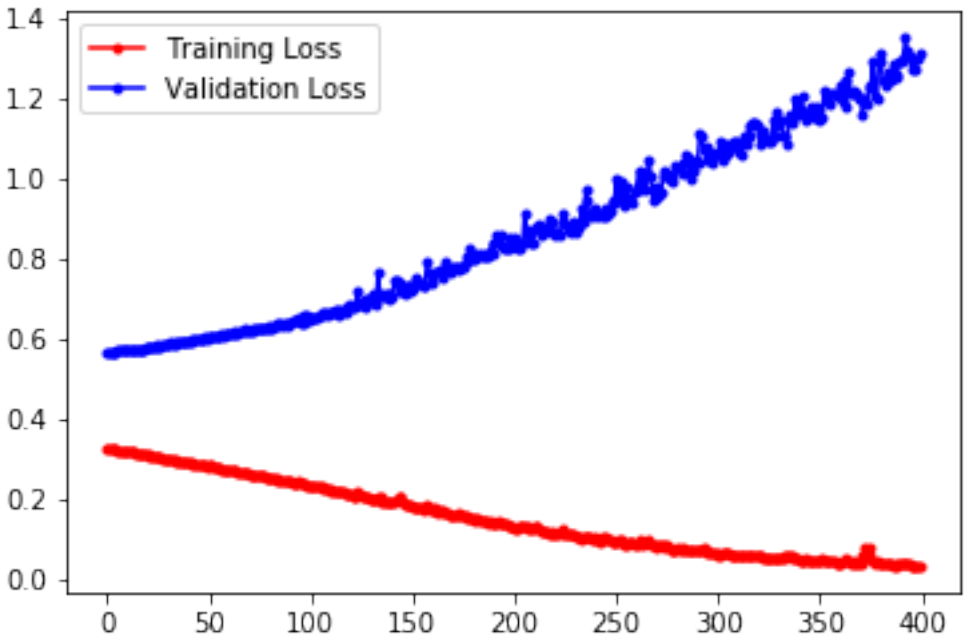
```
ax.plot(run_hist_400.history["acc"],'r', marker='.', label="Training Accuracy")
ax.plot(run_hist_400.history["val_acc"],'b', marker='.', label="Validation␣
 ↪Accuracy")
ax.legend()
```

[468]: `<matplotlib.legend.Legend at 0x1c7b036fb38>`



[469]:
```
#Plotting curves for Training Loss and Validation loss
fig, ax = plt.subplots()
ax.plot(run_hist_400.history["loss"],'r', marker='.', label="Training Loss")
ax.plot(run_hist_400.history["val_loss"],'b', marker='.', label="Validation␣
 ↪Loss")
ax.legend()
```

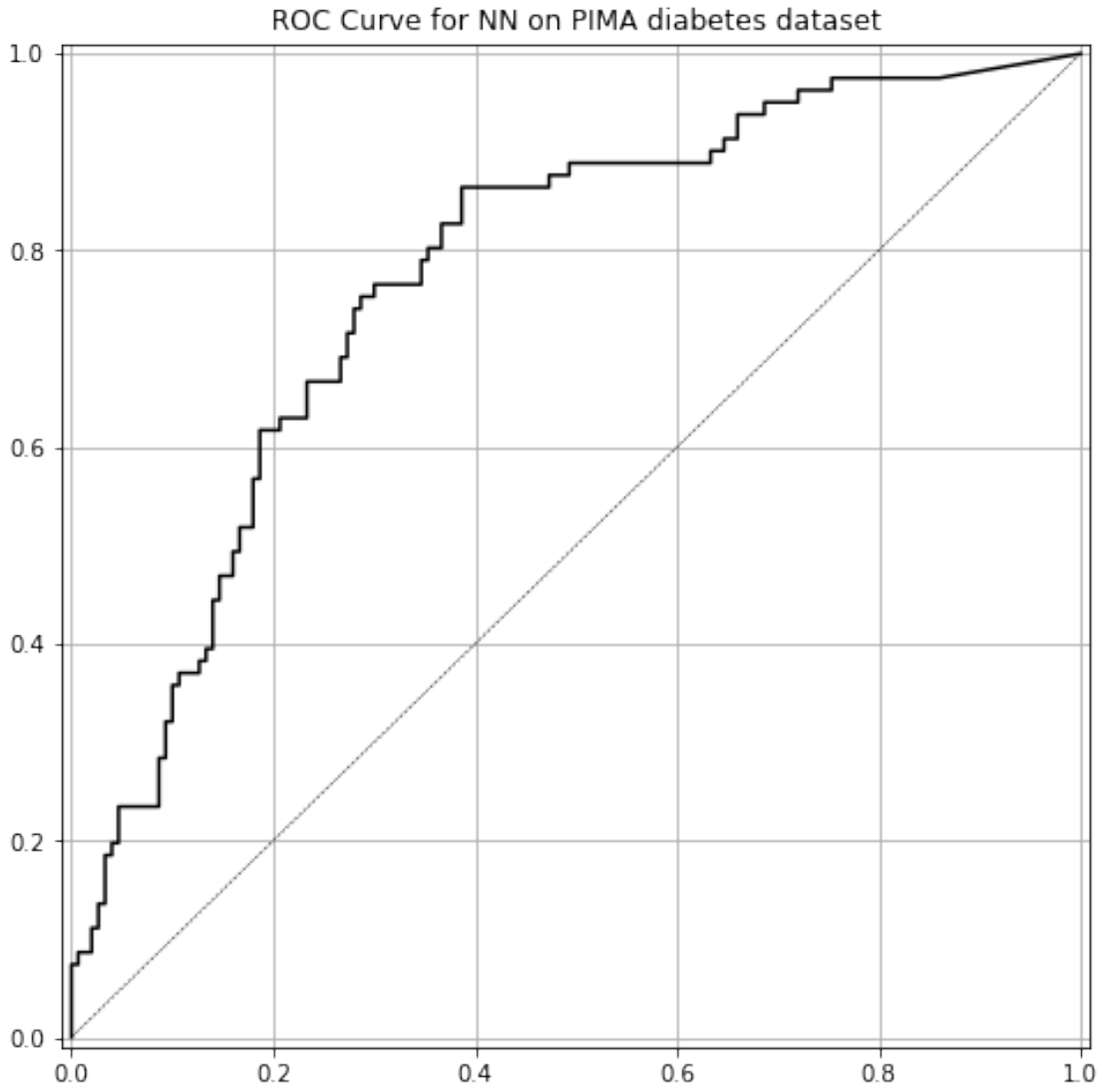
[469]: `<matplotlib.legend.Legend at 0x1c7b03ee240>`



[470]:
```
# Print model performance and plot the roc curve
print('accuracy is {:.3f}'.format(accuracy_score(y_test,y_pred_class_nn_400)))
print('roc-auc is {:.3f}'.format(roc_auc_score(y_test,y_pred_prob_nn_400)))

plot_roc(y_test, y_pred_prob_nn_400, 'NN')
```

```
accuracy is 0.732
roc-auc is 0.774
```



Accuracy obtained for epochs = 400 is 73.2% We see that accuracy is slightly better than previous model.

Now, let's check for epochs = 600 wherein model improves or not.

[481]:
```
run_hist_600 = nn_model_2.fit(X_train_norm, y_train,␣
↪validation_data=(X_test_norm, y_test), epochs=600)
```

```
Train on 537 samples, validate on 231 samples
Epoch 1/600
537/537 [==============================] - 0s 918us/step - loss: 4.6693e-04 -
acc: 1.0000 - val_loss: 2.2036 - val_acc: 0.7100
Epoch 2/600
537/537 [==============================] - 0s 416us/step - loss: 4.6172e-04 -
```

```
acc: 1.0000 - val_loss: 2.2038 - val_acc: 0.7100
Epoch 3/600
537/537 [==============================] - 0s 234us/step - loss: 4.6060e-04 -
acc: 1.0000 - val_loss: 2.2041 - val_acc: 0.7100
Epoch 4/600
537/537 [==============================] - 0s 223us/step - loss: 4.6026e-04 -
acc: 1.0000 - val_loss: 2.2040 - val_acc: 0.7100
Epoch 5/600
537/537 [==============================] - 0s 102us/step - loss: 4.6800e-04 -
acc: 1.0000 - val_loss: 2.2045 - val_acc: 0.7100
Epoch 6/600
537/537 [==============================] - 0s 136us/step - loss: 4.6793e-04 -
acc: 1.0000 - val_loss: 2.2032 - val_acc: 0.7100
Epoch 7/600
537/537 [==============================] - 0s 221us/step - loss: 4.6049e-04 -
acc: 1.0000 - val_loss: 2.2042 - val_acc: 0.7100
Epoch 8/600
537/537 [==============================] - 0s 176us/step - loss: 4.6149e-04 -
acc: 1.0000 - val_loss: 2.2042 - val_acc: 0.7100
Epoch 9/600
537/537 [==============================] - 0s 107us/step - loss: 4.5749e-04 -
acc: 1.0000 - val_loss: 2.2043 - val_acc: 0.7100
Epoch 10/600
537/537 [==============================] - 0s 326us/step - loss: 4.5731e-04 -
acc: 1.0000 - val_loss: 2.2056 - val_acc: 0.7056
Epoch 11/600
537/537 [==============================] - 0s 110us/step - loss: 4.5687e-04 -
acc: 1.0000 - val_loss: 2.2046 - val_acc: 0.7100
Epoch 12/600
537/537 [==============================] - 0s 308us/step - loss: 4.5564e-04 -
acc: 1.0000 - val_loss: 2.2047 - val_acc: 0.7100
Epoch 13/600
537/537 [==============================] - 0s 219us/step - loss: 4.5891e-04 -
acc: 1.0000 - val_loss: 2.2057 - val_acc: 0.7100
Epoch 14/600
537/537 [==============================] - 0s 117us/step - loss: 4.5416e-04 -
acc: 1.0000 - val_loss: 2.2050 - val_acc: 0.7100
Epoch 15/600
537/537 [==============================] - 0s 236us/step - loss: 4.5837e-04 -
acc: 1.0000 - val_loss: 2.2060 - val_acc: 0.7100
Epoch 16/600
537/537 [==============================] - 0s 202us/step - loss: 4.5547e-04 -
acc: 1.0000 - val_loss: 2.2056 - val_acc: 0.7100
Epoch 17/600
537/537 [==============================] - 0s 193us/step - loss: 4.5388e-04 -
acc: 1.0000 - val_loss: 2.2050 - val_acc: 0.7100
Epoch 18/600
537/537 [==============================] - 0s 201us/step - loss: 4.5554e-04 -
```

```
acc: 1.0000 - val_loss: 2.2068 - val_acc: 0.7100
Epoch 19/600
537/537 [==============================] - 0s 249us/step - loss: 4.5884e-04 -
acc: 1.0000 - val_loss: 2.2065 - val_acc: 0.7100
Epoch 20/600
537/537 [==============================] - 0s 127us/step - loss: 4.5544e-04 -
acc: 1.0000 - val_loss: 2.2070 - val_acc: 0.7100
Epoch 21/600
537/537 [==============================] - 0s 284us/step - loss: 4.6578e-04 -
acc: 1.0000 - val_loss: 2.2060 - val_acc: 0.7100
Epoch 22/600
537/537 [==============================] - 0s 314us/step - loss: 4.6009e-04 -
acc: 1.0000 - val_loss: 2.2059 - val_acc: 0.7100
Epoch 23/600
537/537 [==============================] - 0s 165us/step - loss: 4.6556e-04 -
acc: 1.0000 - val_loss: 2.2085 - val_acc: 0.7056
Epoch 24/600
537/537 [==============================] - 0s 208us/step - loss: 4.6195e-04 -
acc: 1.0000 - val_loss: 2.2060 - val_acc: 0.7100
Epoch 25/600
537/537 [==============================] - 0s 227us/step - loss: 4.5038e-04 -
acc: 1.0000 - val_loss: 2.2084 - val_acc: 0.7100
Epoch 26/600
537/537 [==============================] - 0s 306us/step - loss: 4.5410e-04 -
acc: 1.0000 - val_loss: 2.2078 - val_acc: 0.7100
Epoch 27/600
537/537 [==============================] - 0s 125us/step - loss: 4.5969e-04 -
acc: 1.0000 - val_loss: 2.2068 - val_acc: 0.7100
Epoch 28/600
537/537 [==============================] - 0s 327us/step - loss: 4.5087e-04 -
acc: 1.0000 - val_loss: 2.2083 - val_acc: 0.7056
Epoch 29/600
537/537 [==============================] - 0s 106us/step - loss: 4.5008e-04 -
acc: 1.0000 - val_loss: 2.2089 - val_acc: 0.7100
Epoch 30/600
537/537 [==============================] - 0s 90us/step - loss: 4.5028e-04 -
acc: 1.0000 - val_loss: 2.2075 - val_acc: 0.7100
Epoch 31/600
537/537 [==============================] - 0s 123us/step - loss: 4.5267e-04 -
acc: 1.0000 - val_loss: 2.2089 - val_acc: 0.7100
Epoch 32/600
537/537 [==============================] - 0s 163us/step - loss: 4.5140e-04 -
acc: 1.0000 - val_loss: 2.2082 - val_acc: 0.7100
Epoch 33/600
537/537 [==============================] - 0s 139us/step - loss: 4.5459e-04 -
acc: 1.0000 - val_loss: 2.2085 - val_acc: 0.7056
Epoch 34/600
537/537 [==============================] - 0s 219us/step - loss: 4.4579e-04 -
```

```
acc: 1.0000 - val_loss: 2.2099 - val_acc: 0.7100
Epoch 35/600
537/537 [==============================] - 0s 119us/step - loss: 4.5274e-04 -
acc: 1.0000 - val_loss: 2.2098 - val_acc: 0.7100
Epoch 36/600
537/537 [==============================] - 0s 115us/step - loss: 4.4914e-04 -
acc: 1.0000 - val_loss: 2.2105 - val_acc: 0.7056
Epoch 37/600
537/537 [==============================] - 0s 139us/step - loss: 4.4568e-04 -
acc: 1.0000 - val_loss: 2.2102 - val_acc: 0.7100
Epoch 38/600
537/537 [==============================] - 0s 139us/step - loss: 4.4522e-04 -
acc: 1.0000 - val_loss: 2.2104 - val_acc: 0.7100
Epoch 39/600
537/537 [==============================] - 0s 589us/step - loss: 4.4600e-04 -
acc: 1.0000 - val_loss: 2.2103 - val_acc: 0.7100
Epoch 40/600
537/537 [==============================] - 0s 230us/step - loss: 4.4712e-04 -
acc: 1.0000 - val_loss: 2.2096 - val_acc: 0.7100
Epoch 41/600
537/537 [==============================] - 0s 247us/step - loss: 4.4353e-04 -
acc: 1.0000 - val_loss: 2.2083 - val_acc: 0.7100
Epoch 42/600
537/537 [==============================] - 0s 286us/step - loss: 4.4701e-04 -
acc: 1.0000 - val_loss: 2.2105 - val_acc: 0.7056
Epoch 43/600
537/537 [==============================] - 0s 494us/step - loss: 4.4572e-04 -
acc: 1.0000 - val_loss: 2.2106 - val_acc: 0.7100
Epoch 44/600
537/537 [==============================] - 0s 180us/step - loss: 4.4456e-04 -
acc: 1.0000 - val_loss: 2.2098 - val_acc: 0.7100
Epoch 45/600
537/537 [==============================] - 0s 182us/step - loss: 4.4259e-04 -
acc: 1.0000 - val_loss: 2.2103 - val_acc: 0.7100
Epoch 46/600
537/537 [==============================] - 0s 487us/step - loss: 4.4312e-04 -
acc: 1.0000 - val_loss: 2.2103 - val_acc: 0.7100
Epoch 47/600
537/537 [==============================] - 0s 210us/step - loss: 4.4746e-04 -
acc: 1.0000 - val_loss: 2.2120 - val_acc: 0.7056
Epoch 48/600
537/537 [==============================] - 0s 124us/step - loss: 4.4724e-04 -
acc: 1.0000 - val_loss: 2.2114 - val_acc: 0.7100
Epoch 49/600
537/537 [==============================] - 0s 117us/step - loss: 4.4362e-04 -
acc: 1.0000 - val_loss: 2.2103 - val_acc: 0.7100
Epoch 50/600
537/537 [==============================] - 0s 146us/step - loss: 4.4691e-04 -
```

```
acc: 1.0000 - val_loss: 2.2123 - val_acc: 0.7100
Epoch 51/600
537/537 [==============================] - 0s 134us/step - loss: 4.4035e-04 -
acc: 1.0000 - val_loss: 2.2115 - val_acc: 0.7100
Epoch 52/600
537/537 [==============================] - 0s 234us/step - loss: 4.4309e-04 -
acc: 1.0000 - val_loss: 2.2124 - val_acc: 0.7100
Epoch 53/600
537/537 [==============================] - 0s 193us/step - loss: 4.4578e-04 -
acc: 1.0000 - val_loss: 2.2125 - val_acc: 0.7100
Epoch 54/600
537/537 [==============================] - 0s 284us/step - loss: 4.4722e-04 -
acc: 1.0000 - val_loss: 2.2117 - val_acc: 0.7100
Epoch 55/600
537/537 [==============================] - 0s 186us/step - loss: 4.5169e-04 -
acc: 1.0000 - val_loss: 2.2137 - val_acc: 0.7056
Epoch 56/600
537/537 [==============================] - 0s 261us/step - loss: 4.4092e-04 -
acc: 1.0000 - val_loss: 2.2124 - val_acc: 0.7100
Epoch 57/600
537/537 [==============================] - 0s 117us/step - loss: 4.5032e-04 -
acc: 1.0000 - val_loss: 2.2124 - val_acc: 0.7100
Epoch 58/600
537/537 [==============================] - 0s 197us/step - loss: 4.3959e-04 -
acc: 1.0000 - val_loss: 2.2131 - val_acc: 0.7100
Epoch 59/600
537/537 [==============================] - 0s 206us/step - loss: 4.4240e-04 -
acc: 1.0000 - val_loss: 2.2140 - val_acc: 0.7100
Epoch 60/600
537/537 [==============================] - 0s 182us/step - loss: 4.3932e-04 -
acc: 1.0000 - val_loss: 2.2121 - val_acc: 0.7100
Epoch 61/600
537/537 [==============================] - 0s 158us/step - loss: 4.3847e-04 -
acc: 1.0000 - val_loss: 2.2129 - val_acc: 0.7100
Epoch 62/600
537/537 [==============================] - 0s 225us/step - loss: 4.4233e-04 -
acc: 1.0000 - val_loss: 2.2148 - val_acc: 0.7056
Epoch 63/600
537/537 [==============================] - 0s 161us/step - loss: 4.3761e-04 -
acc: 1.0000 - val_loss: 2.2133 - val_acc: 0.7100
Epoch 64/600
537/537 [==============================] - 0s 587us/step - loss: 4.3836e-04 -
acc: 1.0000 - val_loss: 2.2138 - val_acc: 0.7100
Epoch 65/600
537/537 [==============================] - 0s 245us/step - loss: 4.3878e-04 -
acc: 1.0000 - val_loss: 2.2136 - val_acc: 0.7100
Epoch 66/600
537/537 [==============================] - 0s 253us/step - loss: 4.4361e-04 -
```

```
acc: 1.0000 - val_loss: 2.2139 - val_acc: 0.7100
Epoch 67/600
537/537 [==============================] - 0s 154us/step - loss: 4.3740e-04 -
acc: 1.0000 - val_loss: 2.2141 - val_acc: 0.7100
Epoch 68/600
537/537 [==============================] - 0s 372us/step - loss: 4.3849e-04 -
acc: 1.0000 - val_loss: 2.2135 - val_acc: 0.7100
Epoch 69/600
537/537 [==============================] - 0s 229us/step - loss: 4.3679e-04 -
acc: 1.0000 - val_loss: 2.2132 - val_acc: 0.7100
Epoch 70/600
537/537 [==============================] - 0s 217us/step - loss: 4.3649e-04 -
acc: 1.0000 - val_loss: 2.2160 - val_acc: 0.7056
Epoch 71/600
537/537 [==============================] - 0s 228us/step - loss: 4.3814e-04 -
acc: 1.0000 - val_loss: 2.2151 - val_acc: 0.7100
Epoch 72/600
537/537 [==============================] - 0s 184us/step - loss: 4.4470e-04 -
acc: 1.0000 - val_loss: 2.2158 - val_acc: 0.7100
Epoch 73/600
537/537 [==============================] - 0s 565us/step - loss: 4.3807e-04 -
acc: 1.0000 - val_loss: 2.2161 - val_acc: 0.7100
Epoch 74/600
537/537 [==============================] - 0s 243us/step - loss: 4.3270e-04 -
acc: 1.0000 - val_loss: 2.2152 - val_acc: 0.7100
Epoch 75/600
537/537 [==============================] - 0s 247us/step - loss: 4.4149e-04 -
acc: 1.0000 - val_loss: 2.2158 - val_acc: 0.7100
Epoch 76/600
537/537 [==============================] - 0s 117us/step - loss: 4.4369e-04 -
acc: 1.0000 - val_loss: 2.2131 - val_acc: 0.7100
Epoch 77/600
537/537 [==============================] - 0s 160us/step - loss: 4.3231e-04 -
acc: 1.0000 - val_loss: 2.2160 - val_acc: 0.7100
Epoch 78/600
537/537 [==============================] - 0s 193us/step - loss: 4.3404e-04 -
acc: 1.0000 - val_loss: 2.2161 - val_acc: 0.7100
Epoch 79/600
537/537 [==============================] - 0s 205us/step - loss: 4.3651e-04 -
acc: 1.0000 - val_loss: 2.2166 - val_acc: 0.7100
Epoch 80/600
537/537 [==============================] - 0s 277us/step - loss: 4.3154e-04 -
acc: 1.0000 - val_loss: 2.2171 - val_acc: 0.7100
Epoch 81/600
537/537 [==============================] - 0s 165us/step - loss: 4.3203e-04 -
acc: 1.0000 - val_loss: 2.2165 - val_acc: 0.7100
Epoch 82/600
537/537 [==============================] - 0s 234us/step - loss: 4.3299e-04 -
```

```
acc: 1.0000 - val_loss: 2.2182 - val_acc: 0.7056
Epoch 83/600
537/537 [==============================] - 0s 249us/step - loss: 4.3467e-04 -
acc: 1.0000 - val_loss: 2.2172 - val_acc: 0.7100
Epoch 84/600
537/537 [==============================] - 0s 189us/step - loss: 4.3422e-04 -
acc: 1.0000 - val_loss: 2.2165 - val_acc: 0.7100
Epoch 85/600
537/537 [==============================] - 0s 176us/step - loss: 4.3379e-04 -
acc: 1.0000 - val_loss: 2.2161 - val_acc: 0.7100
Epoch 86/600
537/537 [==============================] - 0s 353us/step - loss: 4.2789e-04 -
acc: 1.0000 - val_loss: 2.2179 - val_acc: 0.7100
Epoch 87/600
537/537 [==============================] - 0s 291us/step - loss: 4.3437e-04 -
acc: 1.0000 - val_loss: 2.2175 - val_acc: 0.7100
Epoch 88/600
537/537 [==============================] - 0s 254us/step - loss: 4.2845e-04 -
acc: 1.0000 - val_loss: 2.2185 - val_acc: 0.7056
Epoch 89/600
537/537 [==============================] - 0s 232us/step - loss: 4.2973e-04 -
acc: 1.0000 - val_loss: 2.2189 - val_acc: 0.7056
Epoch 90/600
537/537 [==============================] - 0s 260us/step - loss: 4.3457e-04 -
acc: 1.0000 - val_loss: 2.2177 - val_acc: 0.7100
Epoch 91/600
537/537 [==============================] - 0s 429us/step - loss: 4.2837e-04 -
acc: 1.0000 - val_loss: 2.2194 - val_acc: 0.7056
Epoch 92/600
537/537 [==============================] - 0s 134us/step - loss: 4.3262e-04 -
acc: 1.0000 - val_loss: 2.2184 - val_acc: 0.7100
Epoch 93/600
537/537 [==============================] - 0s 132us/step - loss: 4.3458e-04 -
acc: 1.0000 - val_loss: 2.2174 - val_acc: 0.7100
Epoch 94/600
537/537 [==============================] - 0s 243us/step - loss: 4.3029e-04 -
acc: 1.0000 - val_loss: 2.2190 - val_acc: 0.7056
Epoch 95/600
537/537 [==============================] - 0s 149us/step - loss: 4.2947e-04 -
acc: 1.0000 - val_loss: 2.2195 - val_acc: 0.7100
Epoch 96/600
537/537 [==============================] - 0s 286us/step - loss: 4.3022e-04 -
acc: 1.0000 - val_loss: 2.2204 - val_acc: 0.7100
Epoch 97/600
537/537 [==============================] - 0s 162us/step - loss: 4.3054e-04 -
acc: 1.0000 - val_loss: 2.2191 - val_acc: 0.7100
Epoch 98/600
537/537 [==============================] - 0s 193us/step - loss: 4.2402e-04 -
```

```
acc: 1.0000 - val_loss: 2.2188 - val_acc: 0.7100
Epoch 99/600
537/537 [==============================] - 0s 165us/step - loss: 4.2403e-04 -
acc: 1.0000 - val_loss: 2.2193 - val_acc: 0.7100
Epoch 100/600
537/537 [==============================] - 0s 552us/step - loss: 4.2507e-04 -
acc: 1.0000 - val_loss: 2.2206 - val_acc: 0.7056
Epoch 101/600
537/537 [==============================] - 0s 219us/step - loss: 4.2489e-04 -
acc: 1.0000 - val_loss: 2.2192 - val_acc: 0.7100
Epoch 102/600
537/537 [==============================] - 0s 156us/step - loss: 4.2697e-04 -
acc: 1.0000 - val_loss: 2.2194 - val_acc: 0.7100
Epoch 103/600
537/537 [==============================] - 0s 169us/step - loss: 4.2806e-04 -
acc: 1.0000 - val_loss: 2.2206 - val_acc: 0.7100
Epoch 104/600
537/537 [==============================] - 0s 409us/step - loss: 4.2801e-04 -
acc: 1.0000 - val_loss: 2.2195 - val_acc: 0.7100
Epoch 105/600
537/537 [==============================] - 0s 106us/step - loss: 4.2379e-04 -
acc: 1.0000 - val_loss: 2.2200 - val_acc: 0.7100
Epoch 106/600
537/537 [==============================] - 0s 141us/step - loss: 4.2572e-04 -
acc: 1.0000 - val_loss: 2.2210 - val_acc: 0.7100
Epoch 107/600
537/537 [==============================] - 0s 282us/step - loss: 4.2735e-04 -
acc: 1.0000 - val_loss: 2.2183 - val_acc: 0.7100
Epoch 108/600
537/537 [==============================] - 0s 186us/step - loss: 4.2260e-04 -
acc: 1.0000 - val_loss: 2.2209 - val_acc: 0.7056
Epoch 109/600
537/537 [==============================] - 0s 123us/step - loss: 4.2425e-04 -
acc: 1.0000 - val_loss: 2.2207 - val_acc: 0.7100
Epoch 110/600
537/537 [==============================] - 0s 248us/step - loss: 4.2268e-04 -
acc: 1.0000 - val_loss: 2.2217 - val_acc: 0.7100
Epoch 111/600
537/537 [==============================] - 0s 186us/step - loss: 4.2323e-04 -
acc: 1.0000 - val_loss: 2.2213 - val_acc: 0.7100
Epoch 112/600
537/537 [==============================] - 0s 204us/step - loss: 4.2272e-04 -
acc: 1.0000 - val_loss: 2.2207 - val_acc: 0.7100
Epoch 113/600
537/537 [==============================] - 0s 110us/step - loss: 4.2256e-04 -
acc: 1.0000 - val_loss: 2.2217 - val_acc: 0.7100
Epoch 114/600
537/537 [==============================] - 0s 180us/step - loss: 4.2141e-04 -
```

```
acc: 1.0000 - val_loss: 2.2219 - val_acc: 0.7100
Epoch 115/600
537/537 [==============================] - 0s 243us/step - loss: 4.2234e-04 -
acc: 1.0000 - val_loss: 2.2222 - val_acc: 0.7056
Epoch 116/600
537/537 [==============================] - 0s 113us/step - loss: 4.2180e-04 -
acc: 1.0000 - val_loss: 2.2220 - val_acc: 0.7100
Epoch 117/600
537/537 [==============================] - 0s 342us/step - loss: 4.2242e-04 -
acc: 1.0000 - val_loss: 2.2230 - val_acc: 0.7100
Epoch 118/600
537/537 [==============================] - 0s 184us/step - loss: 4.1775e-04 -
acc: 1.0000 - val_loss: 2.2224 - val_acc: 0.7100
Epoch 119/600
537/537 [==============================] - 0s 123us/step - loss: 4.2317e-04 -
acc: 1.0000 - val_loss: 2.2230 - val_acc: 0.7100
Epoch 120/600
537/537 [==============================] - 0s 163us/step - loss: 4.1784e-04 -
acc: 1.0000 - val_loss: 2.2228 - val_acc: 0.7056
Epoch 121/600
537/537 [==============================] - 0s 130us/step - loss: 4.2132e-04 -
acc: 1.0000 - val_loss: 2.2234 - val_acc: 0.7100
Epoch 122/600
537/537 [==============================] - 0s 409us/step - loss: 4.1708e-04 -
acc: 1.0000 - val_loss: 2.2234 - val_acc: 0.7100
Epoch 123/600
537/537 [==============================] - 0s 275us/step - loss: 4.2857e-04 -
acc: 1.0000 - val_loss: 2.2240 - val_acc: 0.7056
Epoch 124/600
537/537 [==============================] - 0s 145us/step - loss: 4.1987e-04 -
acc: 1.0000 - val_loss: 2.2225 - val_acc: 0.7100
Epoch 125/600
537/537 [==============================] - ETA: 0s - loss: 4.6723e-04 - acc:
1.000 - 0s 221us/step - loss: 4.2074e-04 - acc: 1.0000 - val_loss: 2.2240 -
val_acc: 0.7100
Epoch 126/600
537/537 [==============================] - 0s 134us/step - loss: 4.2174e-04 -
acc: 1.0000 - val_loss: 2.2231 - val_acc: 0.7100
Epoch 127/600
537/537 [==============================] - 0s 178us/step - loss: 4.1925e-04 -
acc: 1.0000 - val_loss: 2.2238 - val_acc: 0.7100
Epoch 128/600
537/537 [==============================] - 0s 128us/step - loss: 4.1522e-04 -
acc: 1.0000 - val_loss: 2.2252 - val_acc: 0.7056
Epoch 129/600
537/537 [==============================] - 0s 134us/step - loss: 4.2109e-04 -
acc: 1.0000 - val_loss: 2.2241 - val_acc: 0.7100
Epoch 130/600
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537/537 [==============================] - 0s 106us/step - loss: 4.1604e-04 -
acc: 1.0000 - val_loss: 2.2247 - val_acc: 0.7056
Epoch 131/600
537/537 [==============================] - 0s 139us/step - loss: 4.1783e-04 -
acc: 1.0000 - val_loss: 2.2251 - val_acc: 0.7100
Epoch 132/600
537/537 [==============================] - 0s 378us/step - loss: 4.2267e-04 -
acc: 1.0000 - val_loss: 2.2237 - val_acc: 0.7100
Epoch 133/600
537/537 [==============================] - 0s 162us/step - loss: 4.1845e-04 -
acc: 1.0000 - val_loss: 2.2244 - val_acc: 0.7100
Epoch 134/600
537/537 [==============================] - 0s 264us/step - loss: 4.1666e-04 -
acc: 1.0000 - val_loss: 2.2251 - val_acc: 0.7100
Epoch 135/600
537/537 [==============================] - 0s 126us/step - loss: 4.1344e-04 -
acc: 1.0000 - val_loss: 2.2240 - val_acc: 0.7100
Epoch 136/600
537/537 [==============================] - 0s 256us/step - loss: 4.1641e-04 -
acc: 1.0000 - val_loss: 2.2249 - val_acc: 0.7056
Epoch 137/600
537/537 [==============================] - 0s 111us/step - loss: 4.1419e-04 -
acc: 1.0000 - val_loss: 2.2262 - val_acc: 0.7100
Epoch 138/600
537/537 [==============================] - 0s 110us/step - loss: 4.1552e-04 -
acc: 1.0000 - val_loss: 2.2255 - val_acc: 0.7100
Epoch 139/600
537/537 [==============================] - 0s 112us/step - loss: 4.1412e-04 -
acc: 1.0000 - val_loss: 2.2260 - val_acc: 0.7100
Epoch 140/600
537/537 [==============================] - 0s 143us/step - loss: 4.1181e-04 -
acc: 1.0000 - val_loss: 2.2268 - val_acc: 0.7056
Epoch 141/600
537/537 [==============================] - 0s 141us/step - loss: 4.1079e-04 -
acc: 1.0000 - val_loss: 2.2258 - val_acc: 0.7100
Epoch 142/600
537/537 [==============================] - 0s 199us/step - loss: 4.1523e-04 -
acc: 1.0000 - val_loss: 2.2252 - val_acc: 0.7100
Epoch 143/600
537/537 [==============================] - 0s 150us/step - loss: 4.1508e-04 -
acc: 1.0000 - val_loss: 2.2268 - val_acc: 0.7056
Epoch 144/600
537/537 [==============================] - 0s 111us/step - loss: 4.1366e-04 -
acc: 1.0000 - val_loss: 2.2254 - val_acc: 0.7100
Epoch 145/600
537/537 [==============================] - 0s 123us/step - loss: 4.1343e-04 -
acc: 1.0000 - val_loss: 2.2268 - val_acc: 0.7100
Epoch 146/600
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537/537 [==============================] - 0s 327us/step - loss: 4.1263e-04 -
acc: 1.0000 - val_loss: 2.2275 - val_acc: 0.7056
Epoch 147/600
537/537 [==============================] - 0s 139us/step - loss: 4.0932e-04 -
acc: 1.0000 - val_loss: 2.2249 - val_acc: 0.7100
Epoch 148/600
537/537 [==============================] - 0s 201us/step - loss: 4.1068e-04 -
acc: 1.0000 - val_loss: 2.2274 - val_acc: 0.7100
Epoch 149/600
537/537 [==============================] - 0s 118us/step - loss: 4.1250e-04 -
acc: 1.0000 - val_loss: 2.2277 - val_acc: 0.7100
Epoch 150/600
537/537 [==============================] - 0s 247us/step - loss: 4.1373e-04 -
acc: 1.0000 - val_loss: 2.2269 - val_acc: 0.7100
Epoch 151/600
537/537 [==============================] - 0s 156us/step - loss: 4.1150e-04 -
acc: 1.0000 - val_loss: 2.2281 - val_acc: 0.7056
Epoch 152/600
537/537 [==============================] - 0s 153us/step - loss: 4.1163e-04 -
acc: 1.0000 - val_loss: 2.2276 - val_acc: 0.7100
Epoch 153/600
537/537 [==============================] - 0s 234us/step - loss: 4.0899e-04 -
acc: 1.0000 - val_loss: 2.2286 - val_acc: 0.7100
Epoch 154/600
537/537 [==============================] - 0s 214us/step - loss: 4.1017e-04 -
acc: 1.0000 - val_loss: 2.2287 - val_acc: 0.7056
Epoch 155/600
537/537 [==============================] - 0s 117us/step - loss: 4.0782e-04 -
acc: 1.0000 - val_loss: 2.2283 - val_acc: 0.7100
Epoch 156/600
537/537 [==============================] - 0s 162us/step - loss: 4.1178e-04 -
acc: 1.0000 - val_loss: 2.2284 - val_acc: 0.7100
Epoch 157/600
537/537 [==============================] - 0s 141us/step - loss: 4.0697e-04 -
acc: 1.0000 - val_loss: 2.2281 - val_acc: 0.7100
Epoch 158/600
537/537 [==============================] - 0s 236us/step - loss: 4.0664e-04 -
acc: 1.0000 - val_loss: 2.2293 - val_acc: 0.7056
Epoch 159/600
537/537 [==============================] - 0s 169us/step - loss: 4.1005e-04 -
acc: 1.0000 - val_loss: 2.2287 - val_acc: 0.7100
Epoch 160/600
537/537 [==============================] - 0s 102us/step - loss: 4.0771e-04 -
acc: 1.0000 - val_loss: 2.2300 - val_acc: 0.7056
Epoch 161/600
537/537 [==============================] - 0s 108us/step - loss: 4.0855e-04 -
acc: 1.0000 - val_loss: 2.2296 - val_acc: 0.7100
Epoch 162/600
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537/537 [==============================] - 0s 113us/step - loss: 4.0582e-04 -
acc: 1.0000 - val_loss: 2.2291 - val_acc: 0.7100
Epoch 163/600
537/537 [==============================] - 0s 241us/step - loss: 4.0591e-04 -
acc: 1.0000 - val_loss: 2.2294 - val_acc: 0.7056
Epoch 164/600
537/537 [==============================] - 0s 106us/step - loss: 4.0591e-04 -
acc: 1.0000 - val_loss: 2.2309 - val_acc: 0.7100
Epoch 165/600
537/537 [==============================] - 0s 110us/step - loss: 4.0894e-04 -
acc: 1.0000 - val_loss: 2.2299 - val_acc: 0.7056
Epoch 166/600
537/537 [==============================] - 0s 128us/step - loss: 4.0897e-04 -
acc: 1.0000 - val_loss: 2.2300 - val_acc: 0.7100
Epoch 167/600
537/537 [==============================] - 0s 117us/step - loss: 4.0634e-04 -
acc: 1.0000 - val_loss: 2.2296 - val_acc: 0.7100
Epoch 168/600
537/537 [==============================] - 0s 245us/step - loss: 4.0524e-04 -
acc: 1.0000 - val_loss: 2.2306 - val_acc: 0.7100
Epoch 169/600
537/537 [==============================] - 0s 119us/step - loss: 4.1152e-04 -
acc: 1.0000 - val_loss: 2.2318 - val_acc: 0.7100
Epoch 170/600
537/537 [==============================] - 0s 115us/step - loss: 4.0620e-04 -
acc: 1.0000 - val_loss: 2.2298 - val_acc: 0.7100
Epoch 171/600
537/537 [==============================] - 0s 162us/step - loss: 4.0544e-04 -
acc: 1.0000 - val_loss: 2.2307 - val_acc: 0.7056
Epoch 172/600
537/537 [==============================] - 0s 115us/step - loss: 4.0266e-04 -
acc: 1.0000 - val_loss: 2.2312 - val_acc: 0.7056
Epoch 173/600
537/537 [==============================] - 0s 121us/step - loss: 4.0081e-04 -
acc: 1.0000 - val_loss: 2.2318 - val_acc: 0.7100
Epoch 174/600
537/537 [==============================] - 0s 93us/step - loss: 4.0618e-04 -
acc: 1.0000 - val_loss: 2.2310 - val_acc: 0.7100
Epoch 175/600
537/537 [==============================] - 0s 202us/step - loss: 4.0163e-04 -
acc: 1.0000 - val_loss: 2.2318 - val_acc: 0.7056
Epoch 176/600
537/537 [==============================] - 0s 252us/step - loss: 4.0096e-04 -
acc: 1.0000 - val_loss: 2.2320 - val_acc: 0.7056
Epoch 177/600
537/537 [==============================] - 0s 186us/step - loss: 4.0311e-04 -
acc: 1.0000 - val_loss: 2.2322 - val_acc: 0.7100
Epoch 178/600
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537/537 [==============================] - 0s 256us/step - loss: 4.0412e-04 -
acc: 1.0000 - val_loss: 2.2313 - val_acc: 0.7100
Epoch 179/600
537/537 [==============================] - 0s 178us/step - loss: 4.1663e-04 -
acc: 1.0000 - val_loss: 2.2335 - val_acc: 0.7056
Epoch 180/600
537/537 [==============================] - 0s 353us/step - loss: 4.1015e-04 -
acc: 1.0000 - val_loss: 2.2309 - val_acc: 0.7100
Epoch 181/600
537/537 [==============================] - 0s 299us/step - loss: 4.0230e-04 -
acc: 1.0000 - val_loss: 2.2329 - val_acc: 0.7056
Epoch 182/600
537/537 [==============================] - 0s 306us/step - loss: 3.9998e-04 -
acc: 1.0000 - val_loss: 2.2331 - val_acc: 0.7100
Epoch 183/600
537/537 [==============================] - 0s 334us/step - loss: 4.0122e-04 -
acc: 1.0000 - val_loss: 2.2331 - val_acc: 0.7056
Epoch 184/600
537/537 [==============================] - 0s 347us/step - loss: 4.0030e-04 -
acc: 1.0000 - val_loss: 2.2323 - val_acc: 0.7100
Epoch 185/600
537/537 [==============================] - 0s 132us/step - loss: 4.0196e-04 -
acc: 1.0000 - val_loss: 2.2333 - val_acc: 0.7056
Epoch 186/600
537/537 [==============================] - 0s 117us/step - loss: 3.9571e-04 -
acc: 1.0000 - val_loss: 2.2332 - val_acc: 0.7100
Epoch 187/600
537/537 [==============================] - 0s 173us/step - loss: 4.0025e-04 -
acc: 1.0000 - val_loss: 2.2334 - val_acc: 0.7100
Epoch 188/600
537/537 [==============================] - 0s 165us/step - loss: 4.0050e-04 -
acc: 1.0000 - val_loss: 2.2333 - val_acc: 0.7100
Epoch 189/600
537/537 [==============================] - 0s 195us/step - loss: 3.9918e-04 -
acc: 1.0000 - val_loss: 2.2343 - val_acc: 0.7056
Epoch 190/600
537/537 [==============================] - 0s 228us/step - loss: 4.0486e-04 -
acc: 1.0000 - val_loss: 2.2329 - val_acc: 0.7100
Epoch 191/600
537/537 [==============================] - 0s 251us/step - loss: 3.9777e-04 -
acc: 1.0000 - val_loss: 2.2346 - val_acc: 0.7056
Epoch 192/600
537/537 [==============================] - 0s 136us/step - loss: 3.9835e-04 -
acc: 1.0000 - val_loss: 2.2343 - val_acc: 0.7100
Epoch 193/600
537/537 [==============================] - 0s 162us/step - loss: 3.9741e-04 -
acc: 1.0000 - val_loss: 2.2341 - val_acc: 0.7056
Epoch 194/600
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537/537 [==============================] - 0s 228us/step - loss: 3.9830e-04 -
acc: 1.0000 - val_loss: 2.2338 - val_acc: 0.7100
Epoch 195/600
537/537 [==============================] - 0s 197us/step - loss: 3.9820e-04 -
acc: 1.0000 - val_loss: 2.2344 - val_acc: 0.7056
Epoch 196/600
537/537 [==============================] - ETA: 0s - loss: 4.0135e-04 - acc:
1.000 - 0s 347us/step - loss: 3.9799e-04 - acc: 1.0000 - val_loss: 2.2352 -
val_acc: 0.7100
Epoch 197/600
537/537 [==============================] - 0s 230us/step - loss: 3.9642e-04 -
acc: 1.0000 - val_loss: 2.2346 - val_acc: 0.7100
Epoch 198/600
537/537 [==============================] - 0s 323us/step - loss: 3.9678e-04 -
acc: 1.0000 - val_loss: 2.2347 - val_acc: 0.7100
Epoch 199/600
537/537 [==============================] - 0s 117us/step - loss: 3.9671e-04 -
acc: 1.0000 - val_loss: 2.2355 - val_acc: 0.7056
Epoch 200/600
537/537 [==============================] - 0s 159us/step - loss: 4.0178e-04 -
acc: 1.0000 - val_loss: 2.2342 - val_acc: 0.7100
Epoch 201/600
537/537 [==============================] - 0s 212us/step - loss: 3.9698e-04 -
acc: 1.0000 - val_loss: 2.2360 - val_acc: 0.7056
Epoch 202/600
537/537 [==============================] - 0s 182us/step - loss: 3.9411e-04 -
acc: 1.0000 - val_loss: 2.2350 - val_acc: 0.7056
Epoch 203/600
537/537 [==============================] - 0s 149us/step - loss: 3.9769e-04 -
acc: 1.0000 - val_loss: 2.2348 - val_acc: 0.7056
Epoch 204/600
537/537 [==============================] - 0s 215us/step - loss: 3.9423e-04 -
acc: 1.0000 - val_loss: 2.2362 - val_acc: 0.7056
Epoch 205/600
537/537 [==============================] - 0s 230us/step - loss: 3.9589e-04 -
acc: 1.0000 - val_loss: 2.2365 - val_acc: 0.7056
Epoch 206/600
537/537 [==============================] - 0s 305us/step - loss: 3.9453e-04 -
acc: 1.0000 - val_loss: 2.2358 - val_acc: 0.7056
Epoch 207/600
537/537 [==============================] - 0s 247us/step - loss: 3.9863e-04 -
acc: 1.0000 - val_loss: 2.2356 - val_acc: 0.7100
Epoch 208/600
537/537 [==============================] - 0s 152us/step - loss: 3.9398e-04 -
acc: 1.0000 - val_loss: 2.2367 - val_acc: 0.7056
Epoch 209/600
537/537 [==============================] - 0s 113us/step - loss: 3.9450e-04 -
acc: 1.0000 - val_loss: 2.2383 - val_acc: 0.7056
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Epoch 210/600
537/537 [==============================] - 0s 217us/step - loss: 3.9160e-04 -
acc: 1.0000 - val_loss: 2.2373 - val_acc: 0.7100
Epoch 211/600
537/537 [==============================] - 0s 149us/step - loss: 3.9366e-04 -
acc: 1.0000 - val_loss: 2.2365 - val_acc: 0.7100
Epoch 212/600
537/537 [==============================] - 0s 204us/step - loss: 3.9830e-04 -
acc: 1.0000 - val_loss: 2.2358 - val_acc: 0.7100
Epoch 213/600
537/537 [==============================] - 0s 100us/step - loss: 3.9020e-04 -
acc: 1.0000 - val_loss: 2.2391 - val_acc: 0.7056
Epoch 214/600
537/537 [==============================] - 0s 241us/step - loss: 3.9320e-04 -
acc: 1.0000 - val_loss: 2.2390 - val_acc: 0.7056
Epoch 215/600
537/537 [==============================] - 0s 135us/step - loss: 3.9372e-04 -
acc: 1.0000 - val_loss: 2.2383 - val_acc: 0.7100
Epoch 216/600
537/537 [==============================] - 0s 254us/step - loss: 3.9147e-04 -
acc: 1.0000 - val_loss: 2.2369 - val_acc: 0.7100
Epoch 217/600
537/537 [==============================] - 0s 128us/step - loss: 3.9619e-04 -
acc: 1.0000 - val_loss: 2.2364 - val_acc: 0.7100
Epoch 218/600
537/537 [==============================] - 0s 199us/step - loss: 3.8863e-04 -
acc: 1.0000 - val_loss: 2.2377 - val_acc: 0.7100
Epoch 219/600
537/537 [==============================] - 0s 199us/step - loss: 3.9633e-04 -
acc: 1.0000 - val_loss: 2.2393 - val_acc: 0.7056
Epoch 220/600
537/537 [==============================] - 0s 108us/step - loss: 3.8973e-04 -
acc: 1.0000 - val_loss: 2.2377 - val_acc: 0.7100
Epoch 221/600
537/537 [==============================] - 0s 162us/step - loss: 3.9081e-04 -
acc: 1.0000 - val_loss: 2.2388 - val_acc: 0.7056
Epoch 222/600
537/537 [==============================] - 0s 126us/step - loss: 3.8932e-04 -
acc: 1.0000 - val_loss: 2.2376 - val_acc: 0.7100
Epoch 223/600
537/537 [==============================] - 0s 106us/step - loss: 3.9146e-04 -
acc: 1.0000 - val_loss: 2.2382 - val_acc: 0.7056
Epoch 224/600
537/537 [==============================] - 0s 100us/step - loss: 3.8839e-04 -
acc: 1.0000 - val_loss: 2.2404 - val_acc: 0.7056
Epoch 225/600
537/537 [==============================] - 0s 189us/step - loss: 3.8916e-04 -
acc: 1.0000 - val_loss: 2.2396 - val_acc: 0.7056
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Epoch 226/600
537/537 [==============================] - 0s 160us/step - loss: 3.8955e-04 -
acc: 1.0000 - val_loss: 2.2404 - val_acc: 0.7056
Epoch 227/600
537/537 [==============================] - 0s 104us/step - loss: 3.8758e-04 -
acc: 1.0000 - val_loss: 2.2401 - val_acc: 0.7056
Epoch 228/600
537/537 [==============================] - 0s 95us/step - loss: 3.8857e-04 -
acc: 1.0000 - val_loss: 2.2388 - val_acc: 0.7100
Epoch 229/600
537/537 [==============================] - 0s 117us/step - loss: 3.9063e-04 -
acc: 1.0000 - val_loss: 2.2394 - val_acc: 0.7056
Epoch 230/600
537/537 [==============================] - 0s 245us/step - loss: 3.8386e-04 -
acc: 1.0000 - val_loss: 2.2391 - val_acc: 0.7100
Epoch 231/600
537/537 [==============================] - 0s 91us/step - loss: 3.8846e-04 -
acc: 1.0000 - val_loss: 2.2382 - val_acc: 0.7100
Epoch 232/600
537/537 [==============================] - 0s 124us/step - loss: 3.8552e-04 -
acc: 1.0000 - val_loss: 2.2401 - val_acc: 0.7056
Epoch 233/600
537/537 [==============================] - 0s 310us/step - loss: 3.8542e-04 -
acc: 1.0000 - val_loss: 2.2402 - val_acc: 0.7100
Epoch 234/600
537/537 [==============================] - 0s 215us/step - loss: 3.9004e-04 -
acc: 1.0000 - val_loss: 2.2420 - val_acc: 0.7056
Epoch 235/600
537/537 [==============================] - 0s 308us/step - loss: 3.9891e-04 -
acc: 1.0000 - val_loss: 2.2398 - val_acc: 0.7100
Epoch 236/600
537/537 [==============================] - 0s 208us/step - loss: 3.8973e-04 -
acc: 1.0000 - val_loss: 2.2413 - val_acc: 0.7056
Epoch 237/600
537/537 [==============================] - 0s 126us/step - loss: 3.8627e-04 -
acc: 1.0000 - val_loss: 2.2410 - val_acc: 0.7100
Epoch 238/600
537/537 [==============================] - 0s 184us/step - loss: 3.8814e-04 -
acc: 1.0000 - val_loss: 2.2415 - val_acc: 0.7100
Epoch 239/600
537/537 [==============================] - 0s 128us/step - loss: 3.9621e-04 -
acc: 1.0000 - val_loss: 2.2396 - val_acc: 0.7056
Epoch 240/600
537/537 [==============================] - 0s 119us/step - loss: 3.8347e-04 -
acc: 1.0000 - val_loss: 2.2428 - val_acc: 0.7056
Epoch 241/600
537/537 [==============================] - 0s 184us/step - loss: 3.8423e-04 -
acc: 1.0000 - val_loss: 2.2427 - val_acc: 0.7056
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Epoch 242/600
537/537 [==============================] - 0s 214us/step - loss: 3.8294e-04 -
acc: 1.0000 - val_loss: 2.2424 - val_acc: 0.7056
Epoch 243/600
537/537 [==============================] - 0s 160us/step - loss: 3.8371e-04 -
acc: 1.0000 - val_loss: 2.2420 - val_acc: 0.7056
Epoch 244/600
537/537 [==============================] - 0s 184us/step - loss: 3.8352e-04 -
acc: 1.0000 - val_loss: 2.2421 - val_acc: 0.7056
Epoch 245/600
537/537 [==============================] - 0s 172us/step - loss: 3.8505e-04 -
acc: 1.0000 - val_loss: 2.2431 - val_acc: 0.7056
Epoch 246/600
537/537 [==============================] - 0s 199us/step - loss: 3.8142e-04 -
acc: 1.0000 - val_loss: 2.2423 - val_acc: 0.7056
Epoch 247/600
537/537 [==============================] - 0s 231us/step - loss: 3.8402e-04 -
acc: 1.0000 - val_loss: 2.2422 - val_acc: 0.7100
Epoch 248/600
537/537 [==============================] - 0s 195us/step - loss: 3.8167e-04 -
acc: 1.0000 - val_loss: 2.2415 - val_acc: 0.7100
Epoch 249/600
537/537 [==============================] - 0s 210us/step - loss: 3.8287e-04 -
acc: 1.0000 - val_loss: 2.2422 - val_acc: 0.7056
Epoch 250/600
537/537 [==============================] - 0s 142us/step - loss: 3.8130e-04 -
acc: 1.0000 - val_loss: 2.2444 - val_acc: 0.7056
Epoch 251/600
537/537 [==============================] - 0s 206us/step - loss: 3.8987e-04 -
acc: 1.0000 - val_loss: 2.2425 - val_acc: 0.7056
Epoch 252/600
537/537 [==============================] - 0s 175us/step - loss: 3.8421e-04 -
acc: 1.0000 - val_loss: 2.2441 - val_acc: 0.7056
Epoch 253/600
537/537 [==============================] - 0s 202us/step - loss: 3.8172e-04 -
acc: 1.0000 - val_loss: 2.2442 - val_acc: 0.7100
Epoch 254/600
537/537 [==============================] - 0s 197us/step - loss: 3.8033e-04 -
acc: 1.0000 - val_loss: 2.2432 - val_acc: 0.7100
Epoch 255/600
537/537 [==============================] - 0s 204us/step - loss: 3.8047e-04 -
acc: 1.0000 - val_loss: 2.2434 - val_acc: 0.7056
Epoch 256/600
537/537 [==============================] - 0s 184us/step - loss: 3.8030e-04 -
acc: 1.0000 - val_loss: 2.2442 - val_acc: 0.7056
Epoch 257/600
537/537 [==============================] - 0s 217us/step - loss: 3.7801e-04 -
acc: 1.0000 - val_loss: 2.2434 - val_acc: 0.7100
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Epoch 258/600
537/537 [==============================] - 0s 139us/step - loss: 3.7806e-04 -
acc: 1.0000 - val_loss: 2.2445 - val_acc: 0.7056
Epoch 259/600
537/537 [==============================] - 0s 121us/step - loss: 3.8172e-04 -
acc: 1.0000 - val_loss: 2.2449 - val_acc: 0.7056
Epoch 260/600
537/537 [==============================] - 0s 277us/step - loss: 3.8326e-04 -
acc: 1.0000 - val_loss: 2.2433 - val_acc: 0.7100
Epoch 261/600
537/537 [==============================] - 0s 123us/step - loss: 3.7926e-04 -
acc: 1.0000 - val_loss: 2.2451 - val_acc: 0.7056
Epoch 262/600
537/537 [==============================] - 0s 156us/step - loss: 3.7933e-04 -
acc: 1.0000 - val_loss: 2.2455 - val_acc: 0.7056
Epoch 263/600
537/537 [==============================] - 0s 154us/step - loss: 3.8439e-04 -
acc: 1.0000 - val_loss: 2.2462 - val_acc: 0.7056
Epoch 264/600
537/537 [==============================] - 0s 128us/step - loss: 3.7982e-04 -
acc: 1.0000 - val_loss: 2.2456 - val_acc: 0.7056
Epoch 265/600
537/537 [==============================] - 0s 145us/step - loss: 3.7978e-04 -
acc: 1.0000 - val_loss: 2.2458 - val_acc: 0.7056
Epoch 266/600
537/537 [==============================] - 0s 136us/step - loss: 3.7762e-04 -
acc: 1.0000 - val_loss: 2.2455 - val_acc: 0.7056
Epoch 267/600
537/537 [==============================] - 0s 113us/step - loss: 3.7606e-04 -
acc: 1.0000 - val_loss: 2.2456 - val_acc: 0.7100
Epoch 268/600
537/537 [==============================] - 0s 93us/step - loss: 3.7623e-04 -
acc: 1.0000 - val_loss: 2.2464 - val_acc: 0.7056
Epoch 269/600
537/537 [==============================] - 0s 97us/step - loss: 3.7848e-04 -
acc: 1.0000 - val_loss: 2.2456 - val_acc: 0.7056
Epoch 270/600
537/537 [==============================] - 0s 143us/step - loss: 3.7514e-04 -
acc: 1.0000 - val_loss: 2.2461 - val_acc: 0.7100
Epoch 271/600
537/537 [==============================] - 0s 216us/step - loss: 3.7953e-04 -
acc: 1.0000 - val_loss: 2.2476 - val_acc: 0.7056
Epoch 272/600
537/537 [==============================] - 0s 136us/step - loss: 3.7511e-04 -
acc: 1.0000 - val_loss: 2.2449 - val_acc: 0.7100
Epoch 273/600
537/537 [==============================] - 0s 98us/step - loss: 3.7780e-04 -
acc: 1.0000 - val_loss: 2.2458 - val_acc: 0.7100
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Epoch 274/600
537/537 [==============================] - 0s 119us/step - loss: 3.7477e-04 -
acc: 1.0000 - val_loss: 2.2467 - val_acc: 0.7056
Epoch 275/600
537/537 [==============================] - 0s 201us/step - loss: 3.7422e-04 -
acc: 1.0000 - val_loss: 2.2479 - val_acc: 0.7056
Epoch 276/600
537/537 [==============================] - 0s 293us/step - loss: 3.7449e-04 -
acc: 1.0000 - val_loss: 2.2476 - val_acc: 0.7056
Epoch 277/600
537/537 [==============================] - 0s 171us/step - loss: 3.7608e-04 -
acc: 1.0000 - val_loss: 2.2478 - val_acc: 0.7056
Epoch 278/600
537/537 [==============================] - 0s 221us/step - loss: 3.7849e-04 -
acc: 1.0000 - val_loss: 2.2468 - val_acc: 0.7100
Epoch 279/600
537/537 [==============================] - 0s 132us/step - loss: 3.7507e-04 -
acc: 1.0000 - val_loss: 2.2460 - val_acc: 0.7100
Epoch 280/600
537/537 [==============================] - 0s 173us/step - loss: 3.7967e-04 -
acc: 1.0000 - val_loss: 2.2475 - val_acc: 0.7056
Epoch 281/600
537/537 [==============================] - 0s 108us/step - loss: 3.7296e-04 -
acc: 1.0000 - val_loss: 2.2462 - val_acc: 0.7100
Epoch 282/600
537/537 [==============================] - 0s 228us/step - loss: 3.7370e-04 -
acc: 1.0000 - val_loss: 2.2470 - val_acc: 0.7056
Epoch 283/600
537/537 [==============================] - 0s 169us/step - loss: 3.7500e-04 -
acc: 1.0000 - val_loss: 2.2491 - val_acc: 0.7056
Epoch 284/600
537/537 [==============================] - 0s 138us/step - loss: 3.7378e-04 -
acc: 1.0000 - val_loss: 2.2480 - val_acc: 0.7056
Epoch 285/600
537/537 [==============================] - 0s 100us/step - loss: 3.7392e-04 -
acc: 1.0000 - val_loss: 2.2484 - val_acc: 0.7056
Epoch 286/600
537/537 [==============================] - 0s 124us/step - loss: 3.7156e-04 -
acc: 1.0000 - val_loss: 2.2485 - val_acc: 0.7056
Epoch 287/600
537/537 [==============================] - 0s 152us/step - loss: 3.7423e-04 -
acc: 1.0000 - val_loss: 2.2490 - val_acc: 0.7056
Epoch 288/600
537/537 [==============================] - 0s 251us/step - loss: 3.7199e-04 -
acc: 1.0000 - val_loss: 2.2476 - val_acc: 0.7100
Epoch 289/600
537/537 [==============================] - 0s 152us/step - loss: 3.7281e-04 -
acc: 1.0000 - val_loss: 2.2487 - val_acc: 0.7056
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Epoch 290/600
537/537 [==============================] - 0s 102us/step - loss: 3.7010e-04 -
acc: 1.0000 - val_loss: 2.2487 - val_acc: 0.7056
Epoch 291/600
537/537 [==============================] - 0s 102us/step - loss: 3.7463e-04 -
acc: 1.0000 - val_loss: 2.2484 - val_acc: 0.7056
Epoch 292/600
537/537 [==============================] - 0s 208us/step - loss: 3.7254e-04 -
acc: 1.0000 - val_loss: 2.2492 - val_acc: 0.7056
Epoch 293/600
537/537 [==============================] - 0s 159us/step - loss: 3.6905e-04 -
acc: 1.0000 - val_loss: 2.2496 - val_acc: 0.7056
Epoch 294/600
537/537 [==============================] - 0s 178us/step - loss: 3.7023e-04 -
acc: 1.0000 - val_loss: 2.2498 - val_acc: 0.7056
Epoch 295/600
537/537 [==============================] - 0s 184us/step - loss: 3.7378e-04 -
acc: 1.0000 - val_loss: 2.2496 - val_acc: 0.7056
Epoch 296/600
537/537 [==============================] - 0s 239us/step - loss: 3.7433e-04 -
acc: 1.0000 - val_loss: 2.2501 - val_acc: 0.7056
Epoch 297/600
537/537 [==============================] - 0s 223us/step - loss: 3.6785e-04 -
acc: 1.0000 - val_loss: 2.2493 - val_acc: 0.7056
Epoch 298/600
537/537 [==============================] - 0s 208us/step - loss: 3.7415e-04 -
acc: 1.0000 - val_loss: 2.2494 - val_acc: 0.7056
Epoch 299/600
537/537 [==============================] - 0s 152us/step - loss: 3.6771e-04 -
acc: 1.0000 - val_loss: 2.2504 - val_acc: 0.7056
Epoch 300/600
537/537 [==============================] - 0s 206us/step - loss: 3.6974e-04 -
acc: 1.0000 - val_loss: 2.2502 - val_acc: 0.7056
Epoch 301/600
537/537 [==============================] - 0s 236us/step - loss: 3.6907e-04 -
acc: 1.0000 - val_loss: 2.2503 - val_acc: 0.7056
Epoch 302/600
537/537 [==============================] - 0s 199us/step - loss: 3.7059e-04 -
acc: 1.0000 - val_loss: 2.2497 - val_acc: 0.7100
Epoch 303/600
537/537 [==============================] - 0s 299us/step - loss: 3.6938e-04 -
acc: 1.0000 - val_loss: 2.2502 - val_acc: 0.7056
Epoch 304/600
537/537 [==============================] - 0s 238us/step - loss: 3.6689e-04 -
acc: 1.0000 - val_loss: 2.2509 - val_acc: 0.7056
Epoch 305/600
537/537 [==============================] - 0s 174us/step - loss: 3.6606e-04 -
acc: 1.0000 - val_loss: 2.2513 - val_acc: 0.7056
```

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Epoch 306/600
537/537 [==============================] - 0s 245us/step - loss: 3.7048e-04 -
acc: 1.0000 - val_loss: 2.2499 - val_acc: 0.7100
Epoch 307/600
537/537 [==============================] - 0s 199us/step - loss: 3.6485e-04 -
acc: 1.0000 - val_loss: 2.2514 - val_acc: 0.7056
Epoch 308/600
537/537 [==============================] - 0s 143us/step - loss: 3.6550e-04 -
acc: 1.0000 - val_loss: 2.2525 - val_acc: 0.7056
Epoch 309/600
537/537 [==============================] - 0s 210us/step - loss: 3.6585e-04 -
acc: 1.0000 - val_loss: 2.2522 - val_acc: 0.7056
Epoch 310/600
537/537 [==============================] - 0s 163us/step - loss: 3.6793e-04 -
acc: 1.0000 - val_loss: 2.2515 - val_acc: 0.7100
Epoch 311/600
537/537 [==============================] - 0s 100us/step - loss: 3.6771e-04 -
acc: 1.0000 - val_loss: 2.2509 - val_acc: 0.7056
Epoch 312/600
537/537 [==============================] - 0s 113us/step - loss: 3.7313e-04 -
acc: 1.0000 - val_loss: 2.2503 - val_acc: 0.7056
Epoch 313/600
537/537 [==============================] - 0s 277us/step - loss: 3.6503e-04 -
acc: 1.0000 - val_loss: 2.2530 - val_acc: 0.7056
Epoch 314/600
537/537 [==============================] - 0s 214us/step - loss: 3.6926e-04 -
acc: 1.0000 - val_loss: 2.2529 - val_acc: 0.7056
Epoch 315/600
537/537 [==============================] - 0s 193us/step - loss: 3.6568e-04 -
acc: 1.0000 - val_loss: 2.2513 - val_acc: 0.7100
Epoch 316/600
537/537 [==============================] - 0s 95us/step - loss: 3.6485e-04 -
acc: 1.0000 - val_loss: 2.2525 - val_acc: 0.7056
Epoch 317/600
537/537 [==============================] - 0s 618us/step - loss: 3.6923e-04 -
acc: 1.0000 - val_loss: 2.2538 - val_acc: 0.7056
Epoch 318/600
537/537 [==============================] - 0s 119us/step - loss: 3.6831e-04 -
acc: 1.0000 - val_loss: 2.2521 - val_acc: 0.7100
Epoch 319/600
537/537 [==============================] - 0s 121us/step - loss: 3.6355e-04 -
acc: 1.0000 - val_loss: 2.2530 - val_acc: 0.7100
Epoch 320/600
537/537 [==============================] - 0s 118us/step - loss: 3.6765e-04 -
acc: 1.0000 - val_loss: 2.2529 - val_acc: 0.7100
Epoch 321/600
537/537 [==============================] - 0s 204us/step - loss: 3.6284e-04 -
acc: 1.0000 - val_loss: 2.2520 - val_acc: 0.7056
```

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Epoch 322/600
537/537 [==============================] - 0s 217us/step - loss: 3.6345e-04 -
acc: 1.0000 - val_loss: 2.2542 - val_acc: 0.7056
Epoch 323/600
537/537 [==============================] - 0s 219us/step - loss: 3.6329e-04 -
acc: 1.0000 - val_loss: 2.2540 - val_acc: 0.7056
Epoch 324/600
537/537 [==============================] - 0s 212us/step - loss: 3.6125e-04 -
acc: 1.0000 - val_loss: 2.2530 - val_acc: 0.7056
Epoch 325/600
537/537 [==============================] - 0s 216us/step - loss: 3.6202e-04 -
acc: 1.0000 - val_loss: 2.2536 - val_acc: 0.7056
Epoch 326/600
537/537 [==============================] - 0s 126us/step - loss: 3.6110e-04 -
acc: 1.0000 - val_loss: 2.2536 - val_acc: 0.7056
Epoch 327/600
537/537 [==============================] - 0s 152us/step - loss: 3.6421e-04 -
acc: 1.0000 - val_loss: 2.2542 - val_acc: 0.7056
Epoch 328/600
537/537 [==============================] - 0s 91us/step - loss: 3.6046e-04 -
acc: 1.0000 - val_loss: 2.2546 - val_acc: 0.7056
Epoch 329/600
537/537 [==============================] - 0s 121us/step - loss: 3.6324e-04 -
acc: 1.0000 - val_loss: 2.2538 - val_acc: 0.7056
Epoch 330/600
537/537 [==============================] - 0s 121us/step - loss: 3.5957e-04 -
acc: 1.0000 - val_loss: 2.2540 - val_acc: 0.7100
Epoch 331/600
537/537 [==============================] - 0s 98us/step - loss: 3.6037e-04 -
acc: 1.0000 - val_loss: 2.2560 - val_acc: 0.7056
Epoch 332/600
537/537 [==============================] - 0s 95us/step - loss: 3.6778e-04 -
acc: 1.0000 - val_loss: 2.2563 - val_acc: 0.7056
Epoch 333/600
537/537 [==============================] - 0s 102us/step - loss: 3.5715e-04 -
acc: 1.0000 - val_loss: 2.2547 - val_acc: 0.7100
Epoch 334/600
537/537 [==============================] - 0s 249us/step - loss: 3.6040e-04 -
acc: 1.0000 - val_loss: 2.2539 - val_acc: 0.7056
Epoch 335/600
537/537 [==============================] - 0s 132us/step - loss: 3.6261e-04 -
acc: 1.0000 - val_loss: 2.2555 - val_acc: 0.7056
Epoch 336/600
537/537 [==============================] - 0s 149us/step - loss: 3.5690e-04 -
acc: 1.0000 - val_loss: 2.2553 - val_acc: 0.7100
Epoch 337/600
537/537 [==============================] - 0s 212us/step - loss: 3.5888e-04 -
acc: 1.0000 - val_loss: 2.2545 - val_acc: 0.7100
```

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Epoch 338/600
537/537 [==============================] - 0s 238us/step - loss: 3.5824e-04 -
acc: 1.0000 - val_loss: 2.2560 - val_acc: 0.7056
Epoch 339/600
537/537 [==============================] - 0s 167us/step - loss: 3.5651e-04 -
acc: 1.0000 - val_loss: 2.2555 - val_acc: 0.7100
Epoch 340/600
537/537 [==============================] - 0s 154us/step - loss: 3.5403e-04 -
acc: 1.0000 - val_loss: 2.2557 - val_acc: 0.7100
Epoch 341/600
537/537 [==============================] - 0s 299us/step - loss: 3.5401e-04 -
acc: 1.0000 - val_loss: 2.2564 - val_acc: 0.7056
Epoch 342/600
537/537 [==============================] - ETA: 0s - loss: 3.4453e-04 - acc:
1.000 - 0s 128us/step - loss: 3.5392e-04 - acc: 1.0000 - val_loss: 2.2575 -
val_acc: 0.7100
Epoch 343/600
537/537 [==============================] - 0s 193us/step - loss: 3.5297e-04 -
acc: 1.0000 - val_loss: 2.2548 - val_acc: 0.7100
Epoch 344/600
537/537 [==============================] - 0s 260us/step - loss: 3.5037e-04 -
acc: 1.0000 - val_loss: 2.2565 - val_acc: 0.7056
Epoch 345/600
537/537 [==============================] - 0s 206us/step - loss: 3.4993e-04 -
acc: 1.0000 - val_loss: 2.2563 - val_acc: 0.7100
Epoch 346/600
537/537 [==============================] - 0s 334us/step - loss: 3.4921e-04 -
acc: 1.0000 - val_loss: 2.2555 - val_acc: 0.7100
Epoch 347/600
537/537 [==============================] - 0s 143us/step - loss: 3.4661e-04 -
acc: 1.0000 - val_loss: 2.2560 - val_acc: 0.7100
Epoch 348/600
537/537 [==============================] - 0s 193us/step - loss: 3.4856e-04 -
acc: 1.0000 - val_loss: 2.2558 - val_acc: 0.7100
Epoch 349/600
537/537 [==============================] - 0s 149us/step - loss: 3.4612e-04 -
acc: 1.0000 - val_loss: 2.2573 - val_acc: 0.7100
Epoch 350/600
537/537 [==============================] - 0s 251us/step - loss: 3.4553e-04 -
acc: 1.0000 - val_loss: 2.2564 - val_acc: 0.7100
Epoch 351/600
537/537 [==============================] - 0s 169us/step - loss: 3.4731e-04 -
acc: 1.0000 - val_loss: 2.2559 - val_acc: 0.7100
Epoch 352/600
537/537 [==============================] - 0s 201us/step - loss: 3.4686e-04 -
acc: 1.0000 - val_loss: 2.2579 - val_acc: 0.7100
Epoch 353/600
537/537 [==============================] - 0s 149us/step - loss: 3.4417e-04 -
```

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acc: 1.0000 - val_loss: 2.2574 - val_acc: 0.7100
Epoch 354/600
537/537 [==============================] - 0s 225us/step - loss: 3.4228e-04 -
acc: 1.0000 - val_loss: 2.2574 - val_acc: 0.7100
Epoch 355/600
537/537 [==============================] - 0s 130us/step - loss: 3.4109e-04 -
acc: 1.0000 - val_loss: 2.2568 - val_acc: 0.7100
Epoch 356/600
537/537 [==============================] - 0s 145us/step - loss: 3.4208e-04 -
acc: 1.0000 - val_loss: 2.2572 - val_acc: 0.7100
Epoch 357/600
537/537 [==============================] - 0s 191us/step - loss: 3.4043e-04 -
acc: 1.0000 - val_loss: 2.2584 - val_acc: 0.7056
Epoch 358/600
537/537 [==============================] - 0s 167us/step - loss: 3.3962e-04 -
acc: 1.0000 - val_loss: 2.2581 - val_acc: 0.7100
Epoch 359/600
537/537 [==============================] - 0s 182us/step - loss: 3.3927e-04 -
acc: 1.0000 - val_loss: 2.2579 - val_acc: 0.7100
Epoch 360/600
537/537 [==============================] - 0s 221us/step - loss: 3.4090e-04 -
acc: 1.0000 - val_loss: 2.2597 - val_acc: 0.7056
Epoch 361/600
537/537 [==============================] - 0s 149us/step - loss: 3.3927e-04 -
acc: 1.0000 - val_loss: 2.2580 - val_acc: 0.7100
Epoch 362/600
537/537 [==============================] - 0s 171us/step - loss: 3.3721e-04 -
acc: 1.0000 - val_loss: 2.2576 - val_acc: 0.7056
Epoch 363/600
537/537 [==============================] - 0s 221us/step - loss: 3.3773e-04 -
acc: 1.0000 - val_loss: 2.2584 - val_acc: 0.7056
Epoch 364/600
537/537 [==============================] - 0s 321us/step - loss: 3.4138e-04 -
acc: 1.0000 - val_loss: 2.2582 - val_acc: 0.7100
Epoch 365/600
537/537 [==============================] - 0s 255us/step - loss: 3.4139e-04 -
acc: 1.0000 - val_loss: 2.2598 - val_acc: 0.7056
Epoch 366/600
537/537 [==============================] - 0s 225us/step - loss: 3.3521e-04 -
acc: 1.0000 - val_loss: 2.2598 - val_acc: 0.7100
Epoch 367/600
537/537 [==============================] - 0s 217us/step - loss: 3.3803e-04 -
acc: 1.0000 - val_loss: 2.2583 - val_acc: 0.7100
Epoch 368/600
537/537 [==============================] - 0s 186us/step - loss: 3.3399e-04 -
acc: 1.0000 - val_loss: 2.2596 - val_acc: 0.7056
Epoch 369/600
537/537 [==============================] - 0s 180us/step - loss: 3.3442e-04 -
```

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acc: 1.0000 - val_loss: 2.2591 - val_acc: 0.7100
Epoch 370/600
537/537 [==============================] - 0s 201us/step - loss: 3.3412e-04 -
acc: 1.0000 - val_loss: 2.2597 - val_acc: 0.7056
Epoch 371/600
537/537 [==============================] - 0s 262us/step - loss: 3.3367e-04 -
acc: 1.0000 - val_loss: 2.2601 - val_acc: 0.7056
Epoch 372/600
537/537 [==============================] - 0s 212us/step - loss: 3.3273e-04 -
acc: 1.0000 - val_loss: 2.2605 - val_acc: 0.7056
Epoch 373/600
537/537 [==============================] - 0s 126us/step - loss: 3.3165e-04 -
acc: 1.0000 - val_loss: 2.2598 - val_acc: 0.7100
Epoch 374/600
537/537 [==============================] - 0s 122us/step - loss: 3.3235e-04 -
acc: 1.0000 - val_loss: 2.2596 - val_acc: 0.7100
Epoch 375/600
537/537 [==============================] - 0s 104us/step - loss: 3.3319e-04 -
acc: 1.0000 - val_loss: 2.2604 - val_acc: 0.7056
Epoch 376/600
537/537 [==============================] - 0s 143us/step - loss: 3.3071e-04 -
acc: 1.0000 - val_loss: 2.2614 - val_acc: 0.7056
Epoch 377/600
537/537 [==============================] - 0s 117us/step - loss: 3.3073e-04 -
acc: 1.0000 - val_loss: 2.2602 - val_acc: 0.7056
Epoch 378/600
537/537 [==============================] - 0s 102us/step - loss: 3.3227e-04 -
acc: 1.0000 - val_loss: 2.2619 - val_acc: 0.7056
Epoch 379/600
537/537 [==============================] - 0s 158us/step - loss: 3.3243e-04 -
acc: 1.0000 - val_loss: 2.2599 - val_acc: 0.7100
Epoch 380/600
537/537 [==============================] - 0s 191us/step - loss: 3.2962e-04 -
acc: 1.0000 - val_loss: 2.2619 - val_acc: 0.7056
Epoch 381/600
537/537 [==============================] - 0s 114us/step - loss: 3.2978e-04 -
acc: 1.0000 - val_loss: 2.2616 - val_acc: 0.7056
Epoch 382/600
537/537 [==============================] - 0s 113us/step - loss: 3.2969e-04 -
acc: 1.0000 - val_loss: 2.2609 - val_acc: 0.7056
Epoch 383/600
537/537 [==============================] - 0s 110us/step - loss: 3.2747e-04 -
acc: 1.0000 - val_loss: 2.2609 - val_acc: 0.7056
Epoch 384/600
537/537 [==============================] - 0s 121us/step - loss: 3.2701e-04 -
acc: 1.0000 - val_loss: 2.2607 - val_acc: 0.7056
Epoch 385/600
537/537 [==============================] - 0s 111us/step - loss: 3.2907e-04 -
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acc: 1.0000 - val_loss: 2.2609 - val_acc: 0.7100
Epoch 386/600
537/537 [==============================] - 0s 191us/step - loss: 3.2858e-04 -
acc: 1.0000 - val_loss: 2.2621 - val_acc: 0.7056
Epoch 387/600
537/537 [==============================] - 0s 119us/step - loss: 3.2656e-04 -
acc: 1.0000 - val_loss: 2.2625 - val_acc: 0.7056
Epoch 388/600
537/537 [==============================] - 0s 121us/step - loss: 3.2713e-04 -
acc: 1.0000 - val_loss: 2.2626 - val_acc: 0.7056
Epoch 389/600
537/537 [==============================] - 0s 134us/step - loss: 3.2683e-04 -
acc: 1.0000 - val_loss: 2.2616 - val_acc: 0.7056
Epoch 390/600
537/537 [==============================] - 0s 110us/step - loss: 3.2507e-04 -
acc: 1.0000 - val_loss: 2.2615 - val_acc: 0.7100
Epoch 391/600
537/537 [==============================] - 0s 397us/step - loss: 3.2434e-04 -
acc: 1.0000 - val_loss: 2.2621 - val_acc: 0.7100
Epoch 392/600
537/537 [==============================] - 0s 189us/step - loss: 3.2480e-04 -
acc: 1.0000 - val_loss: 2.2620 - val_acc: 0.7056
Epoch 393/600
537/537 [==============================] - 0s 113us/step - loss: 3.2677e-04 -
acc: 1.0000 - val_loss: 2.2616 - val_acc: 0.7056
Epoch 394/600
537/537 [==============================] - ETA: 0s - loss: 2.2002e-04 - acc:
1.000 - 0s 134us/step - loss: 3.2329e-04 - acc: 1.0000 - val_loss: 2.2636 -
val_acc: 0.7056
Epoch 395/600
537/537 [==============================] - 0s 195us/step - loss: 3.2313e-04 -
acc: 1.0000 - val_loss: 2.2629 - val_acc: 0.7056
Epoch 396/600
537/537 [==============================] - 0s 152us/step - loss: 3.2317e-04 -
acc: 1.0000 - val_loss: 2.2632 - val_acc: 0.7056
Epoch 397/600
537/537 [==============================] - 0s 115us/step - loss: 3.2394e-04 -
acc: 1.0000 - val_loss: 2.2627 - val_acc: 0.7100
Epoch 398/600
537/537 [==============================] - 0s 130us/step - loss: 3.2288e-04 -
acc: 1.0000 - val_loss: 2.2634 - val_acc: 0.7056
Epoch 399/600
537/537 [==============================] - 0s 100us/step - loss: 3.2338e-04 -
acc: 1.0000 - val_loss: 2.2633 - val_acc: 0.7056
Epoch 400/600
537/537 [==============================] - 0s 112us/step - loss: 3.2338e-04 -
acc: 1.0000 - val_loss: 2.2641 - val_acc: 0.7056
Epoch 401/600
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537/537 [==============================] - 0s 104us/step - loss: 3.2165e-04 -
acc: 1.0000 - val_loss: 2.2636 - val_acc: 0.7056
Epoch 402/600
537/537 [==============================] - 0s 115us/step - loss: 3.2147e-04 -
acc: 1.0000 - val_loss: 2.2635 - val_acc: 0.7056
Epoch 403/600
537/537 [==============================] - 0s 109us/step - loss: 3.2379e-04 -
acc: 1.0000 - val_loss: 2.2632 - val_acc: 0.7056
Epoch 404/600
537/537 [==============================] - 0s 113us/step - loss: 3.2122e-04 -
acc: 1.0000 - val_loss: 2.2636 - val_acc: 0.7056
Epoch 405/600
537/537 [==============================] - 0s 121us/step - loss: 3.2339e-04 -
acc: 1.0000 - val_loss: 2.2654 - val_acc: 0.7056
Epoch 406/600
537/537 [==============================] - 0s 115us/step - loss: 3.2156e-04 -
acc: 1.0000 - val_loss: 2.2636 - val_acc: 0.7056
Epoch 407/600
537/537 [==============================] - 0s 112us/step - loss: 3.2207e-04 -
acc: 1.0000 - val_loss: 2.2644 - val_acc: 0.7056
Epoch 408/600
537/537 [==============================] - 0s 401us/step - loss: 3.2405e-04 -
acc: 1.0000 - val_loss: 2.2640 - val_acc: 0.7056
Epoch 409/600
537/537 [==============================] - 0s 100us/step - loss: 3.2019e-04 -
acc: 1.0000 - val_loss: 2.2645 - val_acc: 0.7056
Epoch 410/600
537/537 [==============================] - 0s 106us/step - loss: 3.2193e-04 -
acc: 1.0000 - val_loss: 2.2653 - val_acc: 0.7056
Epoch 411/600
537/537 [==============================] - 0s 156us/step - loss: 3.2215e-04 -
acc: 1.0000 - val_loss: 2.2650 - val_acc: 0.7056
Epoch 412/600
537/537 [==============================] - 0s 145us/step - loss: 3.2075e-04 -
acc: 1.0000 - val_loss: 2.2654 - val_acc: 0.7056
Epoch 413/600
537/537 [==============================] - 0s 180us/step - loss: 3.1988e-04 -
acc: 1.0000 - val_loss: 2.2657 - val_acc: 0.7056
Epoch 414/600
537/537 [==============================] - 0s 160us/step - loss: 3.1886e-04 -
acc: 1.0000 - val_loss: 2.2658 - val_acc: 0.7056
Epoch 415/600
537/537 [==============================] - 0s 154us/step - loss: 3.1978e-04 -
acc: 1.0000 - val_loss: 2.2655 - val_acc: 0.7056
Epoch 416/600
537/537 [==============================] - 0s 254us/step - loss: 3.1842e-04 -
acc: 1.0000 - val_loss: 2.2654 - val_acc: 0.7056
Epoch 417/600
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537/537 [==============================] - 0s 108us/step - loss: 3.1809e-04 -
acc: 1.0000 - val_loss: 2.2656 - val_acc: 0.7056
Epoch 418/600
537/537 [==============================] - 0s 269us/step - loss: 3.1822e-04 -
acc: 1.0000 - val_loss: 2.2667 - val_acc: 0.7056
Epoch 419/600
537/537 [==============================] - 0s 253us/step - loss: 3.1814e-04 -
acc: 1.0000 - val_loss: 2.2665 - val_acc: 0.7056
Epoch 420/600
537/537 [==============================] - 0s 175us/step - loss: 3.1765e-04 -
acc: 1.0000 - val_loss: 2.2657 - val_acc: 0.7056
Epoch 421/600
537/537 [==============================] - 0s 220us/step - loss: 3.1766e-04 -
acc: 1.0000 - val_loss: 2.2663 - val_acc: 0.7056
Epoch 422/600
537/537 [==============================] - 0s 152us/step - loss: 3.1842e-04 -
acc: 1.0000 - val_loss: 2.2671 - val_acc: 0.7056
Epoch 423/600
537/537 [==============================] - 0s 282us/step - loss: 3.1661e-04 -
acc: 1.0000 - val_loss: 2.2669 - val_acc: 0.7056
Epoch 424/600
537/537 [==============================] - 0s 191us/step - loss: 3.1918e-04 -
acc: 1.0000 - val_loss: 2.2661 - val_acc: 0.7056
Epoch 425/600
537/537 [==============================] - 0s 158us/step - loss: 3.1629e-04 -
acc: 1.0000 - val_loss: 2.2669 - val_acc: 0.7056
Epoch 426/600
537/537 [==============================] - 0s 308us/step - loss: 3.1706e-04 -
acc: 1.0000 - val_loss: 2.2669 - val_acc: 0.7056
Epoch 427/600
537/537 [==============================] - 0s 409us/step - loss: 3.1637e-04 -
acc: 1.0000 - val_loss: 2.2673 - val_acc: 0.7056
Epoch 428/600
537/537 [==============================] - 0s 223us/step - loss: 3.1566e-04 -
acc: 1.0000 - val_loss: 2.2664 - val_acc: 0.7056
Epoch 429/600
537/537 [==============================] - 0s 158us/step - loss: 3.1874e-04 -
acc: 1.0000 - val_loss: 2.2675 - val_acc: 0.7056
Epoch 430/600
537/537 [==============================] - 0s 212us/step - loss: 3.1505e-04 -
acc: 1.0000 - val_loss: 2.2667 - val_acc: 0.7056
Epoch 431/600
537/537 [==============================] - 0s 234us/step - loss: 3.1793e-04 -
acc: 1.0000 - val_loss: 2.2681 - val_acc: 0.7056
Epoch 432/600
537/537 [==============================] - 0s 305us/step - loss: 3.1596e-04 -
acc: 1.0000 - val_loss: 2.2679 - val_acc: 0.7056
Epoch 433/600
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537/537 [==============================] - 0s 165us/step - loss: 3.1711e-04 -
acc: 1.0000 - val_loss: 2.2686 - val_acc: 0.7056
Epoch 434/600
537/537 [==============================] - 0s 234us/step - loss: 3.1608e-04 -
acc: 1.0000 - val_loss: 2.2677 - val_acc: 0.7056
Epoch 435/600
537/537 [==============================] - 0s 258us/step - loss: 3.1418e-04 -
acc: 1.0000 - val_loss: 2.2677 - val_acc: 0.7056
Epoch 436/600
537/537 [==============================] - 0s 152us/step - loss: 3.1486e-04 -
acc: 1.0000 - val_loss: 2.2681 - val_acc: 0.7056
Epoch 437/600
537/537 [==============================] - 0s 223us/step - loss: 3.1418e-04 -
acc: 1.0000 - val_loss: 2.2677 - val_acc: 0.7056
Epoch 438/600
537/537 [==============================] - 0s 188us/step - loss: 3.1438e-04 -
acc: 1.0000 - val_loss: 2.2691 - val_acc: 0.7056
Epoch 439/600
537/537 [==============================] - 0s 325us/step - loss: 3.1516e-04 -
acc: 1.0000 - val_loss: 2.2689 - val_acc: 0.7056
Epoch 440/600
537/537 [==============================] - 0s 154us/step - loss: 3.1230e-04 -
acc: 1.0000 - val_loss: 2.2674 - val_acc: 0.7056
Epoch 441/600
537/537 [==============================] - 0s 121us/step - loss: 3.1601e-04 -
acc: 1.0000 - val_loss: 2.2680 - val_acc: 0.7056
Epoch 442/600
537/537 [==============================] - 0s 243us/step - loss: 3.1361e-04 -
acc: 1.0000 - val_loss: 2.2686 - val_acc: 0.7056
Epoch 443/600
537/537 [==============================] - 0s 119us/step - loss: 3.1326e-04 -
acc: 1.0000 - val_loss: 2.2691 - val_acc: 0.7056
Epoch 444/600
537/537 [==============================] - 0s 134us/step - loss: 3.1465e-04 -
acc: 1.0000 - val_loss: 2.2686 - val_acc: 0.7056
Epoch 445/600
537/537 [==============================] - 0s 212us/step - loss: 3.1214e-04 -
acc: 1.0000 - val_loss: 2.2695 - val_acc: 0.7056
Epoch 446/600
537/537 [==============================] - 0s 104us/step - loss: 3.1305e-04 -
acc: 1.0000 - val_loss: 2.2693 - val_acc: 0.7056
Epoch 447/600
537/537 [==============================] - 0s 124us/step - loss: 3.1221e-04 -
acc: 1.0000 - val_loss: 2.2701 - val_acc: 0.7056
Epoch 448/600
537/537 [==============================] - 0s 167us/step - loss: 3.1271e-04 -
acc: 1.0000 - val_loss: 2.2693 - val_acc: 0.7056
Epoch 449/600
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537/537 [==============================] - 0s 121us/step - loss: 3.1056e-04 -
acc: 1.0000 - val_loss: 2.2692 - val_acc: 0.7056
Epoch 450/600
537/537 [==============================] - 0s 111us/step - loss: 3.1192e-04 -
acc: 1.0000 - val_loss: 2.2694 - val_acc: 0.7056
Epoch 451/600
537/537 [==============================] - 0s 108us/step - loss: 3.1112e-04 -
acc: 1.0000 - val_loss: 2.2695 - val_acc: 0.7056
Epoch 452/600
537/537 [==============================] - 0s 117us/step - loss: 3.1242e-04 -
acc: 1.0000 - val_loss: 2.2695 - val_acc: 0.7056
Epoch 453/600
537/537 [==============================] - 0s 97us/step - loss: 3.1167e-04 -
acc: 1.0000 - val_loss: 2.2702 - val_acc: 0.7056
Epoch 454/600
537/537 [==============================] - 0s 125us/step - loss: 3.0930e-04 -
acc: 1.0000 - val_loss: 2.2695 - val_acc: 0.7056
Epoch 455/600
537/537 [==============================] - 0s 342us/step - loss: 3.1002e-04 -
acc: 1.0000 - val_loss: 2.2711 - val_acc: 0.7056
Epoch 456/600
537/537 [==============================] - 0s 129us/step - loss: 3.0941e-04 -
acc: 1.0000 - val_loss: 2.2710 - val_acc: 0.7056
Epoch 457/600
537/537 [==============================] - 0s 146us/step - loss: 3.1000e-04 -
acc: 1.0000 - val_loss: 2.2713 - val_acc: 0.7056
Epoch 458/600
537/537 [==============================] - 0s 139us/step - loss: 3.0974e-04 -
acc: 1.0000 - val_loss: 2.2711 - val_acc: 0.7056
Epoch 459/600
537/537 [==============================] - 0s 117us/step - loss: 3.0897e-04 -
acc: 1.0000 - val_loss: 2.2715 - val_acc: 0.7056
Epoch 460/600
537/537 [==============================] - 0s 122us/step - loss: 3.0886e-04 -
acc: 1.0000 - val_loss: 2.2711 - val_acc: 0.7056
Epoch 461/600
537/537 [==============================] - 0s 135us/step - loss: 3.1022e-04 -
acc: 1.0000 - val_loss: 2.2699 - val_acc: 0.7056
Epoch 462/600
537/537 [==============================] - 0s 455us/step - loss: 3.1123e-04 -
acc: 1.0000 - val_loss: 2.2708 - val_acc: 0.7056
Epoch 463/600
537/537 [==============================] - 0s 156us/step - loss: 3.0938e-04 -
acc: 1.0000 - val_loss: 2.2719 - val_acc: 0.7056
Epoch 464/600
537/537 [==============================] - 0s 127us/step - loss: 3.0941e-04 -
acc: 1.0000 - val_loss: 2.2717 - val_acc: 0.7056
Epoch 465/600
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537/537 [==============================] - 0s 106us/step - loss: 3.0903e-04 -
acc: 1.0000 - val_loss: 2.2718 - val_acc: 0.7056
Epoch 466/600
537/537 [==============================] - 0s 145us/step - loss: 3.0848e-04 -
acc: 1.0000 - val_loss: 2.2710 - val_acc: 0.7056
Epoch 467/600
537/537 [==============================] - 0s 104us/step - loss: 3.0741e-04 -
acc: 1.0000 - val_loss: 2.2725 - val_acc: 0.7056
Epoch 468/600
537/537 [==============================] - ETA: 0s - loss: 4.6411e-04 - acc:
1.000 - 0s 114us/step - loss: 3.0773e-04 - acc: 1.0000 - val_loss: 2.2727 -
val_acc: 0.7056
Epoch 469/600
537/537 [==============================] - 0s 93us/step - loss: 3.0973e-04 -
acc: 1.0000 - val_loss: 2.2714 - val_acc: 0.7056
Epoch 470/600
537/537 [==============================] - 0s 179us/step - loss: 3.0740e-04 -
acc: 1.0000 - val_loss: 2.2730 - val_acc: 0.7056
Epoch 471/600
537/537 [==============================] - 0s 117us/step - loss: 3.0790e-04 -
acc: 1.0000 - val_loss: 2.2723 - val_acc: 0.7056
Epoch 472/600
537/537 [==============================] - 0s 227us/step - loss: 3.0858e-04 -
acc: 1.0000 - val_loss: 2.2726 - val_acc: 0.7056
Epoch 473/600
537/537 [==============================] - 0s 147us/step - loss: 3.0691e-04 -
acc: 1.0000 - val_loss: 2.2732 - val_acc: 0.7056
Epoch 474/600
537/537 [==============================] - 0s 153us/step - loss: 3.0995e-04 -
acc: 1.0000 - val_loss: 2.2720 - val_acc: 0.7056
Epoch 475/600
537/537 [==============================] - 0s 189us/step - loss: 3.1060e-04 -
acc: 1.0000 - val_loss: 2.2742 - val_acc: 0.7056
Epoch 476/600
537/537 [==============================] - 0s 161us/step - loss: 3.1101e-04 -
acc: 1.0000 - val_loss: 2.2733 - val_acc: 0.7056
Epoch 477/600
537/537 [==============================] - 0s 203us/step - loss: 3.0508e-04 -
acc: 1.0000 - val_loss: 2.2737 - val_acc: 0.7056
Epoch 478/600
537/537 [==============================] - 0s 211us/step - loss: 3.0717e-04 -
acc: 1.0000 - val_loss: 2.2737 - val_acc: 0.7056
Epoch 479/600
537/537 [==============================] - 0s 115us/step - loss: 3.0480e-04 -
acc: 1.0000 - val_loss: 2.2741 - val_acc: 0.7056
Epoch 480/600
537/537 [==============================] - 0s 172us/step - loss: 3.0570e-04 -
acc: 1.0000 - val_loss: 2.2730 - val_acc: 0.7056
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Epoch 481/600
537/537 [==============================] - 0s 196us/step - loss: 3.0500e-04 -
acc: 1.0000 - val_loss: 2.2731 - val_acc: 0.7056
Epoch 482/600
537/537 [==============================] - 0s 188us/step - loss: 3.0548e-04 -
acc: 1.0000 - val_loss: 2.2743 - val_acc: 0.7056
Epoch 483/600
537/537 [==============================] - 0s 308us/step - loss: 3.0525e-04 -
acc: 1.0000 - val_loss: 2.2742 - val_acc: 0.7056
Epoch 484/600
537/537 [==============================] - 0s 199us/step - loss: 3.0434e-04 -
acc: 1.0000 - val_loss: 2.2742 - val_acc: 0.7056
Epoch 485/600
537/537 [==============================] - 0s 257us/step - loss: 3.0509e-04 -
acc: 1.0000 - val_loss: 2.2747 - val_acc: 0.7056
Epoch 486/600
537/537 [==============================] - 0s 302us/step - loss: 3.0265e-04 -
acc: 1.0000 - val_loss: 2.2743 - val_acc: 0.7056
Epoch 487/600
537/537 [==============================] - 0s 225us/step - loss: 3.0384e-04 -
acc: 1.0000 - val_loss: 2.2742 - val_acc: 0.7056
Epoch 488/600
537/537 [==============================] - 0s 127us/step - loss: 3.0469e-04 -
acc: 1.0000 - val_loss: 2.2750 - val_acc: 0.7056
Epoch 489/600
537/537 [==============================] - 0s 187us/step - loss: 3.0919e-04 -
acc: 1.0000 - val_loss: 2.2735 - val_acc: 0.7056
Epoch 490/600
537/537 [==============================] - 0s 359us/step - loss: 3.0405e-04 -
acc: 1.0000 - val_loss: 2.2744 - val_acc: 0.7056
Epoch 491/600
537/537 [==============================] - 0s 140us/step - loss: 3.0288e-04 -
acc: 1.0000 - val_loss: 2.2750 - val_acc: 0.7056
Epoch 492/600
537/537 [==============================] - 0s 123us/step - loss: 3.0492e-04 -
acc: 1.0000 - val_loss: 2.2748 - val_acc: 0.7056
Epoch 493/600
537/537 [==============================] - 0s 117us/step - loss: 3.0203e-04 -
acc: 1.0000 - val_loss: 2.2751 - val_acc: 0.7056
Epoch 494/600
537/537 [==============================] - 0s 263us/step - loss: 3.0407e-04 -
acc: 1.0000 - val_loss: 2.2761 - val_acc: 0.7056
Epoch 495/600
537/537 [==============================] - 0s 208us/step - loss: 3.0164e-04 -
acc: 1.0000 - val_loss: 2.2762 - val_acc: 0.7056
Epoch 496/600
537/537 [==============================] - 0s 200us/step - loss: 3.0174e-04 -
acc: 1.0000 - val_loss: 2.2760 - val_acc: 0.7056
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Epoch 497/600
537/537 [==============================] - 0s 218us/step - loss: 3.0736e-04 -
acc: 1.0000 - val_loss: 2.2737 - val_acc: 0.7100
Epoch 498/600
537/537 [==============================] - 0s 242us/step - loss: 3.0580e-04 -
acc: 1.0000 - val_loss: 2.2758 - val_acc: 0.7056
Epoch 499/600
537/537 [==============================] - 0s 110us/step - loss: 3.0352e-04 -
acc: 1.0000 - val_loss: 2.2748 - val_acc: 0.7056
Epoch 500/600
537/537 [==============================] - 0s 118us/step - loss: 3.0112e-04 -
acc: 1.0000 - val_loss: 2.2750 - val_acc: 0.7056
Epoch 501/600
537/537 [==============================] - 0s 168us/step - loss: 3.0136e-04 -
acc: 1.0000 - val_loss: 2.2759 - val_acc: 0.7056
Epoch 502/600
537/537 [==============================] - 0s 270us/step - loss: 3.0209e-04 -
acc: 1.0000 - val_loss: 2.2766 - val_acc: 0.7056
Epoch 503/600
537/537 [==============================] - 0s 222us/step - loss: 3.0118e-04 -
acc: 1.0000 - val_loss: 2.2759 - val_acc: 0.7056
Epoch 504/600
537/537 [==============================] - 0s 207us/step - loss: 3.0065e-04 -
acc: 1.0000 - val_loss: 2.2758 - val_acc: 0.7056
Epoch 505/600
537/537 [==============================] - 0s 223us/step - loss: 3.0177e-04 -
acc: 1.0000 - val_loss: 2.2759 - val_acc: 0.7056
Epoch 506/600
537/537 [==============================] - 0s 366us/step - loss: 3.0064e-04 -
acc: 1.0000 - val_loss: 2.2769 - val_acc: 0.7056
Epoch 507/600
537/537 [==============================] - 0s 171us/step - loss: 2.9990e-04 -
acc: 1.0000 - val_loss: 2.2773 - val_acc: 0.7056
Epoch 508/600
537/537 [==============================] - 0s 123us/step - loss: 3.0191e-04 -
acc: 1.0000 - val_loss: 2.2777 - val_acc: 0.7056
Epoch 509/600
537/537 [==============================] - 0s 205us/step - loss: 3.0280e-04 -
acc: 1.0000 - val_loss: 2.2763 - val_acc: 0.7056
Epoch 510/600
537/537 [==============================] - 0s 123us/step - loss: 2.9969e-04 -
acc: 1.0000 - val_loss: 2.2765 - val_acc: 0.7056
Epoch 511/600
537/537 [==============================] - 0s 102us/step - loss: 3.0051e-04 -
acc: 1.0000 - val_loss: 2.2776 - val_acc: 0.7056
Epoch 512/600
537/537 [==============================] - 0s 111us/step - loss: 2.9779e-04 -
acc: 1.0000 - val_loss: 2.2770 - val_acc: 0.7056
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Epoch 513/600
537/537 [==============================] - 0s 145us/step - loss: 2.9886e-04 -
acc: 1.0000 - val_loss: 2.2769 - val_acc: 0.7056
Epoch 514/600
537/537 [==============================] - 0s 144us/step - loss: 3.0054e-04 -
acc: 1.0000 - val_loss: 2.2776 - val_acc: 0.7056
Epoch 515/600
537/537 [==============================] - 0s 109us/step - loss: 2.9954e-04 -
acc: 1.0000 - val_loss: 2.2770 - val_acc: 0.7056
Epoch 516/600
537/537 [==============================] - 0s 132us/step - loss: 2.9845e-04 -
acc: 1.0000 - val_loss: 2.2771 - val_acc: 0.7056
Epoch 517/600
537/537 [==============================] - 0s 158us/step - loss: 2.9828e-04 -
acc: 1.0000 - val_loss: 2.2780 - val_acc: 0.7056
Epoch 518/600
537/537 [==============================] - 0s 122us/step - loss: 3.0126e-04 -
acc: 1.0000 - val_loss: 2.2770 - val_acc: 0.7056
Epoch 519/600
537/537 [==============================] - 0s 113us/step - loss: 2.9711e-04 -
acc: 1.0000 - val_loss: 2.2777 - val_acc: 0.7056
Epoch 520/600
537/537 [==============================] - 0s 126us/step - loss: 2.9756e-04 -
acc: 1.0000 - val_loss: 2.2783 - val_acc: 0.7056
Epoch 521/600
537/537 [==============================] - 0s 114us/step - loss: 2.9997e-04 -
acc: 1.0000 - val_loss: 2.2773 - val_acc: 0.7056
Epoch 522/600
537/537 [==============================] - 0s 277us/step - loss: 2.9713e-04 -
acc: 1.0000 - val_loss: 2.2783 - val_acc: 0.7056
Epoch 523/600
537/537 [==============================] - 0s 194us/step - loss: 2.9747e-04 -
acc: 1.0000 - val_loss: 2.2788 - val_acc: 0.7056
Epoch 524/600
537/537 [==============================] - 0s 216us/step - loss: 2.9644e-04 -
acc: 1.0000 - val_loss: 2.2777 - val_acc: 0.7056
Epoch 525/600
537/537 [==============================] - 0s 276us/step - loss: 2.9682e-04 -
acc: 1.0000 - val_loss: 2.2784 - val_acc: 0.7056
Epoch 526/600
537/537 [==============================] - 0s 161us/step - loss: 2.9677e-04 -
acc: 1.0000 - val_loss: 2.2785 - val_acc: 0.7056
Epoch 527/600
537/537 [==============================] - 0s 162us/step - loss: 2.9638e-04 -
acc: 1.0000 - val_loss: 2.2789 - val_acc: 0.7056
Epoch 528/600
537/537 [==============================] - 0s 224us/step - loss: 2.9582e-04 -
acc: 1.0000 - val_loss: 2.2782 - val_acc: 0.7056
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Epoch 529/600
537/537 [==============================] - 0s 263us/step - loss: 2.9598e-04 -
acc: 1.0000 - val_loss: 2.2782 - val_acc: 0.7056
Epoch 530/600
537/537 [==============================] - 0s 185us/step - loss: 2.9650e-04 -
acc: 1.0000 - val_loss: 2.2787 - val_acc: 0.7056
Epoch 531/600
537/537 [==============================] - 0s 189us/step - loss: 2.9801e-04 -
acc: 1.0000 - val_loss: 2.2792 - val_acc: 0.7056
Epoch 532/600
537/537 [==============================] - 0s 188us/step - loss: 2.9572e-04 -
acc: 1.0000 - val_loss: 2.2792 - val_acc: 0.7056
Epoch 533/600
537/537 [==============================] - 0s 185us/step - loss: 2.9458e-04 -
acc: 1.0000 - val_loss: 2.2783 - val_acc: 0.7056
Epoch 534/600
537/537 [==============================] - 0s 180us/step - loss: 2.9503e-04 -
acc: 1.0000 - val_loss: 2.2797 - val_acc: 0.7056
Epoch 535/600
537/537 [==============================] - 0s 261us/step - loss: 2.9469e-04 -
acc: 1.0000 - val_loss: 2.2802 - val_acc: 0.7056
Epoch 536/600
537/537 [==============================] - 0s 256us/step - loss: 2.9465e-04 -
acc: 1.0000 - val_loss: 2.2795 - val_acc: 0.7056
Epoch 537/600
537/537 [==============================] - 0s 147us/step - loss: 2.9375e-04 -
acc: 1.0000 - val_loss: 2.2795 - val_acc: 0.7056
Epoch 538/600
537/537 [==============================] - 1s 1ms/step - loss: 2.9412e-04 - acc:
1.0000 - val_loss: 2.2800 - val_acc: 0.7056
Epoch 539/600
537/537 [==============================] - 0s 257us/step - loss: 2.9422e-04 -
acc: 1.0000 - val_loss: 2.2800 - val_acc: 0.7056
Epoch 540/600
537/537 [==============================] - 0s 215us/step - loss: 2.9451e-04 -
acc: 1.0000 - val_loss: 2.2804 - val_acc: 0.7056
Epoch 541/600
537/537 [==============================] - 0s 119us/step - loss: 2.9494e-04 -
acc: 1.0000 - val_loss: 2.2796 - val_acc: 0.7056
Epoch 542/600
537/537 [==============================] - 0s 185us/step - loss: 2.9283e-04 -
acc: 1.0000 - val_loss: 2.2801 - val_acc: 0.7056
Epoch 543/600
537/537 [==============================] - 0s 234us/step - loss: 2.9395e-04 -
acc: 1.0000 - val_loss: 2.2809 - val_acc: 0.7056
Epoch 544/600
537/537 [==============================] - 0s 195us/step - loss: 2.9396e-04 -
acc: 1.0000 - val_loss: 2.2805 - val_acc: 0.7056
```

```
Epoch 545/600
537/537 [==============================] - 0s 245us/step - loss: 2.9318e-04 -
acc: 1.0000 - val_loss: 2.2806 - val_acc: 0.7056
Epoch 546/600
537/537 [==============================] - 0s 146us/step - loss: 2.9250e-04 -
acc: 1.0000 - val_loss: 2.2806 - val_acc: 0.7056
Epoch 547/600
537/537 [==============================] - 0s 325us/step - loss: 2.9346e-04 -
acc: 1.0000 - val_loss: 2.2805 - val_acc: 0.7056
Epoch 548/600
537/537 [==============================] - 0s 254us/step - loss: 2.9376e-04 -
acc: 1.0000 - val_loss: 2.2806 - val_acc: 0.7056
Epoch 549/600
537/537 [==============================] - 0s 290us/step - loss: 2.9195e-04 -
acc: 1.0000 - val_loss: 2.2813 - val_acc: 0.7056
Epoch 550/600
537/537 [==============================] - 0s 226us/step - loss: 2.9203e-04 -
acc: 1.0000 - val_loss: 2.2824 - val_acc: 0.7056
Epoch 551/600
537/537 [==============================] - 0s 217us/step - loss: 2.9229e-04 -
acc: 1.0000 - val_loss: 2.2815 - val_acc: 0.7056
Epoch 552/600
537/537 [==============================] - 0s 186us/step - loss: 2.9317e-04 -
acc: 1.0000 - val_loss: 2.2827 - val_acc: 0.7056
Epoch 553/600
537/537 [==============================] - 0s 351us/step - loss: 2.9461e-04 -
acc: 1.0000 - val_loss: 2.2817 - val_acc: 0.7056
Epoch 554/600
537/537 [==============================] - 0s 230us/step - loss: 2.9465e-04 -
acc: 1.0000 - val_loss: 2.2822 - val_acc: 0.7056
Epoch 555/600
537/537 [==============================] - 0s 275us/step - loss: 2.9162e-04 -
acc: 1.0000 - val_loss: 2.2816 - val_acc: 0.7056
Epoch 556/600
537/537 [==============================] - 0s 206us/step - loss: 2.9095e-04 -
acc: 1.0000 - val_loss: 2.2826 - val_acc: 0.7056
Epoch 557/600
537/537 [==============================] - 0s 98us/step - loss: 2.9240e-04 -
acc: 1.0000 - val_loss: 2.2827 - val_acc: 0.7056
Epoch 558/600
537/537 [==============================] - 0s 137us/step - loss: 2.9133e-04 -
acc: 1.0000 - val_loss: 2.2815 - val_acc: 0.7056
Epoch 559/600
537/537 [==============================] - 0s 108us/step - loss: 2.9064e-04 -
acc: 1.0000 - val_loss: 2.2817 - val_acc: 0.7056
Epoch 560/600
537/537 [==============================] - 0s 342us/step - loss: 2.9099e-04 -
acc: 1.0000 - val_loss: 2.2808 - val_acc: 0.7056
```

```
Epoch 561/600
537/537 [==============================] - 0s 265us/step - loss: 2.8950e-04 -
acc: 1.0000 - val_loss: 2.2826 - val_acc: 0.7056
Epoch 562/600
537/537 [==============================] - 0s 154us/step - loss: 2.9056e-04 -
acc: 1.0000 - val_loss: 2.2820 - val_acc: 0.7056
Epoch 563/600
537/537 [==============================] - 0s 292us/step - loss: 2.8821e-04 -
acc: 1.0000 - val_loss: 2.2838 - val_acc: 0.7056
Epoch 564/600
537/537 [==============================] - 0s 139us/step - loss: 2.9041e-04 -
acc: 1.0000 - val_loss: 2.2829 - val_acc: 0.7056
Epoch 565/600
537/537 [==============================] - 0s 318us/step - loss: 2.9149e-04 -
acc: 1.0000 - val_loss: 2.2828 - val_acc: 0.7056
Epoch 566/600
537/537 [==============================] - 0s 208us/step - loss: 2.8891e-04 -
acc: 1.0000 - val_loss: 2.2825 - val_acc: 0.7056
Epoch 567/600
537/537 [==============================] - 0s 156us/step - loss: 2.9303e-04 -
acc: 1.0000 - val_loss: 2.2838 - val_acc: 0.7056
Epoch 568/600
537/537 [==============================] - 0s 197us/step - loss: 2.8788e-04 -
acc: 1.0000 - val_loss: 2.2824 - val_acc: 0.7056
Epoch 569/600
537/537 [==============================] - 0s 252us/step - loss: 2.8975e-04 -
acc: 1.0000 - val_loss: 2.2839 - val_acc: 0.7056
Epoch 570/600
537/537 [==============================] - 0s 188us/step - loss: 2.8884e-04 -
acc: 1.0000 - val_loss: 2.2835 - val_acc: 0.7056
Epoch 571/600
537/537 [==============================] - 0s 245us/step - loss: 2.9165e-04 -
acc: 1.0000 - val_loss: 2.2839 - val_acc: 0.7056
Epoch 572/600
537/537 [==============================] - 0s 130us/step - loss: 2.8710e-04 -
acc: 1.0000 - val_loss: 2.2831 - val_acc: 0.7056
Epoch 573/600
537/537 [==============================] - 0s 115us/step - loss: 2.8872e-04 -
acc: 1.0000 - val_loss: 2.2834 - val_acc: 0.7056
Epoch 574/600
537/537 [==============================] - 0s 119us/step - loss: 2.8906e-04 -
acc: 1.0000 - val_loss: 2.2841 - val_acc: 0.7056
Epoch 575/600
537/537 [==============================] - 0s 156us/step - loss: 2.8808e-04 -
acc: 1.0000 - val_loss: 2.2846 - val_acc: 0.7056
Epoch 576/600
537/537 [==============================] - 0s 310us/step - loss: 2.8705e-04 -
acc: 1.0000 - val_loss: 2.2849 - val_acc: 0.7056
```

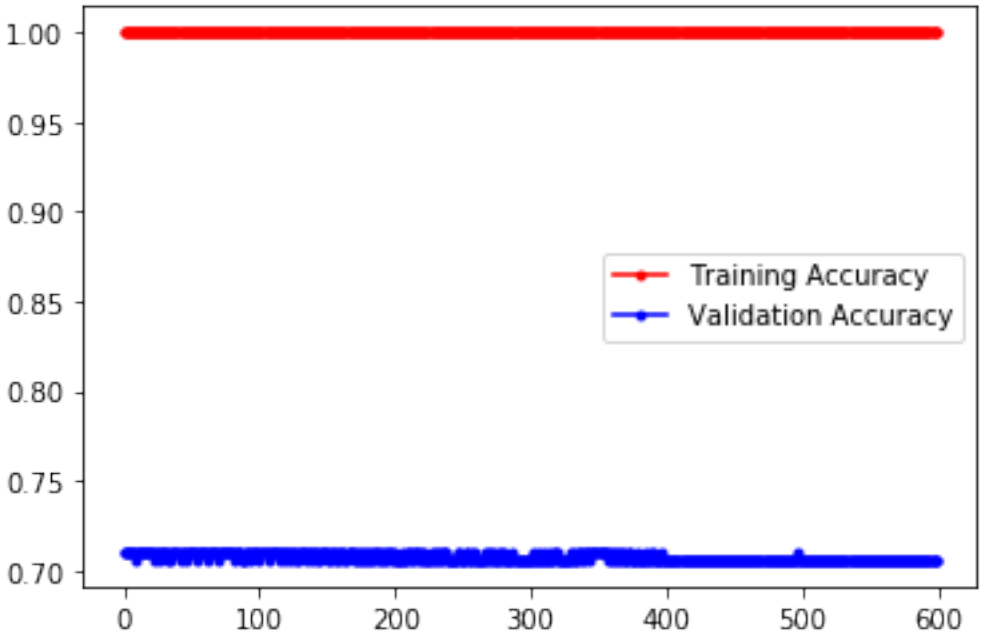
```
Epoch 577/600
537/537 [==============================] - 0s 104us/step - loss: 2.8750e-04 -
acc: 1.0000 - val_loss: 2.2843 - val_acc: 0.7056
Epoch 578/600
537/537 [==============================] - 0s 102us/step - loss: 2.8678e-04 -
acc: 1.0000 - val_loss: 2.2845 - val_acc: 0.7056
Epoch 579/600
537/537 [==============================] - 0s 134us/step - loss: 2.8652e-04 -
acc: 1.0000 - val_loss: 2.2843 - val_acc: 0.7056
Epoch 580/600
537/537 [==============================] - 0s 297us/step - loss: 2.8745e-04 -
acc: 1.0000 - val_loss: 2.2852 - val_acc: 0.7056
Epoch 581/600
537/537 [==============================] - 0s 117us/step - loss: 2.8791e-04 -
acc: 1.0000 - val_loss: 2.2846 - val_acc: 0.7056
Epoch 582/600
537/537 [==============================] - 0s 108us/step - loss: 2.8825e-04 -
acc: 1.0000 - val_loss: 2.2848 - val_acc: 0.7056
Epoch 583/600
537/537 [==============================] - 0s 115us/step - loss: 2.8650e-04 -
acc: 1.0000 - val_loss: 2.2857 - val_acc: 0.7056
Epoch 584/600
537/537 [==============================] - 0s 290us/step - loss: 2.8639e-04 -
acc: 1.0000 - val_loss: 2.2850 - val_acc: 0.7056
Epoch 585/600
537/537 [==============================] - 0s 201us/step - loss: 2.8602e-04 -
acc: 1.0000 - val_loss: 2.2856 - val_acc: 0.7056
Epoch 586/600
537/537 [==============================] - 0s 409us/step - loss: 2.8622e-04 -
acc: 1.0000 - val_loss: 2.2862 - val_acc: 0.7056
Epoch 587/600
537/537 [==============================] - 0s 191us/step - loss: 2.8584e-04 -
acc: 1.0000 - val_loss: 2.2855 - val_acc: 0.7056
Epoch 588/600
537/537 [==============================] - 0s 147us/step - loss: 2.8625e-04 -
acc: 1.0000 - val_loss: 2.2864 - val_acc: 0.7056
Epoch 589/600
537/537 [==============================] - 0s 238us/step - loss: 2.8447e-04 -
acc: 1.0000 - val_loss: 2.2860 - val_acc: 0.7056
Epoch 590/600
537/537 [==============================] - 0s 206us/step - loss: 2.8465e-04 -
acc: 1.0000 - val_loss: 2.2861 - val_acc: 0.7056
Epoch 591/600
537/537 [==============================] - 0s 167us/step - loss: 2.8562e-04 -
acc: 1.0000 - val_loss: 2.2858 - val_acc: 0.7056
Epoch 592/600
537/537 [==============================] - 0s 291us/step - loss: 2.8423e-04 -
acc: 1.0000 - val_loss: 2.2867 - val_acc: 0.7056
```

```
Epoch 593/600
537/537 [==============================] - 0s 197us/step - loss: 2.8540e-04 -
acc: 1.0000 - val_loss: 2.2861 - val_acc: 0.7056
Epoch 594/600
537/537 [==============================] - 0s 284us/step - loss: 2.8632e-04 -
acc: 1.0000 - val_loss: 2.2869 - val_acc: 0.7056
Epoch 595/600
537/537 [==============================] - 0s 165us/step - loss: 2.8611e-04 -
acc: 1.0000 - val_loss: 2.2854 - val_acc: 0.7056
Epoch 596/600
537/537 [==============================] - 0s 256us/step - loss: 2.8732e-04 -
acc: 1.0000 - val_loss: 2.2870 - val_acc: 0.7056
Epoch 597/600
537/537 [==============================] - 0s 174us/step - loss: 2.8438e-04 -
acc: 1.0000 - val_loss: 2.2871 - val_acc: 0.7056
Epoch 598/600
537/537 [==============================] - 0s 306us/step - loss: 2.8403e-04 -
acc: 1.0000 - val_loss: 2.2865 - val_acc: 0.7056
Epoch 599/600
537/537 [==============================] - 0s 115us/step - loss: 2.8433e-04 -
acc: 1.0000 - val_loss: 2.2870 - val_acc: 0.7056
Epoch 600/600
537/537 [==============================] - 0s 164us/step - loss: 2.8442e-04 -
acc: 1.0000 - val_loss: 2.2877 - val_acc: 0.7056
```

[482]:
```
y_pred_class_nn_600 = nn_model_2.predict_classes(X_test_norm)
y_pred_prob_nn_600 = nn_model_2.predict(X_test_norm)
```

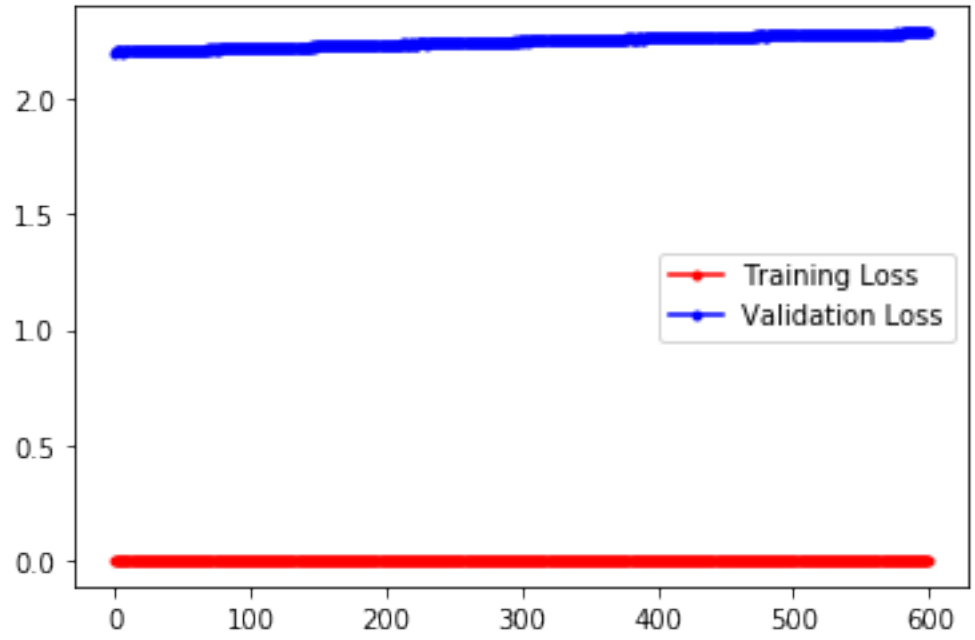
[484]:
```
#plotting the curve to check training and validation accuracy
fig, ax = plt.subplots()
ax.plot(run_hist_600.history["acc"],'r', marker='.', label="Training Accuracy")
ax.plot(run_hist_600.history["val_acc"],'b', marker='.', label="Validation␣
 ↪Accuracy")
ax.legend()
```

[484]:
```
<matplotlib.legend.Legend at 0x1c7c36880b8>
```



[485]:
```
#Plotting curves for Training Loss and Validation loss
fig, ax = plt.subplots()
ax.plot(run_hist_600.history["loss"],'r', marker='.', label="Training Loss")
ax.plot(run_hist_600.history["val_loss"],'b', marker='.', label="Validation␣
 ↪Loss")
ax.legend()
```

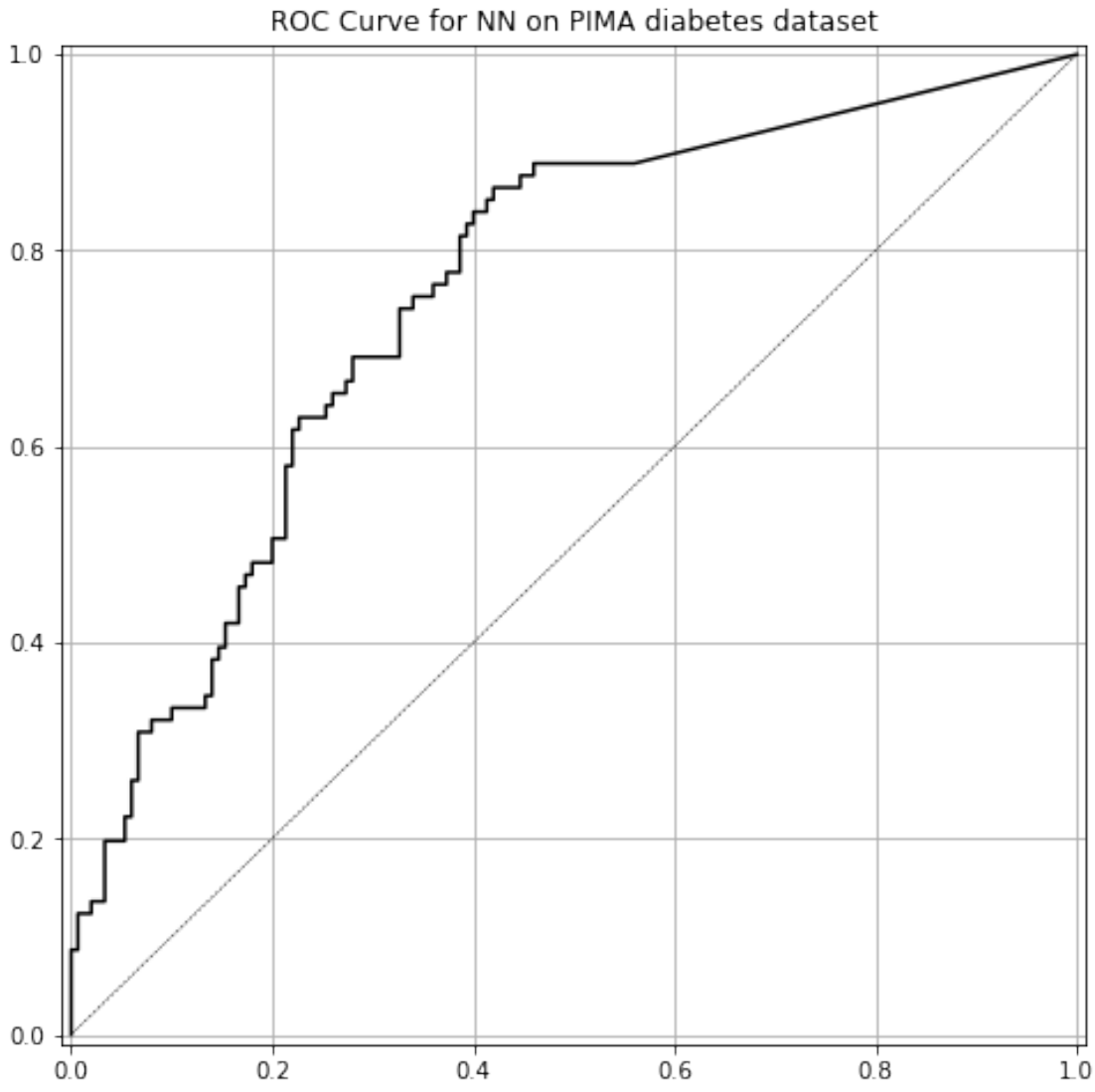
[485]:
```
<matplotlib.legend.Legend at 0x1c7c36eff28>
```



[486]:
```
# Print model performance and plot the roc curve
print('accuracy is {:.3f}'.format(accuracy_score(y_test,y_pred_class_nn_600)))
print('roc-auc is {:.3f}'.format(roc_auc_score(y_test,y_pred_prob_nn_600)))

plot_roc(y_test, y_pred_prob_nn_600, 'NN')
```

```
accuracy is 0.706
roc-auc is 0.755
```



We observe that we reach an accuracy of 70.6%

1.6.4 Building more complex model

[492]:
```
def model_4(model):
    model.add(Dense(1024, input_dim=8, activation='relu'))
    model.add(Dense(512, activation='relu'))
    model.add(Dense(256, activation='relu'))
    model.add(Dense(128, activation='relu'))
    model.add(Dense(64, activation='relu'))
    model.add(Dense(32, activation='relu'))
    model.add(Dense(16, activation='relu'))
    model.add(Dense(8, activation='relu'))
    model.add(Dense(1, activation='sigmoid'))
    return model
```

[493]:
```
model = Sequential()
model = model_4(model)
```

[494]:
```
# compile the model
    model.compile(
        loss = 'binary_crossentropy',
        optimizer = SGD(lr=1e-4, decay=1e-6, momentum=0.9),
        metrics = ['accuracy']
    )
```

[495]:
```
mystr = model.summary()
```

```
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
dense_103 (Dense)            (None, 1024)              9216
_________________________________________________________________
dense_104 (Dense)            (None, 512)               524800
_________________________________________________________________
dense_105 (Dense)            (None, 256)               131328
_________________________________________________________________
dense_106 (Dense)            (None, 128)               32896
_________________________________________________________________
dense_107 (Dense)            (None, 64)                8256
_________________________________________________________________
dense_108 (Dense)            (None, 32)                2080
_________________________________________________________________
dense_109 (Dense)            (None, 16)                528
_________________________________________________________________
dense_110 (Dense)            (None, 8)                 136
_________________________________________________________________
dense_111 (Dense)            (None, 1)                 9
=================================================================
Total params: 709,249
Trainable params: 709,249
```

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

[496]:
```
# Train the model for the given number of epochs
    history = model.fit(
        X_train_norm, y_train,
        steps_per_epoch=10,
        epochs=500,
        verbose=1,
        validation_data=(X_test, y_test),
        validation_steps=10
    )
```

```
Train on 537 samples, validate on 231 samples
Epoch 1/500
10/10 [==============================] - 3s 300ms/step - loss: 0.6948 - acc:
0.3473 - val_loss: 0.6945 - val_acc: 0.3550
Epoch 2/500
10/10 [==============================] - 1s 80ms/step - loss: 0.6944 - acc:
0.3544 - val_loss: 0.6940 - val_acc: 0.3723
Epoch 3/500
10/10 [==============================] - 1s 51ms/step - loss: 0.6938 - acc:
0.4020 - val_loss: 0.6934 - val_acc: 0.4675
Epoch 4/500
10/10 [==============================] - 1s 84ms/step - loss: 0.6932 - acc:
0.5259 - val_loss: 0.6928 - val_acc: 0.5758
Epoch 5/500
10/10 [==============================] - 1s 61ms/step - loss: 0.6926 - acc:
0.6291 - val_loss: 0.6923 - val_acc: 0.6190
Epoch 6/500
10/10 [==============================] - 0s 49ms/step - loss: 0.6921 - acc:
0.6555 - val_loss: 0.6917 - val_acc: 0.6320
Epoch 7/500
10/10 [==============================] - 0s 44ms/step - loss: 0.6916 - acc:
0.6611 - val_loss: 0.6913 - val_acc: 0.6494
Epoch 8/500
10/10 [==============================] - 1s 52ms/step - loss: 0.6911 - acc:
0.6536 - val_loss: 0.6908 - val_acc: 0.6277
Epoch 9/500
10/10 [==============================] - 1s 72ms/step - loss: 0.6907 - acc:
0.6499 - val_loss: 0.6904 - val_acc: 0.6537
Epoch 10/500
10/10 [==============================] - 1s 77ms/step - loss: 0.6903 - acc:
0.6389 - val_loss: 0.6900 - val_acc: 0.6623
Epoch 11/500
10/10 [==============================] - 1s 69ms/step - loss: 0.6900 - acc:
0.6443 - val_loss: 0.6896 - val_acc: 0.6710
```

```
Epoch 12/500
10/10 [==============================] - 1s 120ms/step - loss: 0.6896 - acc:
0.6451 - val_loss: 0.6893 - val_acc: 0.6667
Epoch 13/500
10/10 [==============================] - 1s 135ms/step - loss: 0.6893 - acc:
0.6490 - val_loss: 0.6889 - val_acc: 0.6667
Epoch 14/500
10/10 [==============================] - 1s 62ms/step - loss: 0.6890 - acc:
0.6538 - val_loss: 0.6886 - val_acc: 0.6623
Epoch 15/500
10/10 [==============================] - 0s 49ms/step - loss: 0.6886 - acc:
0.6555 - val_loss: 0.6883 - val_acc: 0.6623
Epoch 16/500
10/10 [==============================] - 1s 56ms/step - loss: 0.6883 - acc:
0.6555 - val_loss: 0.6879 - val_acc: 0.6580
Epoch 17/500
10/10 [==============================] - 1s 52ms/step - loss: 0.6880 - acc:
0.6555 - val_loss: 0.6876 - val_acc: 0.6580
Epoch 18/500
10/10 [==============================] - 1s 51ms/step - loss: 0.6877 - acc:
0.6547 - val_loss: 0.6873 - val_acc: 0.6580
Epoch 19/500
10/10 [==============================] - 1s 56ms/step - loss: 0.6874 - acc:
0.6523 - val_loss: 0.6870 - val_acc: 0.6580
Epoch 20/500
10/10 [==============================] - 1s 51ms/step - loss: 0.6871 - acc:
0.6514 - val_loss: 0.6867 - val_acc: 0.6580
Epoch 21/500
10/10 [==============================] - 1s 55ms/step - loss: 0.6868 - acc:
0.6499 - val_loss: 0.6864 - val_acc: 0.6537
Epoch 22/500
10/10 [==============================] - 1s 64ms/step - loss: 0.6865 - acc:
0.6499 - val_loss: 0.6861 - val_acc: 0.6537
Epoch 23/500
10/10 [==============================] - 1s 58ms/step - loss: 0.6862 - acc:
0.6499 - val_loss: 0.6858 - val_acc: 0.6537
Epoch 24/500
10/10 [==============================] - 1s 66ms/step - loss: 0.6859 - acc:
0.6499 - val_loss: 0.6855 - val_acc: 0.6537
Epoch 25/500
10/10 [==============================] - 1s 57ms/step - loss: 0.6856 - acc:
0.6499 - val_loss: 0.6852 - val_acc: 0.6537
Epoch 26/500
10/10 [==============================] - 1s 60ms/step - loss: 0.6853 - acc:
0.6499 - val_loss: 0.6849 - val_acc: 0.6494
Epoch 27/500
10/10 [==============================] - 1s 68ms/step - loss: 0.6850 - acc:
0.6499 - val_loss: 0.6847 - val_acc: 0.6494
```

```
Epoch 28/500
10/10 [==============================] - 1s 77ms/step - loss: 0.6847 - acc:
0.6499 - val_loss: 0.6844 - val_acc: 0.6494
Epoch 29/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6844 - acc:
0.6499 - val_loss: 0.6841 - val_acc: 0.6494
Epoch 30/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6841 - acc:
0.6499 - val_loss: 0.6838 - val_acc: 0.6494
Epoch 31/500
10/10 [==============================] - 1s 93ms/step - loss: 0.6838 - acc:
0.6507 - val_loss: 0.6836 - val_acc: 0.6494
Epoch 32/500
10/10 [==============================] - 1s 70ms/step - loss: 0.6835 - acc:
0.6518 - val_loss: 0.6833 - val_acc: 0.6494
Epoch 33/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6833 - acc:
0.6518 - val_loss: 0.6830 - val_acc: 0.6494
Epoch 34/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6830 - acc:
0.6518 - val_loss: 0.6827 - val_acc: 0.6494
Epoch 35/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6827 - acc:
0.6518 - val_loss: 0.6825 - val_acc: 0.6494
Epoch 36/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6824 - acc:
0.6518 - val_loss: 0.6822 - val_acc: 0.6494
Epoch 37/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6822 - acc:
0.6518 - val_loss: 0.6819 - val_acc: 0.6494
Epoch 38/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6819 - acc:
0.6518 - val_loss: 0.6817 - val_acc: 0.6494
Epoch 39/500
10/10 [==============================] - 1s 67ms/step - loss: 0.6816 - acc:
0.6518 - val_loss: 0.6814 - val_acc: 0.6494
Epoch 40/500
10/10 [==============================] - 1s 118ms/step - loss: 0.6813 - acc:
0.6518 - val_loss: 0.6811 - val_acc: 0.6494
Epoch 41/500
10/10 [==============================] - 1s 116ms/step - loss: 0.6811 - acc:
0.6518 - val_loss: 0.6809 - val_acc: 0.6494
Epoch 42/500
10/10 [==============================] - 1s 73ms/step - loss: 0.6808 - acc:
0.6518 - val_loss: 0.6806 - val_acc: 0.6494
Epoch 43/500
10/10 [==============================] - 1s 85ms/step - loss: 0.6805 - acc:
0.6518 - val_loss: 0.6803 - val_acc: 0.6494
```

```
Epoch 44/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6802 - acc:
0.6518 - val_loss: 0.6801 - val_acc: 0.6494
Epoch 45/500
10/10 [==============================] - 1s 77ms/step - loss: 0.6800 - acc:
0.6518 - val_loss: 0.6798 - val_acc: 0.6494
Epoch 46/500
10/10 [==============================] - 1s 71ms/step - loss: 0.6797 - acc:
0.6518 - val_loss: 0.6796 - val_acc: 0.6494
Epoch 47/500
10/10 [==============================] - 1s 71ms/step - loss: 0.6795 - acc:
0.6518 - val_loss: 0.6793 - val_acc: 0.6494
Epoch 48/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6792 - acc:
0.6518 - val_loss: 0.6791 - val_acc: 0.6494
Epoch 49/500
10/10 [==============================] - 1s 117ms/step - loss: 0.6789 - acc:
0.6518 - val_loss: 0.6788 - val_acc: 0.6494
Epoch 50/500
10/10 [==============================] - 1s 102ms/step - loss: 0.6787 - acc:
0.6518 - val_loss: 0.6786 - val_acc: 0.6494
Epoch 51/500
10/10 [==============================] - 1s 93ms/step - loss: 0.6784 - acc:
0.6518 - val_loss: 0.6783 - val_acc: 0.6494
Epoch 52/500
10/10 [==============================] - 1s 84ms/step - loss: 0.6782 - acc:
0.6518 - val_loss: 0.6781 - val_acc: 0.6494
Epoch 53/500
10/10 [==============================] - 1s 68ms/step - loss: 0.6779 - acc:
0.6518 - val_loss: 0.6778 - val_acc: 0.6494
Epoch 54/500
10/10 [==============================] - 1s 62ms/step - loss: 0.6777 - acc:
0.6518 - val_loss: 0.6776 - val_acc: 0.6494
Epoch 55/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6774 - acc:
0.6518 - val_loss: 0.6773 - val_acc: 0.6494
Epoch 56/500
10/10 [==============================] - 1s 135ms/step - loss: 0.6772 - acc:
0.6518 - val_loss: 0.6771 - val_acc: 0.6494
Epoch 57/500
10/10 [==============================] - 1s 125ms/step - loss: 0.6769 - acc:
0.6518 - val_loss: 0.6769 - val_acc: 0.6494
Epoch 58/500
10/10 [==============================] - 1s 91ms/step - loss: 0.6767 - acc:
0.6518 - val_loss: 0.6766 - val_acc: 0.6494
Epoch 59/500
10/10 [==============================] - 1s 89ms/step - loss: 0.6764 - acc:
0.6518 - val_loss: 0.6764 - val_acc: 0.6494
```

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Epoch 60/500
10/10 [==============================] - 1s 67ms/step - loss: 0.6762 - acc:
0.6518 - val_loss: 0.6761 - val_acc: 0.6494
Epoch 61/500
10/10 [==============================] - 2s 170ms/step - loss: 0.6759 - acc:
0.6518 - val_loss: 0.6759 - val_acc: 0.6494
Epoch 62/500
10/10 [==============================] - 1s 121ms/step - loss: 0.6757 - acc:
0.6518 - val_loss: 0.6757 - val_acc: 0.6494
Epoch 63/500
10/10 [==============================] - 1s 101ms/step - loss: 0.6755 - acc:
0.6518 - val_loss: 0.6754 - val_acc: 0.6494
Epoch 64/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6752 - acc:
0.6518 - val_loss: 0.6752 - val_acc: 0.6494
Epoch 65/500
10/10 [==============================] - 1s 112ms/step - loss: 0.6750 - acc:
0.6518 - val_loss: 0.6750 - val_acc: 0.6494
Epoch 66/500
10/10 [==============================] - 1s 100ms/step - loss: 0.6748 - acc:
0.6518 - val_loss: 0.6747 - val_acc: 0.6494
Epoch 67/500
10/10 [==============================] - 1s 101ms/step - loss: 0.6745 - acc:
0.6518 - val_loss: 0.6745 - val_acc: 0.6494
Epoch 68/500
10/10 [==============================] - 1s 100ms/step - loss: 0.6743 - acc:
0.6518 - val_loss: 0.6743 - val_acc: 0.6494
Epoch 69/500
10/10 [==============================] - 1s 92ms/step - loss: 0.6740 - acc:
0.6518 - val_loss: 0.6741 - val_acc: 0.6494
Epoch 70/500
10/10 [==============================] - 1s 67ms/step - loss: 0.6738 - acc:
0.6518 - val_loss: 0.6738 - val_acc: 0.6494
Epoch 71/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6736 - acc:
0.6518 - val_loss: 0.6736 - val_acc: 0.6494
Epoch 72/500
10/10 [==============================] - 1s 66ms/step - loss: 0.6734 - acc:
0.6518 - val_loss: 0.6734 - val_acc: 0.6494
Epoch 73/500
10/10 [==============================] - 1s 87ms/step - loss: 0.6731 - acc:
0.6518 - val_loss: 0.6732 - val_acc: 0.6494
Epoch 74/500
10/10 [==============================] - 1s 104ms/step - loss: 0.6729 - acc:
0.6518 - val_loss: 0.6730 - val_acc: 0.6494
Epoch 75/500
10/10 [==============================] - 1s 80ms/step - loss: 0.6727 - acc:
0.6518 - val_loss: 0.6727 - val_acc: 0.6494
```

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Epoch 76/500
10/10 [==============================] - 1s 72ms/step - loss: 0.6725 - acc:
0.6518 - val_loss: 0.6725 - val_acc: 0.6494
Epoch 77/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6722 - acc:
0.6518 - val_loss: 0.6723 - val_acc: 0.6494
Epoch 78/500
10/10 [==============================] - 1s 73ms/step - loss: 0.6720 - acc:
0.6518 - val_loss: 0.6721 - val_acc: 0.6494
Epoch 79/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6718 - acc:
0.6518 - val_loss: 0.6719 - val_acc: 0.6494
Epoch 80/500
10/10 [==============================] - 1s 127ms/step - loss: 0.6716 - acc:
0.6518 - val_loss: 0.6717 - val_acc: 0.6494
Epoch 81/500
10/10 [==============================] - 1s 93ms/step - loss: 0.6714 - acc:
0.6518 - val_loss: 0.6715 - val_acc: 0.6494
Epoch 82/500
10/10 [==============================] - 1s 131ms/step - loss: 0.6711 - acc:
0.6518 - val_loss: 0.6713 - val_acc: 0.6494
Epoch 83/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6709 - acc:
0.6518 - val_loss: 0.6710 - val_acc: 0.6494
Epoch 84/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6707 - acc:
0.6518 - val_loss: 0.6708 - val_acc: 0.6494
Epoch 85/500
10/10 [==============================] - 1s 83ms/step - loss: 0.6705 - acc:
0.6518 - val_loss: 0.6706 - val_acc: 0.6494
Epoch 86/500
10/10 [==============================] - 1s 88ms/step - loss: 0.6703 - acc:
0.6518 - val_loss: 0.6704 - val_acc: 0.6494
Epoch 87/500
10/10 [==============================] - 2s 196ms/step - loss: 0.6701 - acc:
0.6518 - val_loss: 0.6702 - val_acc: 0.6494
Epoch 88/500
10/10 [==============================] - 2s 152ms/step - loss: 0.6699 - acc:
0.6518 - val_loss: 0.6700 - val_acc: 0.6494
Epoch 89/500
10/10 [==============================] - 1s 104ms/step - loss: 0.6697 - acc:
0.6518 - val_loss: 0.6698 - val_acc: 0.6494
Epoch 90/500
10/10 [==============================] - 1s 92ms/step - loss: 0.6695 - acc:
0.6518 - val_loss: 0.6696 - val_acc: 0.6494
Epoch 91/500
10/10 [==============================] - 1s 84ms/step - loss: 0.6693 - acc:
0.6518 - val_loss: 0.6694 - val_acc: 0.6494
```

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Epoch 92/500
10/10 [==============================] - 1s 93ms/step - loss: 0.6690 - acc:
0.6518 - val_loss: 0.6692 - val_acc: 0.6494
Epoch 93/500
10/10 [==============================] - 1s 87ms/step - loss: 0.6688 - acc:
0.6518 - val_loss: 0.6690 - val_acc: 0.6494
Epoch 94/500
10/10 [==============================] - 1s 109ms/step - loss: 0.6686 - acc:
0.6518 - val_loss: 0.6688 - val_acc: 0.6494
Epoch 95/500
10/10 [==============================] - 1s 106ms/step - loss: 0.6684 - acc:
0.6518 - val_loss: 0.6686 - val_acc: 0.6494
Epoch 96/500
10/10 [==============================] - 1s 124ms/step - loss: 0.6682 - acc:
0.6518 - val_loss: 0.6684 - val_acc: 0.6494
Epoch 97/500
10/10 [==============================] - 1s 96ms/step - loss: 0.6680 - acc:
0.6518 - val_loss: 0.6682 - val_acc: 0.6494
Epoch 98/500
10/10 [==============================] - 1s 120ms/step - loss: 0.6678 - acc:
0.6518 - val_loss: 0.6681 - val_acc: 0.6494
Epoch 99/500
10/10 [==============================] - 1s 114ms/step - loss: 0.6676 - acc:
0.6518 - val_loss: 0.6679 - val_acc: 0.6494
Epoch 100/500
10/10 [==============================] - 1s 98ms/step - loss: 0.6674 - acc:
0.6518 - val_loss: 0.6677 - val_acc: 0.6494
Epoch 101/500
10/10 [==============================] - 1s 95ms/step - loss: 0.6672 - acc:
0.6518 - val_loss: 0.6675 - val_acc: 0.6494
Epoch 102/500
10/10 [==============================] - 1s 94ms/step - loss: 0.6671 - acc:
0.6518 - val_loss: 0.6673 - val_acc: 0.6494
Epoch 103/500
10/10 [==============================] - 1s 92ms/step - loss: 0.6669 - acc:
0.6518 - val_loss: 0.6671 - val_acc: 0.6494
Epoch 104/500
10/10 [==============================] - 1s 81ms/step - loss: 0.6667 - acc:
0.6518 - val_loss: 0.6669 - val_acc: 0.6494
Epoch 105/500
10/10 [==============================] - 1s 85ms/step - loss: 0.6665 - acc:
0.6518 - val_loss: 0.6667 - val_acc: 0.6494
Epoch 106/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6663 - acc:
0.6518 - val_loss: 0.6666 - val_acc: 0.6494
Epoch 107/500
10/10 [==============================] - 1s 77ms/step - loss: 0.6661 - acc:
0.6518 - val_loss: 0.6664 - val_acc: 0.6494
```

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Epoch 108/500
10/10 [==============================] - 1s 85ms/step - loss: 0.6659 - acc:
0.6518 - val_loss: 0.6662 - val_acc: 0.6494
Epoch 109/500
10/10 [==============================] - 1s 96ms/step - loss: 0.6657 - acc:
0.6518 - val_loss: 0.6660 - val_acc: 0.6494
Epoch 110/500
10/10 [==============================] - 1s 91ms/step - loss: 0.6655 - acc:
0.6518 - val_loss: 0.6658 - val_acc: 0.6494
Epoch 111/500
10/10 [==============================] - 1s 100ms/step - loss: 0.6653 - acc:
0.6518 - val_loss: 0.6656 - val_acc: 0.6494
Epoch 112/500
10/10 [==============================] - 1s 105ms/step - loss: 0.6651 - acc:
0.6518 - val_loss: 0.6655 - val_acc: 0.6494
Epoch 113/500
10/10 [==============================] - 1s 119ms/step - loss: 0.6650 - acc:
0.6518 - val_loss: 0.6653 - val_acc: 0.6494
Epoch 114/500
10/10 [==============================] - 1s 117ms/step - loss: 0.6648 - acc:
0.6518 - val_loss: 0.6651 - val_acc: 0.6494
Epoch 115/500
10/10 [==============================] - 1s 92ms/step - loss: 0.6646 - acc:
0.6518 - val_loss: 0.6649 - val_acc: 0.6494
Epoch 116/500
10/10 [==============================] - 1s 98ms/step - loss: 0.6644 - acc:
0.6518 - val_loss: 0.6648 - val_acc: 0.6494
Epoch 117/500
10/10 [==============================] - 1s 92ms/step - loss: 0.6642 - acc:
0.6518 - val_loss: 0.6646 - val_acc: 0.6494
Epoch 118/500
10/10 [==============================] - 1s 99ms/step - loss: 0.6640 - acc:
0.6518 - val_loss: 0.6644 - val_acc: 0.6494
Epoch 119/500
10/10 [==============================] - 1s 97ms/step - loss: 0.6638 - acc:
0.6518 - val_loss: 0.6642 - val_acc: 0.6494
Epoch 120/500
10/10 [==============================] - 1s 111ms/step - loss: 0.6637 - acc:
0.6518 - val_loss: 0.6640 - val_acc: 0.6494
Epoch 121/500
10/10 [==============================] - 1s 100ms/step - loss: 0.6635 - acc:
0.6518 - val_loss: 0.6639 - val_acc: 0.6494
Epoch 122/500
10/10 [==============================] - 1s 93ms/step - loss: 0.6633 - acc:
0.6518 - val_loss: 0.6637 - val_acc: 0.6494
Epoch 123/500
10/10 [==============================] - 1s 90ms/step - loss: 0.6631 - acc:
0.6518 - val_loss: 0.6635 - val_acc: 0.6494
```

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Epoch 124/500
10/10 [==============================] - 1s 105ms/step - loss: 0.6629 - acc:
0.6518 - val_loss: 0.6634 - val_acc: 0.6494
Epoch 125/500
10/10 [==============================] - 1s 89ms/step - loss: 0.6628 - acc:
0.6518 - val_loss: 0.6632 - val_acc: 0.6494
Epoch 126/500
10/10 [==============================] - 1s 92ms/step - loss: 0.6626 - acc:
0.6518 - val_loss: 0.6630 - val_acc: 0.6494
Epoch 127/500
10/10 [==============================] - 1s 92ms/step - loss: 0.6624 - acc:
0.6518 - val_loss: 0.6628 - val_acc: 0.6494
Epoch 128/500
10/10 [==============================] - 1s 87ms/step - loss: 0.6622 - acc:
0.6518 - val_loss: 0.6627 - val_acc: 0.6494
Epoch 129/500
10/10 [==============================] - 1s 95ms/step - loss: 0.6620 - acc:
0.6518 - val_loss: 0.6625 - val_acc: 0.6494
Epoch 130/500
10/10 [==============================] - 1s 82ms/step - loss: 0.6619 - acc:
0.6518 - val_loss: 0.6623 - val_acc: 0.6494
Epoch 131/500
10/10 [==============================] - 1s 72ms/step - loss: 0.6617 - acc:
0.6518 - val_loss: 0.6621 - val_acc: 0.6494
Epoch 132/500
10/10 [==============================] - 1s 65ms/step - loss: 0.6615 - acc:
0.6518 - val_loss: 0.6620 - val_acc: 0.6494
Epoch 133/500
10/10 [==============================] - 1s 81ms/step - loss: 0.6613 - acc:
0.6518 - val_loss: 0.6618 - val_acc: 0.6494
Epoch 134/500
10/10 [==============================] - 1s 69ms/step - loss: 0.6612 - acc:
0.6518 - val_loss: 0.6616 - val_acc: 0.6494
Epoch 135/500
10/10 [==============================] - 1s 69ms/step - loss: 0.6610 - acc:
0.6518 - val_loss: 0.6615 - val_acc: 0.6494
Epoch 136/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6608 - acc:
0.6518 - val_loss: 0.6613 - val_acc: 0.6494
Epoch 137/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6606 - acc:
0.6518 - val_loss: 0.6611 - val_acc: 0.6494
Epoch 138/500
10/10 [==============================] - 1s 80ms/step - loss: 0.6605 - acc:
0.6518 - val_loss: 0.6610 - val_acc: 0.6494
Epoch 139/500
10/10 [==============================] - 1s 81ms/step - loss: 0.6603 - acc:
0.6518 - val_loss: 0.6608 - val_acc: 0.6494
```

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Epoch 140/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6601 - acc:
0.6518 - val_loss: 0.6606 - val_acc: 0.6494
Epoch 141/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6599 - acc:
0.6518 - val_loss: 0.6604 - val_acc: 0.6494
Epoch 142/500
10/10 [==============================] - 1s 85ms/step - loss: 0.6598 - acc:
0.6518 - val_loss: 0.6603 - val_acc: 0.6494
Epoch 143/500
10/10 [==============================] - 1s 83ms/step - loss: 0.6596 - acc:
0.6518 - val_loss: 0.6601 - val_acc: 0.6494
Epoch 144/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6594 - acc:
0.6518 - val_loss: 0.6599 - val_acc: 0.6494
Epoch 145/500
10/10 [==============================] - 1s 71ms/step - loss: 0.6592 - acc:
0.6518 - val_loss: 0.6598 - val_acc: 0.6494
Epoch 146/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6591 - acc:
0.6518 - val_loss: 0.6596 - val_acc: 0.6494
Epoch 147/500
10/10 [==============================] - 1s 80ms/step - loss: 0.6589 - acc:
0.6518 - val_loss: 0.6595 - val_acc: 0.6494
Epoch 148/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6587 - acc:
0.6518 - val_loss: 0.6593 - val_acc: 0.6494
Epoch 149/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6586 - acc:
0.6518 - val_loss: 0.6591 - val_acc: 0.6494
Epoch 150/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6584 - acc:
0.6518 - val_loss: 0.6590 - val_acc: 0.6494
Epoch 151/500
10/10 [==============================] - 1s 82ms/step - loss: 0.6582 - acc:
0.6518 - val_loss: 0.6588 - val_acc: 0.6494
Epoch 152/500
10/10 [==============================] - 1s 80ms/step - loss: 0.6580 - acc:
0.6518 - val_loss: 0.6586 - val_acc: 0.6494
Epoch 153/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6579 - acc:
0.6518 - val_loss: 0.6585 - val_acc: 0.6494
Epoch 154/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6577 - acc:
0.6518 - val_loss: 0.6583 - val_acc: 0.6494
Epoch 155/500
10/10 [==============================] - 1s 80ms/step - loss: 0.6575 - acc:
0.6518 - val_loss: 0.6582 - val_acc: 0.6494
```

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Epoch 156/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6574 - acc:
0.6518 - val_loss: 0.6580 - val_acc: 0.6494
Epoch 157/500
10/10 [==============================] - 1s 110ms/step - loss: 0.6572 - acc:
0.6518 - val_loss: 0.6578 - val_acc: 0.6494
Epoch 158/500
10/10 [==============================] - 1s 100ms/step - loss: 0.6570 - acc:
0.6518 - val_loss: 0.6577 - val_acc: 0.6494
Epoch 159/500
10/10 [==============================] - 1s 92ms/step - loss: 0.6569 - acc:
0.6518 - val_loss: 0.6575 - val_acc: 0.6494
Epoch 160/500
10/10 [==============================] - 1s 92ms/step - loss: 0.6567 - acc:
0.6518 - val_loss: 0.6574 - val_acc: 0.6494
Epoch 161/500
10/10 [==============================] - 1s 101ms/step - loss: 0.6566 - acc:
0.6518 - val_loss: 0.6572 - val_acc: 0.6494
Epoch 162/500
10/10 [==============================] - 1s 95ms/step - loss: 0.6564 - acc:
0.6518 - val_loss: 0.6571 - val_acc: 0.6494
Epoch 163/500
10/10 [==============================] - 1s 92ms/step - loss: 0.6562 - acc:
0.6518 - val_loss: 0.6569 - val_acc: 0.6494
Epoch 164/500
10/10 [==============================] - 1s 96ms/step - loss: 0.6561 - acc:
0.6518 - val_loss: 0.6567 - val_acc: 0.6494
Epoch 165/500
10/10 [==============================] - 1s 86ms/step - loss: 0.6559 - acc:
0.6518 - val_loss: 0.6566 - val_acc: 0.6494
Epoch 166/500
10/10 [==============================] - 1s 96ms/step - loss: 0.6558 - acc:
0.6518 - val_loss: 0.6564 - val_acc: 0.6494
Epoch 167/500
10/10 [==============================] - 1s 91ms/step - loss: 0.6556 - acc:
0.6518 - val_loss: 0.6563 - val_acc: 0.6494
Epoch 168/500
10/10 [==============================] - 1s 104ms/step - loss: 0.6555 - acc:
0.6518 - val_loss: 0.6561 - val_acc: 0.6494
Epoch 169/500
10/10 [==============================] - 1s 84ms/step - loss: 0.6553 - acc:
0.6518 - val_loss: 0.6560 - val_acc: 0.6494
Epoch 170/500
10/10 [==============================] - 1s 93ms/step - loss: 0.6551 - acc:
0.6518 - val_loss: 0.6558 - val_acc: 0.6494
Epoch 171/500
10/10 [==============================] - 1s 105ms/step - loss: 0.6550 - acc:
0.6518 - val_loss: 0.6557 - val_acc: 0.6494
```

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Epoch 172/500
10/10 [==============================] - 1s 110ms/step - loss: 0.6548 - acc:
0.6518 - val_loss: 0.6555 - val_acc: 0.6494
Epoch 173/500
10/10 [==============================] - 1s 103ms/step - loss: 0.6547 - acc:
0.6518 - val_loss: 0.6554 - val_acc: 0.6494
Epoch 174/500
10/10 [==============================] - 1s 84ms/step - loss: 0.6545 - acc:
0.6518 - val_loss: 0.6553 - val_acc: 0.6494
Epoch 175/500
10/10 [==============================] - 1s 115ms/step - loss: 0.6544 - acc:
0.6518 - val_loss: 0.6551 - val_acc: 0.6494
Epoch 176/500
10/10 [==============================] - 1s 115ms/step - loss: 0.6542 - acc:
0.6518 - val_loss: 0.6550 - val_acc: 0.6494
Epoch 177/500
10/10 [==============================] - 1s 137ms/step - loss: 0.6541 - acc:
0.6518 - val_loss: 0.6548 - val_acc: 0.6494
Epoch 178/500
10/10 [==============================] - 1s 92ms/step - loss: 0.6540 - acc:
0.6518 - val_loss: 0.6547 - val_acc: 0.6494
Epoch 179/500
10/10 [==============================] - 1s 89ms/step - loss: 0.6538 - acc:
0.6518 - val_loss: 0.6545 - val_acc: 0.6494
Epoch 180/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6537 - acc:
0.6518 - val_loss: 0.6544 - val_acc: 0.6494
Epoch 181/500
10/10 [==============================] - 1s 108ms/step - loss: 0.6535 - acc:
0.6518 - val_loss: 0.6543 - val_acc: 0.6494
Epoch 182/500
10/10 [==============================] - 1s 84ms/step - loss: 0.6534 - acc:
0.6518 - val_loss: 0.6541 - val_acc: 0.6494
Epoch 183/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6532 - acc:
0.6518 - val_loss: 0.6540 - val_acc: 0.6494
Epoch 184/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6531 - acc:
0.6518 - val_loss: 0.6538 - val_acc: 0.6494
Epoch 185/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6529 - acc:
0.6518 - val_loss: 0.6537 - val_acc: 0.6494
Epoch 186/500
10/10 [==============================] - 1s 72ms/step - loss: 0.6528 - acc:
0.6518 - val_loss: 0.6536 - val_acc: 0.6494
Epoch 187/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6527 - acc:
0.6518 - val_loss: 0.6534 - val_acc: 0.6494
```

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Epoch 188/500
10/10 [==============================] - 1s 71ms/step - loss: 0.6525 - acc:
0.6518 - val_loss: 0.6533 - val_acc: 0.6494
Epoch 189/500
10/10 [==============================] - 1s 71ms/step - loss: 0.6524 - acc:
0.6518 - val_loss: 0.6532 - val_acc: 0.6494
Epoch 190/500
10/10 [==============================] - 1s 82ms/step - loss: 0.6522 - acc:
0.6518 - val_loss: 0.6530 - val_acc: 0.6494
Epoch 191/500
10/10 [==============================] - 1s 92ms/step - loss: 0.6521 - acc:
0.6518 - val_loss: 0.6529 - val_acc: 0.6494
Epoch 192/500
10/10 [==============================] - 2s 159ms/step - loss: 0.6520 - acc:
0.6518 - val_loss: 0.6528 - val_acc: 0.6494
Epoch 193/500
10/10 [==============================] - 1s 73ms/step - loss: 0.6518 - acc:
0.6518 - val_loss: 0.6526 - val_acc: 0.6494
Epoch 194/500
10/10 [==============================] - 1s 84ms/step - loss: 0.6517 - acc:
0.6518 - val_loss: 0.6525 - val_acc: 0.6494
Epoch 195/500
10/10 [==============================] - 1s 66ms/step - loss: 0.6515 - acc:
0.6518 - val_loss: 0.6524 - val_acc: 0.6494
Epoch 196/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6514 - acc:
0.6518 - val_loss: 0.6522 - val_acc: 0.6494
Epoch 197/500
10/10 [==============================] - 1s 122ms/step - loss: 0.6513 - acc:
0.6518 - val_loss: 0.6521 - val_acc: 0.6494
Epoch 198/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6511 - acc:
0.6518 - val_loss: 0.6520 - val_acc: 0.6494
Epoch 199/500
10/10 [==============================] - 1s 77ms/step - loss: 0.6510 - acc:
0.6518 - val_loss: 0.6518 - val_acc: 0.6494
Epoch 200/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6509 - acc:
0.6518 - val_loss: 0.6517 - val_acc: 0.6494
Epoch 201/500
10/10 [==============================] - 1s 118ms/step - loss: 0.6507 - acc:
0.6518 - val_loss: 0.6516 - val_acc: 0.6494
Epoch 202/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6506 - acc:
0.6518 - val_loss: 0.6515 - val_acc: 0.6494
Epoch 203/500
10/10 [==============================] - 1s 71ms/step - loss: 0.6505 - acc:
0.6518 - val_loss: 0.6513 - val_acc: 0.6494
```

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Epoch 204/500
10/10 [==============================] - 1s 95ms/step - loss: 0.6503 - acc:
0.6518 - val_loss: 0.6512 - val_acc: 0.6494
Epoch 205/500
10/10 [==============================] - 1s 107ms/step - loss: 0.6502 - acc:
0.6518 - val_loss: 0.6511 - val_acc: 0.6494
Epoch 206/500
10/10 [==============================] - 1s 101ms/step - loss: 0.6501 - acc:
0.6518 - val_loss: 0.6509 - val_acc: 0.6494
Epoch 207/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6499 - acc:
0.6518 - val_loss: 0.6508 - val_acc: 0.6494
Epoch 208/500
10/10 [==============================] - 1s 84ms/step - loss: 0.6498 - acc:
0.6518 - val_loss: 0.6507 - val_acc: 0.6494
Epoch 209/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6497 - acc:
0.6518 - val_loss: 0.6506 - val_acc: 0.6494
Epoch 210/500
10/10 [==============================] - 1s 129ms/step - loss: 0.6496 - acc:
0.6518 - val_loss: 0.6504 - val_acc: 0.6494
Epoch 211/500
10/10 [==============================] - 1s 129ms/step - loss: 0.6494 - acc:
0.6518 - val_loss: 0.6503 - val_acc: 0.6494
Epoch 212/500
10/10 [==============================] - 1s 136ms/step - loss: 0.6493 - acc:
0.6518 - val_loss: 0.6502 - val_acc: 0.6494
Epoch 213/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6492 - acc:
0.6518 - val_loss: 0.6501 - val_acc: 0.6494
Epoch 214/500
10/10 [==============================] - 1s 108ms/step - loss: 0.6490 - acc:
0.6518 - val_loss: 0.6499 - val_acc: 0.6494
Epoch 215/500
10/10 [==============================] - 1s 112ms/step - loss: 0.6489 - acc:
0.6518 - val_loss: 0.6498 - val_acc: 0.6494
Epoch 216/500
10/10 [==============================] - 1s 87ms/step - loss: 0.6488 - acc:
0.6518 - val_loss: 0.6497 - val_acc: 0.6494
Epoch 217/500
10/10 [==============================] - 1s 71ms/step - loss: 0.6486 - acc:
0.6518 - val_loss: 0.6496 - val_acc: 0.6494
Epoch 218/500
10/10 [==============================] - 1s 85ms/step - loss: 0.6485 - acc:
0.6518 - val_loss: 0.6494 - val_acc: 0.6494
Epoch 219/500
10/10 [==============================] - 1s 72ms/step - loss: 0.6484 - acc:
0.6518 - val_loss: 0.6493 - val_acc: 0.6494
```

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Epoch 220/500
10/10 [==============================] - 1s 86ms/step - loss: 0.6483 - acc:
0.6518 - val_loss: 0.6492 - val_acc: 0.6494
Epoch 221/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6481 - acc:
0.6518 - val_loss: 0.6491 - val_acc: 0.6494
Epoch 222/500
10/10 [==============================] - 1s 83ms/step - loss: 0.6480 - acc:
0.6518 - val_loss: 0.6489 - val_acc: 0.6494
Epoch 223/500
10/10 [==============================] - 1s 86ms/step - loss: 0.6479 - acc:
0.6518 - val_loss: 0.6488 - val_acc: 0.6494
Epoch 224/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6478 - acc:
0.6518 - val_loss: 0.6487 - val_acc: 0.6494
Epoch 225/500
10/10 [==============================] - 1s 83ms/step - loss: 0.6476 - acc:
0.6518 - val_loss: 0.6486 - val_acc: 0.6494
Epoch 226/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6475 - acc:
0.6518 - val_loss: 0.6485 - val_acc: 0.6494
Epoch 227/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6474 - acc:
0.6518 - val_loss: 0.6483 - val_acc: 0.6494
Epoch 228/500
10/10 [==============================] - 1s 81ms/step - loss: 0.6473 - acc:
0.6518 - val_loss: 0.6482 - val_acc: 0.6494
Epoch 229/500
10/10 [==============================] - 1s 87ms/step - loss: 0.6471 - acc:
0.6518 - val_loss: 0.6481 - val_acc: 0.6494
Epoch 230/500
10/10 [==============================] - 1s 87ms/step - loss: 0.6470 - acc:
0.6518 - val_loss: 0.6480 - val_acc: 0.6494
Epoch 231/500
10/10 [==============================] - 1s 85ms/step - loss: 0.6469 - acc:
0.6518 - val_loss: 0.6479 - val_acc: 0.6494
Epoch 232/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6468 - acc:
0.6518 - val_loss: 0.6477 - val_acc: 0.6494
Epoch 233/500
10/10 [==============================] - 1s 77ms/step - loss: 0.6466 - acc:
0.6518 - val_loss: 0.6476 - val_acc: 0.6494
Epoch 234/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6465 - acc:
0.6518 - val_loss: 0.6475 - val_acc: 0.6494
Epoch 235/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6464 - acc:
0.6518 - val_loss: 0.6474 - val_acc: 0.6494
```

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Epoch 236/500
10/10 [==============================] - 1s 73ms/step - loss: 0.6463 - acc:
0.6518 - val_loss: 0.6473 - val_acc: 0.6494
Epoch 237/500
10/10 [==============================] - 1s 81ms/step - loss: 0.6462 - acc:
0.6518 - val_loss: 0.6471 - val_acc: 0.6494
Epoch 238/500
10/10 [==============================] - 1s 80ms/step - loss: 0.6460 - acc:
0.6518 - val_loss: 0.6470 - val_acc: 0.6494
Epoch 239/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6459 - acc:
0.6518 - val_loss: 0.6469 - val_acc: 0.6494
Epoch 240/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6458 - acc:
0.6518 - val_loss: 0.6468 - val_acc: 0.6494
Epoch 241/500
10/10 [==============================] - 1s 94ms/step - loss: 0.6457 - acc:
0.6518 - val_loss: 0.6467 - val_acc: 0.6494
Epoch 242/500
10/10 [==============================] - 1s 87ms/step - loss: 0.6456 - acc:
0.6518 - val_loss: 0.6466 - val_acc: 0.6494
Epoch 243/500
10/10 [==============================] - 1s 92ms/step - loss: 0.6454 - acc:
0.6518 - val_loss: 0.6464 - val_acc: 0.6494
Epoch 244/500
10/10 [==============================] - 1s 77ms/step - loss: 0.6453 - acc:
0.6518 - val_loss: 0.6463 - val_acc: 0.6494
Epoch 245/500
10/10 [==============================] - 1s 69ms/step - loss: 0.6452 - acc:
0.6518 - val_loss: 0.6462 - val_acc: 0.6494
Epoch 246/500
10/10 [==============================] - 1s 67ms/step - loss: 0.6451 - acc:
0.6518 - val_loss: 0.6461 - val_acc: 0.6494
Epoch 247/500
10/10 [==============================] - 1s 68ms/step - loss: 0.6450 - acc:
0.6518 - val_loss: 0.6460 - val_acc: 0.6494
Epoch 248/500
10/10 [==============================] - 1s 71ms/step - loss: 0.6448 - acc:
0.6518 - val_loss: 0.6459 - val_acc: 0.6494
Epoch 249/500
10/10 [==============================] - 1s 70ms/step - loss: 0.6447 - acc:
0.6518 - val_loss: 0.6457 - val_acc: 0.6494
Epoch 250/500
10/10 [==============================] - 1s 66ms/step - loss: 0.6446 - acc:
0.6518 - val_loss: 0.6456 - val_acc: 0.6494
Epoch 251/500
10/10 [==============================] - 1s 73ms/step - loss: 0.6445 - acc:
0.6518 - val_loss: 0.6455 - val_acc: 0.6494
```

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Epoch 252/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6444 - acc:
0.6518 - val_loss: 0.6454 - val_acc: 0.6494
Epoch 253/500
10/10 [==============================] - 1s 73ms/step - loss: 0.6442 - acc:
0.6518 - val_loss: 0.6453 - val_acc: 0.6494
Epoch 254/500
10/10 [==============================] - 1s 82ms/step - loss: 0.6441 - acc:
0.6518 - val_loss: 0.6452 - val_acc: 0.6494
Epoch 255/500
10/10 [==============================] - 1s 80ms/step - loss: 0.6440 - acc:
0.6518 - val_loss: 0.6451 - val_acc: 0.6494
Epoch 256/500
10/10 [==============================] - 1s 71ms/step - loss: 0.6439 - acc:
0.6518 - val_loss: 0.6449 - val_acc: 0.6494
Epoch 257/500
10/10 [==============================] - 1s 63ms/step - loss: 0.6438 - acc:
0.6518 - val_loss: 0.6448 - val_acc: 0.6494
Epoch 258/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6437 - acc:
0.6518 - val_loss: 0.6447 - val_acc: 0.6494
Epoch 259/500
10/10 [==============================] - 1s 69ms/step - loss: 0.6435 - acc:
0.6518 - val_loss: 0.6446 - val_acc: 0.6494
Epoch 260/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6434 - acc:
0.6518 - val_loss: 0.6445 - val_acc: 0.6494
Epoch 261/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6433 - acc:
0.6518 - val_loss: 0.6444 - val_acc: 0.6494
Epoch 262/500
10/10 [==============================] - 1s 128ms/step - loss: 0.6432 - acc:
0.6518 - val_loss: 0.6443 - val_acc: 0.6494
Epoch 263/500
10/10 [==============================] - 1s 132ms/step - loss: 0.6431 - acc:
0.6518 - val_loss: 0.6442 - val_acc: 0.6494
Epoch 264/500
10/10 [==============================] - 1s 120ms/step - loss: 0.6430 - acc:
0.6518 - val_loss: 0.6440 - val_acc: 0.6494
Epoch 265/500
10/10 [==============================] - 1s 82ms/step - loss: 0.6429 - acc:
0.6518 - val_loss: 0.6439 - val_acc: 0.6494
Epoch 266/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6427 - acc:
0.6518 - val_loss: 0.6438 - val_acc: 0.6494
Epoch 267/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6426 - acc:
0.6518 - val_loss: 0.6437 - val_acc: 0.6494
```

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Epoch 268/500
10/10 [==============================] - 1s 69ms/step - loss: 0.6425 - acc:
0.6518 - val_loss: 0.6436 - val_acc: 0.6494
Epoch 269/500
10/10 [==============================] - 1s 83ms/step - loss: 0.6424 - acc:
0.6518 - val_loss: 0.6435 - val_acc: 0.6494
Epoch 270/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6423 - acc:
0.6518 - val_loss: 0.6434 - val_acc: 0.6494
Epoch 271/500
10/10 [==============================] - 2s 162ms/step - loss: 0.6422 - acc:
0.6518 - val_loss: 0.6433 - val_acc: 0.6494
Epoch 272/500
10/10 [==============================] - 1s 140ms/step - loss: 0.6421 - acc:
0.6518 - val_loss: 0.6432 - val_acc: 0.6494
Epoch 273/500
10/10 [==============================] - 1s 106ms/step - loss: 0.6419 - acc:
0.6518 - val_loss: 0.6430 - val_acc: 0.6494
Epoch 274/500
10/10 [==============================] - 1s 115ms/step - loss: 0.6418 - acc:
0.6518 - val_loss: 0.6429 - val_acc: 0.6494
Epoch 275/500
10/10 [==============================] - 1s 126ms/step - loss: 0.6417 - acc:
0.6518 - val_loss: 0.6428 - val_acc: 0.6494
Epoch 276/500
10/10 [==============================] - 1s 89ms/step - loss: 0.6416 - acc:
0.6518 - val_loss: 0.6427 - val_acc: 0.6494
Epoch 277/500
10/10 [==============================] - 1s 100ms/step - loss: 0.6415 - acc:
0.6518 - val_loss: 0.6426 - val_acc: 0.6494
Epoch 278/500
10/10 [==============================] - 1s 85ms/step - loss: 0.6414 - acc:
0.6518 - val_loss: 0.6425 - val_acc: 0.6494
Epoch 279/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6413 - acc:
0.6518 - val_loss: 0.6424 - val_acc: 0.6494
Epoch 280/500
10/10 [==============================] - 1s 83ms/step - loss: 0.6412 - acc:
0.6518 - val_loss: 0.6423 - val_acc: 0.6494
Epoch 281/500
10/10 [==============================] - 1s 77ms/step - loss: 0.6410 - acc:
0.6518 - val_loss: 0.6422 - val_acc: 0.6494
Epoch 282/500
10/10 [==============================] - 1s 77ms/step - loss: 0.6409 - acc:
0.6518 - val_loss: 0.6421 - val_acc: 0.6494
Epoch 283/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6408 - acc:
0.6518 - val_loss: 0.6420 - val_acc: 0.6494
```

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Epoch 284/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6407 - acc:
0.6518 - val_loss: 0.6419 - val_acc: 0.6494
Epoch 285/500
10/10 [==============================] - 1s 67ms/step - loss: 0.6406 - acc:
0.6518 - val_loss: 0.6417 - val_acc: 0.6494
Epoch 286/500
10/10 [==============================] - 1s 81ms/step - loss: 0.6405 - acc:
0.6518 - val_loss: 0.6416 - val_acc: 0.6494
Epoch 287/500
10/10 [==============================] - 1s 80ms/step - loss: 0.6404 - acc:
0.6518 - val_loss: 0.6415 - val_acc: 0.6494
Epoch 288/500
10/10 [==============================] - 1s 81ms/step - loss: 0.6403 - acc:
0.6518 - val_loss: 0.6414 - val_acc: 0.6494
Epoch 289/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6401 - acc:
0.6518 - val_loss: 0.6413 - val_acc: 0.6494
Epoch 290/500
10/10 [==============================] - 1s 71ms/step - loss: 0.6400 - acc:
0.6518 - val_loss: 0.6412 - val_acc: 0.6494
Epoch 291/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6399 - acc:
0.6518 - val_loss: 0.6411 - val_acc: 0.6494
Epoch 292/500
10/10 [==============================] - 1s 82ms/step - loss: 0.6398 - acc:
0.6518 - val_loss: 0.6410 - val_acc: 0.6494
Epoch 293/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6397 - acc:
0.6518 - val_loss: 0.6409 - val_acc: 0.6494
Epoch 294/500
10/10 [==============================] - 1s 71ms/step - loss: 0.6396 - acc:
0.6518 - val_loss: 0.6408 - val_acc: 0.6494
Epoch 295/500
10/10 [==============================] - 1s 85ms/step - loss: 0.6395 - acc:
0.6518 - val_loss: 0.6407 - val_acc: 0.6494
Epoch 296/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6393 - acc:
0.6518 - val_loss: 0.6406 - val_acc: 0.6494
Epoch 297/500
10/10 [==============================] - 1s 83ms/step - loss: 0.6392 - acc:
0.6518 - val_loss: 0.6404 - val_acc: 0.6494
Epoch 298/500
10/10 [==============================] - 1s 73ms/step - loss: 0.6391 - acc:
0.6518 - val_loss: 0.6403 - val_acc: 0.6494
Epoch 299/500
10/10 [==============================] - 1s 80ms/step - loss: 0.6390 - acc:
0.6518 - val_loss: 0.6402 - val_acc: 0.6494
```

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Epoch 300/500
10/10 [==============================] - 1s 88ms/step - loss: 0.6389 - acc:
0.6518 - val_loss: 0.6401 - val_acc: 0.6494
Epoch 301/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6388 - acc:
0.6518 - val_loss: 0.6400 - val_acc: 0.6494
Epoch 302/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6387 - acc:
0.6518 - val_loss: 0.6399 - val_acc: 0.6494
Epoch 303/500
10/10 [==============================] - 1s 82ms/step - loss: 0.6385 - acc:
0.6518 - val_loss: 0.6398 - val_acc: 0.6494
Epoch 304/500
10/10 [==============================] - 1s 81ms/step - loss: 0.6384 - acc:
0.6518 - val_loss: 0.6397 - val_acc: 0.6494
Epoch 305/500
10/10 [==============================] - 1s 84ms/step - loss: 0.6383 - acc:
0.6518 - val_loss: 0.6396 - val_acc: 0.6494
Epoch 306/500
10/10 [==============================] - 1s 73ms/step - loss: 0.6382 - acc:
0.6518 - val_loss: 0.6395 - val_acc: 0.6494
Epoch 307/500
10/10 [==============================] - 1s 63ms/step - loss: 0.6381 - acc:
0.6518 - val_loss: 0.6394 - val_acc: 0.6494
Epoch 308/500
10/10 [==============================] - 1s 70ms/step - loss: 0.6380 - acc:
0.6518 - val_loss: 0.6392 - val_acc: 0.6494
Epoch 309/500
10/10 [==============================] - 1s 70ms/step - loss: 0.6379 - acc:
0.6518 - val_loss: 0.6391 - val_acc: 0.6494
Epoch 310/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6377 - acc:
0.6518 - val_loss: 0.6390 - val_acc: 0.6494
Epoch 311/500
10/10 [==============================] - 1s 73ms/step - loss: 0.6376 - acc:
0.6518 - val_loss: 0.6389 - val_acc: 0.6494
Epoch 312/500
10/10 [==============================] - 1s 68ms/step - loss: 0.6375 - acc:
0.6518 - val_loss: 0.6388 - val_acc: 0.6494
Epoch 313/500
10/10 [==============================] - 1s 72ms/step - loss: 0.6374 - acc:
0.6518 - val_loss: 0.6387 - val_acc: 0.6494
Epoch 314/500
10/10 [==============================] - 1s 69ms/step - loss: 0.6373 - acc:
0.6518 - val_loss: 0.6386 - val_acc: 0.6494
Epoch 315/500
10/10 [==============================] - 1s 77ms/step - loss: 0.6372 - acc:
0.6518 - val_loss: 0.6385 - val_acc: 0.6494
```

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Epoch 316/500
10/10 [==============================] - 1s 70ms/step - loss: 0.6371 - acc:
0.6518 - val_loss: 0.6384 - val_acc: 0.6494
Epoch 317/500
10/10 [==============================] - 1s 61ms/step - loss: 0.6369 - acc:
0.6518 - val_loss: 0.6383 - val_acc: 0.6494
Epoch 318/500
10/10 [==============================] - 1s 69ms/step - loss: 0.6368 - acc:
0.6518 - val_loss: 0.6382 - val_acc: 0.6494
Epoch 319/500
10/10 [==============================] - 1s 70ms/step - loss: 0.6367 - acc:
0.6518 - val_loss: 0.6380 - val_acc: 0.6494
Epoch 320/500
10/10 [==============================] - 1s 72ms/step - loss: 0.6366 - acc:
0.6518 - val_loss: 0.6379 - val_acc: 0.6494
Epoch 321/500
10/10 [==============================] - 1s 70ms/step - loss: 0.6365 - acc:
0.6518 - val_loss: 0.6378 - val_acc: 0.6494
Epoch 322/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6364 - acc:
0.6518 - val_loss: 0.6377 - val_acc: 0.6494
Epoch 323/500
10/10 [==============================] - 1s 69ms/step - loss: 0.6363 - acc:
0.6518 - val_loss: 0.6376 - val_acc: 0.6494
Epoch 324/500
10/10 [==============================] - 1s 70ms/step - loss: 0.6362 - acc:
0.6518 - val_loss: 0.6375 - val_acc: 0.6494
Epoch 325/500
10/10 [==============================] - 1s 70ms/step - loss: 0.6360 - acc:
0.6518 - val_loss: 0.6374 - val_acc: 0.6494
Epoch 326/500
10/10 [==============================] - 1s 87ms/step - loss: 0.6359 - acc:
0.6518 - val_loss: 0.6373 - val_acc: 0.6494
Epoch 327/500
10/10 [==============================] - 1s 87ms/step - loss: 0.6358 - acc:
0.6518 - val_loss: 0.6372 - val_acc: 0.6494
Epoch 328/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6357 - acc:
0.6518 - val_loss: 0.6371 - val_acc: 0.6494
Epoch 329/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6356 - acc:
0.6518 - val_loss: 0.6370 - val_acc: 0.6494
Epoch 330/500
10/10 [==============================] - 1s 118ms/step - loss: 0.6355 - acc:
0.6518 - val_loss: 0.6369 - val_acc: 0.6494
Epoch 331/500
10/10 [==============================] - 1s 105ms/step - loss: 0.6354 - acc:
0.6518 - val_loss: 0.6367 - val_acc: 0.6494
```

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Epoch 332/500
10/10 [==============================] - 1s 91ms/step - loss: 0.6353 - acc:
0.6518 - val_loss: 0.6366 - val_acc: 0.6494
Epoch 333/500
10/10 [==============================] - 1s 83ms/step - loss: 0.6351 - acc:
0.6518 - val_loss: 0.6365 - val_acc: 0.6494
Epoch 334/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6350 - acc:
0.6518 - val_loss: 0.6364 - val_acc: 0.6494
Epoch 335/500
10/10 [==============================] - 1s 80ms/step - loss: 0.6349 - acc:
0.6518 - val_loss: 0.6363 - val_acc: 0.6494
Epoch 336/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6348 - acc:
0.6518 - val_loss: 0.6362 - val_acc: 0.6494
Epoch 337/500
10/10 [==============================] - 1s 101ms/step - loss: 0.6347 - acc:
0.6518 - val_loss: 0.6361 - val_acc: 0.6494
Epoch 338/500
10/10 [==============================] - 1s 125ms/step - loss: 0.6346 - acc:
0.6518 - val_loss: 0.6360 - val_acc: 0.6494
Epoch 339/500
10/10 [==============================] - 1s 144ms/step - loss: 0.6345 - acc:
0.6518 - val_loss: 0.6359 - val_acc: 0.6494
Epoch 340/500
10/10 [==============================] - 1s 84ms/step - loss: 0.6344 - acc:
0.6518 - val_loss: 0.6358 - val_acc: 0.6494
Epoch 341/500
10/10 [==============================] - 1s 91ms/step - loss: 0.6342 - acc:
0.6518 - val_loss: 0.6357 - val_acc: 0.6494
Epoch 342/500
10/10 [==============================] - 1s 127ms/step - loss: 0.6341 - acc:
0.6518 - val_loss: 0.6355 - val_acc: 0.6494
Epoch 343/500
10/10 [==============================] - 1s 125ms/step - loss: 0.6340 - acc:
0.6518 - val_loss: 0.6354 - val_acc: 0.6494
Epoch 344/500
10/10 [==============================] - 1s 103ms/step - loss: 0.6339 - acc:
0.6518 - val_loss: 0.6353 - val_acc: 0.6494
Epoch 345/500
10/10 [==============================] - 1s 104ms/step - loss: 0.6338 - acc:
0.6518 - val_loss: 0.6352 - val_acc: 0.6494
Epoch 346/500
10/10 [==============================] - 1s 134ms/step - loss: 0.6337 - acc:
0.6518 - val_loss: 0.6351 - val_acc: 0.6494
Epoch 347/500
10/10 [==============================] - 2s 156ms/step - loss: 0.6336 - acc:
0.6518 - val_loss: 0.6350 - val_acc: 0.6494
```

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Epoch 348/500
10/10 [==============================] - 1s 120ms/step - loss: 0.6334 - acc:
0.6518 - val_loss: 0.6349 - val_acc: 0.6494
Epoch 349/500
10/10 [==============================] - 1s 120ms/step - loss: 0.6333 - acc:
0.6518 - val_loss: 0.6348 - val_acc: 0.6494
Epoch 350/500
10/10 [==============================] - 1s 119ms/step - loss: 0.6332 - acc:
0.6518 - val_loss: 0.6347 - val_acc: 0.6494
Epoch 351/500
10/10 [==============================] - 1s 115ms/step - loss: 0.6331 - acc:
0.6518 - val_loss: 0.6346 - val_acc: 0.6494
Epoch 352/500
10/10 [==============================] - 1s 117ms/step - loss: 0.6330 - acc:
0.6518 - val_loss: 0.6344 - val_acc: 0.6494
Epoch 353/500
10/10 [==============================] - 1s 123ms/step - loss: 0.6329 - acc:
0.6518 - val_loss: 0.6343 - val_acc: 0.6494
Epoch 354/500
10/10 [==============================] - 1s 129ms/step - loss: 0.6327 - acc:
0.6518 - val_loss: 0.6342 - val_acc: 0.6494
Epoch 355/500
10/10 [==============================] - 1s 107ms/step - loss: 0.6326 - acc:
0.6518 - val_loss: 0.6341 - val_acc: 0.6494
Epoch 356/500
10/10 [==============================] - 1s 101ms/step - loss: 0.6325 - acc:
0.6518 - val_loss: 0.6340 - val_acc: 0.6494
Epoch 357/500
10/10 [==============================] - 1s 80ms/step - loss: 0.6324 - acc:
0.6518 - val_loss: 0.6339 - val_acc: 0.6494
Epoch 358/500
10/10 [==============================] - 1s 90ms/step - loss: 0.6323 - acc:
0.6518 - val_loss: 0.6338 - val_acc: 0.6494
Epoch 359/500
10/10 [==============================] - 1s 86ms/step - loss: 0.6322 - acc:
0.6518 - val_loss: 0.6337 - val_acc: 0.6494
Epoch 360/500
10/10 [==============================] - 1s 93ms/step - loss: 0.6321 - acc:
0.6518 - val_loss: 0.6335 - val_acc: 0.6494
Epoch 361/500
10/10 [==============================] - 1s 97ms/step - loss: 0.6319 - acc:
0.6518 - val_loss: 0.6334 - val_acc: 0.6494
Epoch 362/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6318 - acc:
0.6518 - val_loss: 0.6333 - val_acc: 0.6494
Epoch 363/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6317 - acc:
0.6518 - val_loss: 0.6332 - val_acc: 0.6494
```

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Epoch 364/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6316 - acc:
0.6518 - val_loss: 0.6331 - val_acc: 0.6494
Epoch 365/500
10/10 [==============================] - 1s 81ms/step - loss: 0.6315 - acc:
0.6518 - val_loss: 0.6330 - val_acc: 0.6494
Epoch 366/500
10/10 [==============================] - 1s 97ms/step - loss: 0.6314 - acc:
0.6518 - val_loss: 0.6329 - val_acc: 0.6494
Epoch 367/500
10/10 [==============================] - 1s 72ms/step - loss: 0.6312 - acc:
0.6518 - val_loss: 0.6328 - val_acc: 0.6494
Epoch 368/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6311 - acc:
0.6518 - val_loss: 0.6327 - val_acc: 0.6494
Epoch 369/500
10/10 [==============================] - 1s 77ms/step - loss: 0.6310 - acc:
0.6518 - val_loss: 0.6325 - val_acc: 0.6494
Epoch 370/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6309 - acc:
0.6518 - val_loss: 0.6324 - val_acc: 0.6494
Epoch 371/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6308 - acc:
0.6518 - val_loss: 0.6323 - val_acc: 0.6494
Epoch 372/500
10/10 [==============================] - 1s 82ms/step - loss: 0.6307 - acc:
0.6518 - val_loss: 0.6322 - val_acc: 0.6494
Epoch 373/500
10/10 [==============================] - 1s 84ms/step - loss: 0.6305 - acc:
0.6518 - val_loss: 0.6321 - val_acc: 0.6494
Epoch 374/500
10/10 [==============================] - 1s 113ms/step - loss: 0.6304 - acc:
0.6518 - val_loss: 0.6320 - val_acc: 0.6494
Epoch 375/500
10/10 [==============================] - 1s 83ms/step - loss: 0.6303 - acc:
0.6518 - val_loss: 0.6319 - val_acc: 0.6494
Epoch 376/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6302 - acc:
0.6518 - val_loss: 0.6317 - val_acc: 0.6494
Epoch 377/500
10/10 [==============================] - 1s 70ms/step - loss: 0.6301 - acc:
0.6518 - val_loss: 0.6316 - val_acc: 0.6494
Epoch 378/500
10/10 [==============================] - 1s 82ms/step - loss: 0.6300 - acc:
0.6518 - val_loss: 0.6315 - val_acc: 0.6494
Epoch 379/500
10/10 [==============================] - 1s 82ms/step - loss: 0.6298 - acc:
0.6518 - val_loss: 0.6314 - val_acc: 0.6494
```

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Epoch 380/500
10/10 [==============================] - 1s 70ms/step - loss: 0.6297 - acc:
0.6518 - val_loss: 0.6313 - val_acc: 0.6494
Epoch 381/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6296 - acc:
0.6518 - val_loss: 0.6312 - val_acc: 0.6494
Epoch 382/500
10/10 [==============================] - 1s 68ms/step - loss: 0.6295 - acc:
0.6518 - val_loss: 0.6311 - val_acc: 0.6494
Epoch 383/500
10/10 [==============================] - 1s 70ms/step - loss: 0.6294 - acc:
0.6518 - val_loss: 0.6309 - val_acc: 0.6494
Epoch 384/500
10/10 [==============================] - 1s 69ms/step - loss: 0.6292 - acc:
0.6518 - val_loss: 0.6308 - val_acc: 0.6494
Epoch 385/500
10/10 [==============================] - 1s 67ms/step - loss: 0.6291 - acc:
0.6518 - val_loss: 0.6307 - val_acc: 0.6494
Epoch 386/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6290 - acc:
0.6518 - val_loss: 0.6306 - val_acc: 0.6494
Epoch 387/500
10/10 [==============================] - 1s 77ms/step - loss: 0.6289 - acc:
0.6518 - val_loss: 0.6305 - val_acc: 0.6494
Epoch 388/500
10/10 [==============================] - 1s 62ms/step - loss: 0.6288 - acc:
0.6518 - val_loss: 0.6304 - val_acc: 0.6494
Epoch 389/500
10/10 [==============================] - 1s 77ms/step - loss: 0.6286 - acc:
0.6518 - val_loss: 0.6302 - val_acc: 0.6494
Epoch 390/500
10/10 [==============================] - 1s 85ms/step - loss: 0.6285 - acc:
0.6518 - val_loss: 0.6301 - val_acc: 0.6494
Epoch 391/500
10/10 [==============================] - 1s 82ms/step - loss: 0.6284 - acc:
0.6518 - val_loss: 0.6300 - val_acc: 0.6494
Epoch 392/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6283 - acc:
0.6518 - val_loss: 0.6299 - val_acc: 0.6494
Epoch 393/500
10/10 [==============================] - 1s 83ms/step - loss: 0.6282 - acc:
0.6518 - val_loss: 0.6298 - val_acc: 0.6494
Epoch 394/500
10/10 [==============================] - 1s 83ms/step - loss: 0.6280 - acc:
0.6518 - val_loss: 0.6297 - val_acc: 0.6494
Epoch 395/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6279 - acc:
0.6518 - val_loss: 0.6295 - val_acc: 0.6494
```

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Epoch 396/500
10/10 [==============================] - 1s 141ms/step - loss: 0.6278 - acc:
0.6518 - val_loss: 0.6294 - val_acc: 0.6494
Epoch 397/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6277 - acc:
0.6518 - val_loss: 0.6293 - val_acc: 0.6494
Epoch 398/500
10/10 [==============================] - 1s 73ms/step - loss: 0.6275 - acc:
0.6518 - val_loss: 0.6292 - val_acc: 0.6494
Epoch 399/500
10/10 [==============================] - 1s 99ms/step - loss: 0.6274 - acc:
0.6518 - val_loss: 0.6291 - val_acc: 0.6494
Epoch 400/500
10/10 [==============================] - 1s 100ms/step - loss: 0.6273 - acc:
0.6518 - val_loss: 0.6289 - val_acc: 0.6494
Epoch 401/500
10/10 [==============================] - 1s 71ms/step - loss: 0.6272 - acc:
0.6518 - val_loss: 0.6288 - val_acc: 0.6494
Epoch 402/500
10/10 [==============================] - 1s 87ms/step - loss: 0.6271 - acc:
0.6518 - val_loss: 0.6287 - val_acc: 0.6494
Epoch 403/500
10/10 [==============================] - 1s 85ms/step - loss: 0.6269 - acc:
0.6518 - val_loss: 0.6286 - val_acc: 0.6494
Epoch 404/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6268 - acc:
0.6518 - val_loss: 0.6285 - val_acc: 0.6494
Epoch 405/500
10/10 [==============================] - 1s 99ms/step - loss: 0.6267 - acc:
0.6518 - val_loss: 0.6283 - val_acc: 0.6494
Epoch 406/500
10/10 [==============================] - 1s 103ms/step - loss: 0.6266 - acc:
0.6518 - val_loss: 0.6282 - val_acc: 0.6494
Epoch 407/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6264 - acc:
0.6518 - val_loss: 0.6281 - val_acc: 0.6494
Epoch 408/500
10/10 [==============================] - 1s 127ms/step - loss: 0.6263 - acc:
0.6518 - val_loss: 0.6280 - val_acc: 0.6494
Epoch 409/500
10/10 [==============================] - 1s 81ms/step - loss: 0.6262 - acc:
0.6518 - val_loss: 0.6278 - val_acc: 0.6494
Epoch 410/500
10/10 [==============================] - 1s 73ms/step - loss: 0.6261 - acc:
0.6518 - val_loss: 0.6277 - val_acc: 0.6494
Epoch 411/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6259 - acc:
0.6518 - val_loss: 0.6276 - val_acc: 0.6494
```

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Epoch 412/500
10/10 [==============================] - 1s 103ms/step - loss: 0.6258 - acc:
0.6518 - val_loss: 0.6275 - val_acc: 0.6494
Epoch 413/500
10/10 [==============================] - 1s 108ms/step - loss: 0.6257 - acc:
0.6518 - val_loss: 0.6274 - val_acc: 0.6494
Epoch 414/500
10/10 [==============================] - 1s 105ms/step - loss: 0.6256 - acc:
0.6518 - val_loss: 0.6272 - val_acc: 0.6494
Epoch 415/500
10/10 [==============================] - 1s 83ms/step - loss: 0.6254 - acc:
0.6518 - val_loss: 0.6271 - val_acc: 0.6494
Epoch 416/500
10/10 [==============================] - 1s 87ms/step - loss: 0.6253 - acc:
0.6518 - val_loss: 0.6270 - val_acc: 0.6494
Epoch 417/500
10/10 [==============================] - 1s 101ms/step - loss: 0.6252 - acc:
0.6518 - val_loss: 0.6269 - val_acc: 0.6494
Epoch 418/500
10/10 [==============================] - 1s 110ms/step - loss: 0.6250 - acc:
0.6518 - val_loss: 0.6267 - val_acc: 0.6494
Epoch 419/500
10/10 [==============================] - 1s 84ms/step - loss: 0.6249 - acc:
0.6518 - val_loss: 0.6266 - val_acc: 0.6494
Epoch 420/500
10/10 [==============================] - 1s 82ms/step - loss: 0.6248 - acc:
0.6518 - val_loss: 0.6265 - val_acc: 0.6494
Epoch 421/500
10/10 [==============================] - 1s 81ms/step - loss: 0.6247 - acc:
0.6518 - val_loss: 0.6264 - val_acc: 0.6494
Epoch 422/500
10/10 [==============================] - 1s 77ms/step - loss: 0.6245 - acc:
0.6518 - val_loss: 0.6262 - val_acc: 0.6494
Epoch 423/500
10/10 [==============================] - 1s 77ms/step - loss: 0.6244 - acc:
0.6518 - val_loss: 0.6261 - val_acc: 0.6494
Epoch 424/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6243 - acc:
0.6518 - val_loss: 0.6260 - val_acc: 0.6494
Epoch 425/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6241 - acc:
0.6518 - val_loss: 0.6258 - val_acc: 0.6494
Epoch 426/500
10/10 [==============================] - 1s 102ms/step - loss: 0.6240 - acc:
0.6518 - val_loss: 0.6257 - val_acc: 0.6494
Epoch 427/500
10/10 [==============================] - 1s 145ms/step - loss: 0.6239 - acc:
0.6518 - val_loss: 0.6256 - val_acc: 0.6494
```

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Epoch 428/500
10/10 [==============================] - 1s 105ms/step - loss: 0.6237 - acc:
0.6518 - val_loss: 0.6255 - val_acc: 0.6494
Epoch 429/500
10/10 [==============================] - 1s 65ms/step - loss: 0.6236 - acc:
0.6518 - val_loss: 0.6253 - val_acc: 0.6494
Epoch 430/500
10/10 [==============================] - 1s 69ms/step - loss: 0.6235 - acc:
0.6518 - val_loss: 0.6252 - val_acc: 0.6494
Epoch 431/500
10/10 [==============================] - 1s 106ms/step - loss: 0.6233 - acc:
0.6518 - val_loss: 0.6251 - val_acc: 0.6494
Epoch 432/500
10/10 [==============================] - 2s 221ms/step - loss: 0.6232 - acc:
0.6518 - val_loss: 0.6249 - val_acc: 0.6494
Epoch 433/500
10/10 [==============================] - 1s 84ms/step - loss: 0.6231 - acc:
0.6518 - val_loss: 0.6248 - val_acc: 0.6494
Epoch 434/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6229 - acc:
0.6518 - val_loss: 0.6247 - val_acc: 0.6494
Epoch 435/500
10/10 [==============================] - 1s 146ms/step - loss: 0.6228 - acc:
0.6518 - val_loss: 0.6246 - val_acc: 0.6494
Epoch 436/500
10/10 [==============================] - 1s 77ms/step - loss: 0.6227 - acc:
0.6518 - val_loss: 0.6244 - val_acc: 0.6494
Epoch 437/500
10/10 [==============================] - 1s 123ms/step - loss: 0.6225 - acc:
0.6518 - val_loss: 0.6243 - val_acc: 0.6494
Epoch 438/500
10/10 [==============================] - 2s 191ms/step - loss: 0.6224 - acc:
0.6518 - val_loss: 0.6242 - val_acc: 0.6494
Epoch 439/500
10/10 [==============================] - 1s 128ms/step - loss: 0.6223 - acc:
0.6518 - val_loss: 0.6240 - val_acc: 0.6494
Epoch 440/500
10/10 [==============================] - 1s 117ms/step - loss: 0.6221 - acc:
0.6518 - val_loss: 0.6239 - val_acc: 0.6494
Epoch 441/500
10/10 [==============================] - 1s 83ms/step - loss: 0.6220 - acc:
0.6518 - val_loss: 0.6238 - val_acc: 0.6494
Epoch 442/500
10/10 [==============================] - 1s 97ms/step - loss: 0.6219 - acc:
0.6518 - val_loss: 0.6236 - val_acc: 0.6494
Epoch 443/500
10/10 [==============================] - 1s 95ms/step - loss: 0.6217 - acc:
0.6518 - val_loss: 0.6235 - val_acc: 0.6494
```

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Epoch 444/500
10/10 [==============================] - 1s 102ms/step - loss: 0.6216 - acc:
0.6518 - val_loss: 0.6234 - val_acc: 0.6494
Epoch 445/500
10/10 [==============================] - 1s 95ms/step - loss: 0.6215 - acc:
0.6518 - val_loss: 0.6232 - val_acc: 0.6494
Epoch 446/500
10/10 [==============================] - 1s 98ms/step - loss: 0.6213 - acc:
0.6518 - val_loss: 0.6231 - val_acc: 0.6494
Epoch 447/500
10/10 [==============================] - 1s 116ms/step - loss: 0.6212 - acc:
0.6518 - val_loss: 0.6230 - val_acc: 0.6494
Epoch 448/500
10/10 [==============================] - 1s 117ms/step - loss: 0.6210 - acc:
0.6518 - val_loss: 0.6228 - val_acc: 0.6494
Epoch 449/500
10/10 [==============================] - 1s 107ms/step - loss: 0.6209 - acc:
0.6518 - val_loss: 0.6227 - val_acc: 0.6494
Epoch 450/500
10/10 [==============================] - 1s 88ms/step - loss: 0.6208 - acc:
0.6518 - val_loss: 0.6226 - val_acc: 0.6494
Epoch 451/500
10/10 [==============================] - 1s 110ms/step - loss: 0.6206 - acc:
0.6518 - val_loss: 0.6224 - val_acc: 0.6494
Epoch 452/500
10/10 [==============================] - 1s 129ms/step - loss: 0.6205 - acc:
0.6518 - val_loss: 0.6223 - val_acc: 0.6494
Epoch 453/500
10/10 [==============================] - 1s 102ms/step - loss: 0.6203 - acc:
0.6518 - val_loss: 0.6221 - val_acc: 0.6494
Epoch 454/500
10/10 [==============================] - 1s 127ms/step - loss: 0.6202 - acc:
0.6518 - val_loss: 0.6220 - val_acc: 0.6494
Epoch 455/500
10/10 [==============================] - 2s 170ms/step - loss: 0.6201 - acc:
0.6518 - val_loss: 0.6219 - val_acc: 0.6494
Epoch 456/500
10/10 [==============================] - 1s 114ms/step - loss: 0.6199 - acc:
0.6518 - val_loss: 0.6217 - val_acc: 0.6494
Epoch 457/500
10/10 [==============================] - 2s 206ms/step - loss: 0.6198 - acc:
0.6518 - val_loss: 0.6216 - val_acc: 0.6494
Epoch 458/500
10/10 [==============================] - 2s 168ms/step - loss: 0.6196 - acc:
0.6518 - val_loss: 0.6214 - val_acc: 0.6494
Epoch 459/500
10/10 [==============================] - 1s 127ms/step - loss: 0.6195 - acc:
0.6518 - val_loss: 0.6213 - val_acc: 0.6494
```

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Epoch 460/500
10/10 [==============================] - 1s 109ms/step - loss: 0.6194 - acc:
0.6518 - val_loss: 0.6212 - val_acc: 0.6494
Epoch 461/500
10/10 [==============================] - 1s 125ms/step - loss: 0.6192 - acc:
0.6518 - val_loss: 0.6210 - val_acc: 0.6494
Epoch 462/500
10/10 [==============================] - 1s 131ms/step - loss: 0.6191 - acc:
0.6518 - val_loss: 0.6209 - val_acc: 0.6494
Epoch 463/500
10/10 [==============================] - 1s 113ms/step - loss: 0.6189 - acc:
0.6518 - val_loss: 0.6207 - val_acc: 0.6494
Epoch 464/500
10/10 [==============================] - 1s 121ms/step - loss: 0.6188 - acc:
0.6518 - val_loss: 0.6206 - val_acc: 0.6494
Epoch 465/500
10/10 [==============================] - 1s 100ms/step - loss: 0.6186 - acc:
0.6518 - val_loss: 0.6204 - val_acc: 0.6494
Epoch 466/500
10/10 [==============================] - 1s 129ms/step - loss: 0.6185 - acc:
0.6518 - val_loss: 0.6203 - val_acc: 0.6494
Epoch 467/500
10/10 [==============================] - 1s 101ms/step - loss: 0.6183 - acc:
0.6518 - val_loss: 0.6202 - val_acc: 0.6494
Epoch 468/500
10/10 [==============================] - 2s 195ms/step - loss: 0.6182 - acc:
0.6518 - val_loss: 0.6200 - val_acc: 0.6494
Epoch 469/500
10/10 [==============================] - 1s 120ms/step - loss: 0.6180 - acc:
0.6518 - val_loss: 0.6199 - val_acc: 0.6494
Epoch 470/500
10/10 [==============================] - 1s 91ms/step - loss: 0.6179 - acc:
0.6518 - val_loss: 0.6197 - val_acc: 0.6494
Epoch 471/500
10/10 [==============================] - 1s 124ms/step - loss: 0.6177 - acc:
0.6518 - val_loss: 0.6196 - val_acc: 0.6494
Epoch 472/500
10/10 [==============================] - 1s 131ms/step - loss: 0.6176 - acc:
0.6518 - val_loss: 0.6194 - val_acc: 0.6494
Epoch 473/500
10/10 [==============================] - 1s 111ms/step - loss: 0.6175 - acc:
0.6518 - val_loss: 0.6193 - val_acc: 0.6494
Epoch 474/500
10/10 [==============================] - 2s 176ms/step - loss: 0.6173 - acc:
0.6518 - val_loss: 0.6191 - val_acc: 0.6494
Epoch 475/500
10/10 [==============================] - 1s 107ms/step - loss: 0.6172 - acc:
0.6518 - val_loss: 0.6190 - val_acc: 0.6494
```

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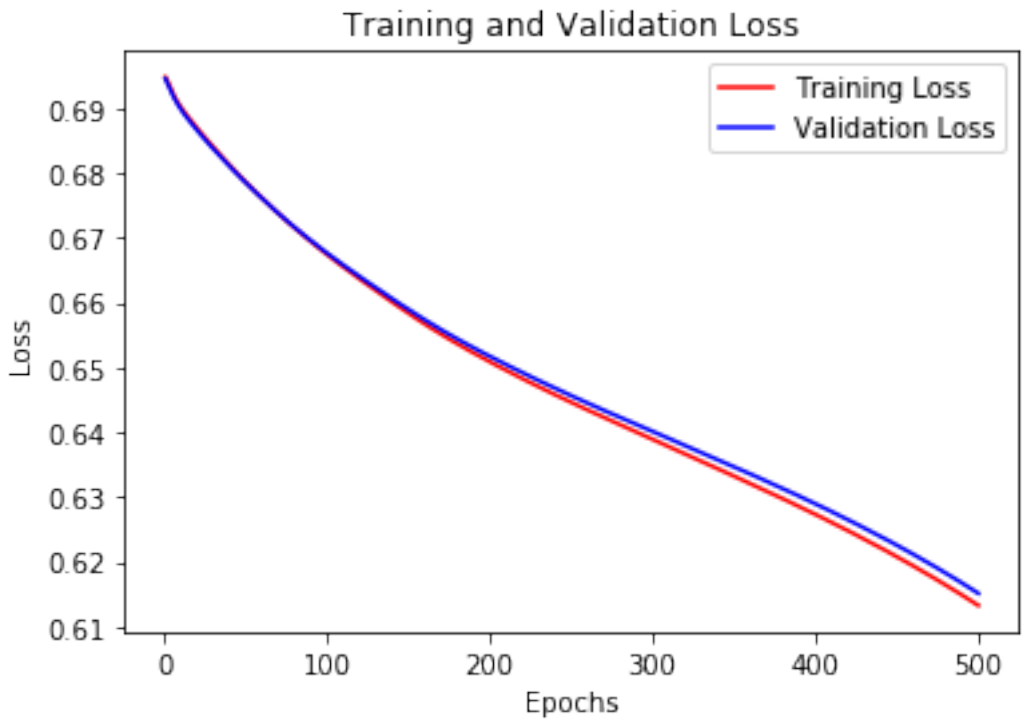
Epoch 476/500
10/10 [==============================] - 1s 109ms/step - loss: 0.6170 - acc:
0.6518 - val_loss: 0.6188 - val_acc: 0.6494
Epoch 477/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6169 - acc:
0.6518 - val_loss: 0.6187 - val_acc: 0.6494
Epoch 478/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6167 - acc:
0.6518 - val_loss: 0.6185 - val_acc: 0.6494
Epoch 479/500
10/10 [==============================] - 1s 102ms/step - loss: 0.6165 - acc:
0.6518 - val_loss: 0.6184 - val_acc: 0.6494
Epoch 480/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6164 - acc:
0.6518 - val_loss: 0.6182 - val_acc: 0.6494
Epoch 481/500
10/10 [==============================] - 1s 80ms/step - loss: 0.6162 - acc:
0.6518 - val_loss: 0.6181 - val_acc: 0.6494
Epoch 482/500
10/10 [==============================] - 1s 85ms/step - loss: 0.6161 - acc:
0.6518 - val_loss: 0.6179 - val_acc: 0.6494
Epoch 483/500
10/10 [==============================] - 1s 85ms/step - loss: 0.6159 - acc:
0.6518 - val_loss: 0.6178 - val_acc: 0.6494
Epoch 484/500
10/10 [==============================] - 1s 76ms/step - loss: 0.6158 - acc:
0.6518 - val_loss: 0.6176 - val_acc: 0.6494
Epoch 485/500
10/10 [==============================] - 1s 83ms/step - loss: 0.6156 - acc:
0.6518 - val_loss: 0.6175 - val_acc: 0.6494
Epoch 486/500
10/10 [==============================] - 1s 78ms/step - loss: 0.6155 - acc:
0.6518 - val_loss: 0.6173 - val_acc: 0.6494
Epoch 487/500
10/10 [==============================] - 1s 79ms/step - loss: 0.6153 - acc:
0.6518 - val_loss: 0.6172 - val_acc: 0.6494
Epoch 488/500
10/10 [==============================] - 1s 77ms/step - loss: 0.6152 - acc:
0.6518 - val_loss: 0.6170 - val_acc: 0.6494
Epoch 489/500
10/10 [==============================] - 1s 66ms/step - loss: 0.6150 - acc:
0.6518 - val_loss: 0.6169 - val_acc: 0.6494
Epoch 490/500
10/10 [==============================] - 1s 59ms/step - loss: 0.6148 - acc:
0.6518 - val_loss: 0.6167 - val_acc: 0.6494
Epoch 491/500
10/10 [==============================] - 1s 69ms/step - loss: 0.6147 - acc:
0.6518 - val_loss: 0.6166 - val_acc: 0.6494
```

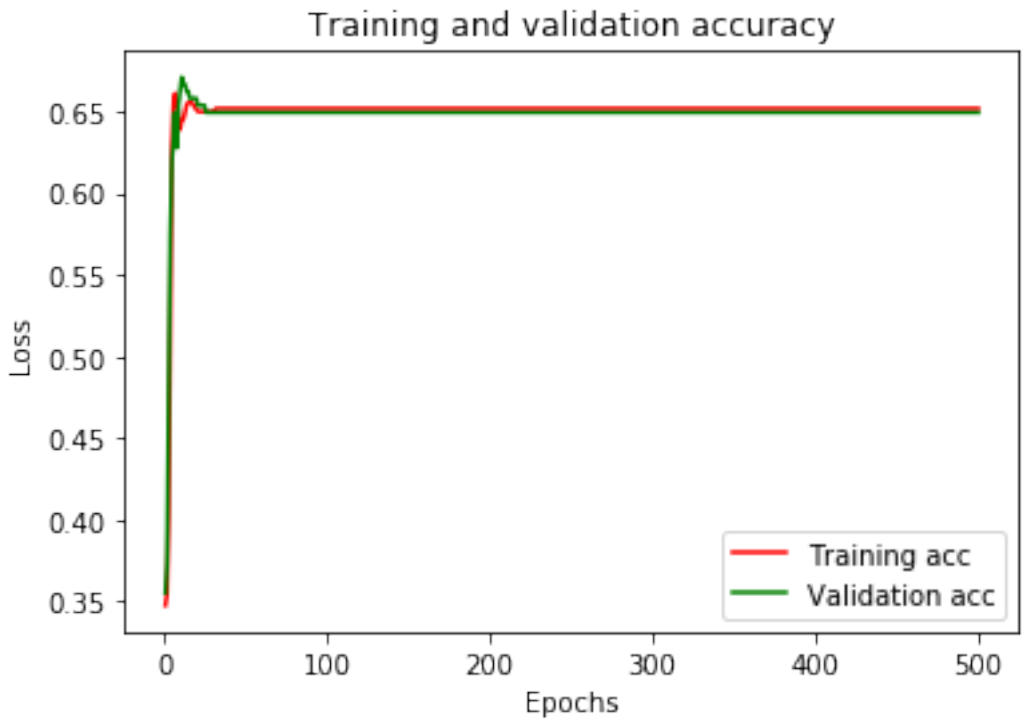
```
Epoch 492/500
10/10 [==============================] - 1s 69ms/step - loss: 0.6145 - acc:
0.6518 - val_loss: 0.6164 - val_acc: 0.6494
Epoch 493/500
10/10 [==============================] - 1s 71ms/step - loss: 0.6144 - acc:
0.6518 - val_loss: 0.6162 - val_acc: 0.6494
Epoch 494/500
10/10 [==============================] - 1s 68ms/step - loss: 0.6142 - acc:
0.6518 - val_loss: 0.6161 - val_acc: 0.6494
Epoch 495/500
10/10 [==============================] - 1s 73ms/step - loss: 0.6141 - acc:
0.6518 - val_loss: 0.6159 - val_acc: 0.6494
Epoch 496/500
10/10 [==============================] - 1s 68ms/step - loss: 0.6139 - acc:
0.6518 - val_loss: 0.6158 - val_acc: 0.6494
Epoch 497/500
10/10 [==============================] - 1s 75ms/step - loss: 0.6137 - acc:
0.6518 - val_loss: 0.6156 - val_acc: 0.6494
Epoch 498/500
10/10 [==============================] - 1s 66ms/step - loss: 0.6136 - acc:
0.6518 - val_loss: 0.6154 - val_acc: 0.6494
Epoch 499/500
10/10 [==============================] - 1s 74ms/step - loss: 0.6134 - acc:
0.6518 - val_loss: 0.6153 - val_acc: 0.6494
Epoch 500/500
10/10 [==============================] - 1s 67ms/step - loss: 0.6132 - acc:
0.6518 - val_loss: 0.6151 - val_acc: 0.6494
```

[497]:
```
loss = history.history['loss']
val_loss = history.history['val_loss']
acc = history.history['acc']
val_acc = history.history['val_acc']
```

[498]:
```
# Evaluate the losses of the model
    epochs = range(1, len(loss)+1)
    plt.plot(epochs, loss, color='red', label='Training Loss')
    plt.plot(epochs, val_loss, color='blue', label='Validation Loss')
    plt.title('Training and Validation Loss')
    plt.xlabel('Epochs')
    plt.ylabel('Loss')
    plt.legend()
    plt.show()
```



[499]:
```
# Evaluate the accuracy of the model
    plt.plot(epochs, acc, color='red', label='Training acc')
    plt.plot(epochs, val_acc, color='green', label='Validation acc')
    plt.title('Training and validation accuracy')
    plt.xlabel('Epochs')
    plt.ylabel('Loss')
    plt.legend()
    plt.show()
```

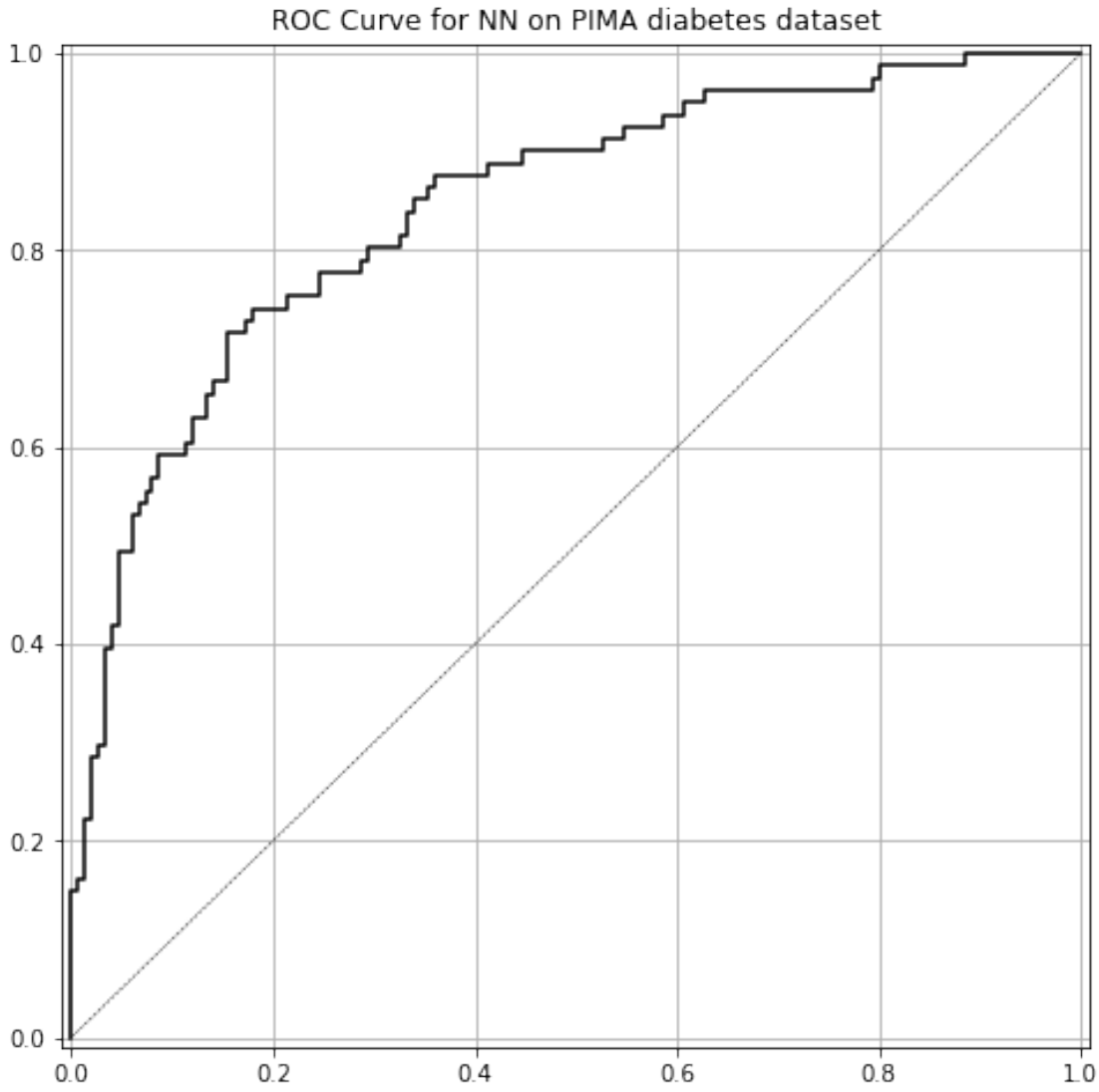


[500]:
```
y_pred_class_nn_mod5 = model.predict_classes(X_test_norm)
y_pred_prob_nn_mod5 = model.predict(X_test_norm)
```

[501]:
```
# Print model performance and plot the roc curve
print('accuracy is {:.3f}'.format(accuracy_score(y_test,y_pred_class_nn_mod5)))
print('roc-auc is {:.3f}'.format(roc_auc_score(y_test,y_pred_prob_nn_mod5)))

plot_roc(y_test, y_pred_prob_nn_mod5, 'NN')
```

```
accuracy is 0.649
roc-auc is 0.843
```



Accuracy obtained from this model is 64.9%

[352]:
```
# Train the model for the given number of epochs
    history_700 = model.fit(
        X_train_norm, y_train,
        steps_per_epoch=10,
        epochs=700,
        verbose=1,
        validation_data=(X_test, y_test),
        validation_steps=10
    )
```

```
Train on 537 samples, validate on 231 samples
Epoch 1/700
```

```
10/10 [==============================] - 1s 58ms/step - loss: 0.5281 - acc:
0.7732 - val_loss: 0.5371 - val_acc: 0.7619
Epoch 2/700
10/10 [==============================] - 1s 56ms/step - loss: 0.5277 - acc:
0.7745 - val_loss: 0.5367 - val_acc: 0.7619
Epoch 3/700
10/10 [==============================] - 1s 53ms/step - loss: 0.5272 - acc:
0.7713 - val_loss: 0.5363 - val_acc: 0.7706
Epoch 4/700
10/10 [==============================] - 0s 48ms/step - loss: 0.5268 - acc:
0.7709 - val_loss: 0.5359 - val_acc: 0.7749
Epoch 5/700
10/10 [==============================] - 1s 56ms/step - loss: 0.5263 - acc:
0.7719 - val_loss: 0.5355 - val_acc: 0.7749
Epoch 6/700
10/10 [==============================] - 1s 52ms/step - loss: 0.5258 - acc:
0.7736 - val_loss: 0.5351 - val_acc: 0.7749
Epoch 7/700
10/10 [==============================] - 1s 52ms/step - loss: 0.5254 - acc:
0.7750 - val_loss: 0.5347 - val_acc: 0.7792
Epoch 8/700
10/10 [==============================] - 1s 55ms/step - loss: 0.5249 - acc:
0.7752 - val_loss: 0.5343 - val_acc: 0.7792
Epoch 9/700
10/10 [==============================] - 1s 57ms/step - loss: 0.5245 - acc:
0.7747 - val_loss: 0.5339 - val_acc: 0.7792
Epoch 10/700
10/10 [==============================] - 1s 54ms/step - loss: 0.5240 - acc:
0.7747 - val_loss: 0.5336 - val_acc: 0.7792
Epoch 11/700
10/10 [==============================] - 1s 53ms/step - loss: 0.5236 - acc:
0.7752 - val_loss: 0.5332 - val_acc: 0.7792
Epoch 12/700
10/10 [==============================] - 1s 65ms/step - loss: 0.5231 - acc:
0.7765 - val_loss: 0.5328 - val_acc: 0.7792
Epoch 13/700
10/10 [==============================] - 1s 60ms/step - loss: 0.5227 - acc:
0.7765 - val_loss: 0.5324 - val_acc: 0.7792
Epoch 14/700
10/10 [==============================] - 1s 55ms/step - loss: 0.5222 - acc:
0.7765 - val_loss: 0.5320 - val_acc: 0.7792
Epoch 15/700
10/10 [==============================] - 1s 60ms/step - loss: 0.5218 - acc:
0.7765 - val_loss: 0.5316 - val_acc: 0.7792
Epoch 16/700
10/10 [==============================] - 1s 62ms/step - loss: 0.5213 - acc:
0.7750 - val_loss: 0.5313 - val_acc: 0.7792
Epoch 17/700
```

```
10/10 [==============================] - 1s 58ms/step - loss: 0.5209 - acc:
0.7747 - val_loss: 0.5309 - val_acc: 0.7792
Epoch 18/700
10/10 [==============================] - 1s 56ms/step - loss: 0.5204 - acc:
0.7747 - val_loss: 0.5305 - val_acc: 0.7879
Epoch 19/700
10/10 [==============================] - 1s 57ms/step - loss: 0.5200 - acc:
0.7760 - val_loss: 0.5301 - val_acc: 0.7879
Epoch 20/700
10/10 [==============================] - 1s 63ms/step - loss: 0.5195 - acc:
0.7765 - val_loss: 0.5297 - val_acc: 0.7879
Epoch 21/700
10/10 [==============================] - 1s 54ms/step - loss: 0.5191 - acc:
0.7765 - val_loss: 0.5294 - val_acc: 0.7922
Epoch 22/700
10/10 [==============================] - 1s 56ms/step - loss: 0.5187 - acc:
0.7765 - val_loss: 0.5290 - val_acc: 0.7922
Epoch 23/700
10/10 [==============================] - 1s 57ms/step - loss: 0.5182 - acc:
0.7765 - val_loss: 0.5286 - val_acc: 0.7922
Epoch 24/700
10/10 [==============================] - 1s 56ms/step - loss: 0.5178 - acc:
0.7765 - val_loss: 0.5282 - val_acc: 0.7922
Epoch 25/700
10/10 [==============================] - 1s 50ms/step - loss: 0.5173 - acc:
0.7765 - val_loss: 0.5279 - val_acc: 0.7922
Epoch 26/700
10/10 [==============================] - 1s 53ms/step - loss: 0.5169 - acc:
0.7752 - val_loss: 0.5275 - val_acc: 0.7965
Epoch 27/700
10/10 [==============================] - 1s 54ms/step - loss: 0.5165 - acc:
0.7747 - val_loss: 0.5271 - val_acc: 0.7965
Epoch 28/700
10/10 [==============================] - 1s 57ms/step - loss: 0.5160 - acc:
0.7747 - val_loss: 0.5267 - val_acc: 0.7965
Epoch 29/700
10/10 [==============================] - 1s 57ms/step - loss: 0.5156 - acc:
0.7747 - val_loss: 0.5264 - val_acc: 0.7922
Epoch 30/700
10/10 [==============================] - 1s 52ms/step - loss: 0.5151 - acc:
0.7747 - val_loss: 0.5260 - val_acc: 0.7922
Epoch 31/700
10/10 [==============================] - 1s 63ms/step - loss: 0.5147 - acc:
0.7743 - val_loss: 0.5256 - val_acc: 0.7922
Epoch 32/700
10/10 [==============================] - 1s 75ms/step - loss: 0.5143 - acc:
0.7728 - val_loss: 0.5253 - val_acc: 0.7922
Epoch 33/700
```

```
10/10 [==============================] - 1s 56ms/step - loss: 0.5138 - acc:
0.7728 - val_loss: 0.5249 - val_acc: 0.7922
Epoch 34/700
10/10 [==============================] - 1s 57ms/step - loss: 0.5134 - acc:
0.7728 - val_loss: 0.5245 - val_acc: 0.7922
Epoch 35/700
10/10 [==============================] - 1s 52ms/step - loss: 0.5129 - acc:
0.7728 - val_loss: 0.5242 - val_acc: 0.7922
Epoch 36/700
10/10 [==============================] - 1s 61ms/step - loss: 0.5125 - acc:
0.7730 - val_loss: 0.5238 - val_acc: 0.7922
Epoch 37/700
10/10 [==============================] - 1s 59ms/step - loss: 0.5121 - acc:
0.7747 - val_loss: 0.5234 - val_acc: 0.7922
Epoch 38/700
10/10 [==============================] - 1s 51ms/step - loss: 0.5116 - acc:
0.7728 - val_loss: 0.5231 - val_acc: 0.7922
Epoch 39/700
10/10 [==============================] - 1s 58ms/step - loss: 0.5112 - acc:
0.7728 - val_loss: 0.5227 - val_acc: 0.7879
Epoch 40/700
10/10 [==============================] - 1s 53ms/step - loss: 0.5107 - acc:
0.7709 - val_loss: 0.5224 - val_acc: 0.7879
Epoch 41/700
10/10 [==============================] - 1s 56ms/step - loss: 0.5103 - acc:
0.7702 - val_loss: 0.5220 - val_acc: 0.7879
Epoch 42/700
10/10 [==============================] - 1s 60ms/step - loss: 0.5099 - acc:
0.7700 - val_loss: 0.5217 - val_acc: 0.7879
Epoch 43/700
10/10 [==============================] - ETA: 0s - loss: 0.5095 - acc: 0.769 -
1s 56ms/step - loss: 0.5094 - acc: 0.7691 - val_loss: 0.5213 - val_acc: 0.7879
Epoch 44/700
10/10 [==============================] - 1s 60ms/step - loss: 0.5090 - acc:
0.7713 - val_loss: 0.5209 - val_acc: 0.7879
Epoch 45/700
10/10 [==============================] - 1s 57ms/step - loss: 0.5086 - acc:
0.7728 - val_loss: 0.5206 - val_acc: 0.7879
Epoch 46/700
10/10 [==============================] - 1s 59ms/step - loss: 0.5081 - acc:
0.7728 - val_loss: 0.5202 - val_acc: 0.7879
Epoch 47/700
10/10 [==============================] - 1s 51ms/step - loss: 0.5077 - acc:
0.7728 - val_loss: 0.5199 - val_acc: 0.7879
Epoch 48/700
10/10 [==============================] - 1s 57ms/step - loss: 0.5073 - acc:
0.7728 - val_loss: 0.5195 - val_acc: 0.7879
Epoch 49/700
```

```
10/10 [==============================] - 1s 60ms/step - loss: 0.5068 - acc:
0.7728 - val_loss: 0.5192 - val_acc: 0.7879
Epoch 50/700
10/10 [==============================] - 1s 60ms/step - loss: 0.5064 - acc:
0.7728 - val_loss: 0.5188 - val_acc: 0.7879
Epoch 51/700
10/10 [==============================] - 1s 63ms/step - loss: 0.5060 - acc:
0.7726 - val_loss: 0.5185 - val_acc: 0.7879
Epoch 52/700
10/10 [==============================] - 1s 68ms/step - loss: 0.5056 - acc:
0.7764 - val_loss: 0.5182 - val_acc: 0.7835
Epoch 53/700
10/10 [==============================] - 1s 69ms/step - loss: 0.5051 - acc:
0.7784 - val_loss: 0.5178 - val_acc: 0.7835
Epoch 54/700
10/10 [==============================] - 1s 59ms/step - loss: 0.5047 - acc:
0.7784 - val_loss: 0.5175 - val_acc: 0.7835
Epoch 55/700
10/10 [==============================] - 1s 53ms/step - loss: 0.5043 - acc:
0.7778 - val_loss: 0.5171 - val_acc: 0.7879
Epoch 56/700
10/10 [==============================] - 1s 51ms/step - loss: 0.5039 - acc:
0.7765 - val_loss: 0.5168 - val_acc: 0.7879
Epoch 57/700
10/10 [==============================] - 1s 70ms/step - loss: 0.5034 - acc:
0.7749 - val_loss: 0.5165 - val_acc: 0.7879
Epoch 58/700
10/10 [==============================] - 1s 56ms/step - loss: 0.5030 - acc:
0.7747 - val_loss: 0.5161 - val_acc: 0.7879
Epoch 59/700
10/10 [==============================] - 1s 66ms/step - loss: 0.5026 - acc:
0.7756 - val_loss: 0.5158 - val_acc: 0.7879
Epoch 60/700
10/10 [==============================] - 1s 64ms/step - loss: 0.5022 - acc:
0.7765 - val_loss: 0.5155 - val_acc: 0.7879
Epoch 61/700
10/10 [==============================] - 1s 63ms/step - loss: 0.5017 - acc:
0.7765 - val_loss: 0.5151 - val_acc: 0.7879
Epoch 62/700
10/10 [==============================] - 1s 53ms/step - loss: 0.5013 - acc:
0.7765 - val_loss: 0.5148 - val_acc: 0.7879
Epoch 63/700
10/10 [==============================] - 0s 47ms/step - loss: 0.5009 - acc:
0.7765 - val_loss: 0.5145 - val_acc: 0.7879
Epoch 64/700
10/10 [==============================] - 1s 51ms/step - loss: 0.5005 - acc:
0.7765 - val_loss: 0.5141 - val_acc: 0.7879
Epoch 65/700
```

```
10/10 [==============================] - 0s 49ms/step - loss: 0.5000 - acc:
0.7765 - val_loss: 0.5138 - val_acc: 0.7879
Epoch 66/700
10/10 [==============================] - 1s 50ms/step - loss: 0.4996 - acc:
0.7765 - val_loss: 0.5135 - val_acc: 0.7879
Epoch 67/700
10/10 [==============================] - 1s 57ms/step - loss: 0.4992 - acc:
0.7765 - val_loss: 0.5131 - val_acc: 0.7879
Epoch 68/700
10/10 [==============================] - 1s 52ms/step - loss: 0.4988 - acc:
0.7765 - val_loss: 0.5128 - val_acc: 0.7879
Epoch 69/700
10/10 [==============================] - 0s 49ms/step - loss: 0.4984 - acc:
0.7765 - val_loss: 0.5125 - val_acc: 0.7879
Epoch 70/700
10/10 [==============================] - 1s 54ms/step - loss: 0.4980 - acc:
0.7765 - val_loss: 0.5122 - val_acc: 0.7879
Epoch 71/700
10/10 [==============================] - 1s 53ms/step - loss: 0.4975 - acc:
0.7780 - val_loss: 0.5118 - val_acc: 0.7835
Epoch 72/700
10/10 [==============================] - 0s 49ms/step - loss: 0.4971 - acc:
0.7784 - val_loss: 0.5115 - val_acc: 0.7835
Epoch 73/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4967 - acc:
0.7784 - val_loss: 0.5112 - val_acc: 0.7835
Epoch 74/700
10/10 [==============================] - 1s 65ms/step - loss: 0.4963 - acc:
0.7801 - val_loss: 0.5109 - val_acc: 0.7835
Epoch 75/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4959 - acc:
0.7832 - val_loss: 0.5106 - val_acc: 0.7835
Epoch 76/700
10/10 [==============================] - 1s 55ms/step - loss: 0.4955 - acc:
0.7840 - val_loss: 0.5102 - val_acc: 0.7835
Epoch 77/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4951 - acc:
0.7845 - val_loss: 0.5099 - val_acc: 0.7879
Epoch 78/700
10/10 [==============================] - 0s 50ms/step - loss: 0.4947 - acc:
0.7858 - val_loss: 0.5096 - val_acc: 0.7879
Epoch 79/700
10/10 [==============================] - 1s 52ms/step - loss: 0.4942 - acc:
0.7844 - val_loss: 0.5093 - val_acc: 0.7922
Epoch 80/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4938 - acc:
0.7840 - val_loss: 0.5090 - val_acc: 0.7879
Epoch 81/700
```

```
10/10 [==============================] - 1s 54ms/step - loss: 0.4934 - acc:
0.7855 - val_loss: 0.5087 - val_acc: 0.7879
Epoch 82/700
10/10 [==============================] - 1s 53ms/step - loss: 0.4930 - acc:
0.7858 - val_loss: 0.5084 - val_acc: 0.7879
Epoch 83/700
10/10 [==============================] - 1s 55ms/step - loss: 0.4926 - acc:
0.7858 - val_loss: 0.5081 - val_acc: 0.7879
Epoch 84/700
10/10 [==============================] - 1s 54ms/step - loss: 0.4922 - acc:
0.7858 - val_loss: 0.5078 - val_acc: 0.7835
Epoch 85/700
10/10 [==============================] - 1s 74ms/step - loss: 0.4918 - acc:
0.7858 - val_loss: 0.5075 - val_acc: 0.7835
Epoch 86/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4914 - acc:
0.7858 - val_loss: 0.5072 - val_acc: 0.7835
Epoch 87/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4910 - acc:
0.7858 - val_loss: 0.5069 - val_acc: 0.7835
Epoch 88/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4906 - acc:
0.7858 - val_loss: 0.5066 - val_acc: 0.7835
Epoch 89/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4902 - acc:
0.7858 - val_loss: 0.5063 - val_acc: 0.7879
Epoch 90/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4898 - acc:
0.7858 - val_loss: 0.5060 - val_acc: 0.7879
Epoch 91/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4894 - acc:
0.7858 - val_loss: 0.5057 - val_acc: 0.7835
Epoch 92/700
10/10 [==============================] - 1s 65ms/step - loss: 0.4890 - acc:
0.7858 - val_loss: 0.5054 - val_acc: 0.7835
Epoch 93/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4886 - acc:
0.7877 - val_loss: 0.5051 - val_acc: 0.7835
Epoch 94/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4882 - acc:
0.7877 - val_loss: 0.5048 - val_acc: 0.7835
Epoch 95/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4878 - acc:
0.7877 - val_loss: 0.5045 - val_acc: 0.7835
Epoch 96/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4874 - acc:
0.7877 - val_loss: 0.5042 - val_acc: 0.7879
Epoch 97/700
```

```
10/10 [==============================] - 1s 58ms/step - loss: 0.4870 - acc:
0.7877 - val_loss: 0.5040 - val_acc: 0.7879
Epoch 98/700
10/10 [==============================] - 1s 57ms/step - loss: 0.4866 - acc:
0.7870 - val_loss: 0.5037 - val_acc: 0.7879
Epoch 99/700
10/10 [==============================] - 1s 64ms/step - loss: 0.4862 - acc:
0.7858 - val_loss: 0.5034 - val_acc: 0.7879
Epoch 100/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4858 - acc:
0.7858 - val_loss: 0.5031 - val_acc: 0.7879
Epoch 101/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4854 - acc:
0.7858 - val_loss: 0.5028 - val_acc: 0.7922
Epoch 102/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4850 - acc:
0.7858 - val_loss: 0.5026 - val_acc: 0.7922
Epoch 103/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4846 - acc:
0.7858 - val_loss: 0.5023 - val_acc: 0.7922
Epoch 104/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4842 - acc:
0.7858 - val_loss: 0.5020 - val_acc: 0.7922
Epoch 105/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4838 - acc:
0.7858 - val_loss: 0.5017 - val_acc: 0.7922
Epoch 106/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4834 - acc:
0.7858 - val_loss: 0.5015 - val_acc: 0.7922
Epoch 107/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4830 - acc:
0.7858 - val_loss: 0.5012 - val_acc: 0.7879
Epoch 108/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4826 - acc:
0.7858 - val_loss: 0.5009 - val_acc: 0.7879
Epoch 109/700
10/10 [==============================] - 1s 62ms/step - loss: 0.4822 - acc:
0.7858 - val_loss: 0.5006 - val_acc: 0.7879
Epoch 110/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4818 - acc:
0.7858 - val_loss: 0.5004 - val_acc: 0.7879
Epoch 111/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4815 - acc:
0.7858 - val_loss: 0.5001 - val_acc: 0.7879
Epoch 112/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4811 - acc:
0.7858 - val_loss: 0.4998 - val_acc: 0.7879
Epoch 113/700
```

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10/10 [==============================] - 1s 58ms/step - loss: 0.4807 - acc:
0.7858 - val_loss: 0.4996 - val_acc: 0.7879
Epoch 114/700
10/10 [==============================] - 1s 65ms/step - loss: 0.4803 - acc:
0.7858 - val_loss: 0.4993 - val_acc: 0.7879
Epoch 115/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4799 - acc:
0.7886 - val_loss: 0.4991 - val_acc: 0.7879
Epoch 116/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4795 - acc:
0.7896 - val_loss: 0.4988 - val_acc: 0.7879
Epoch 117/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4791 - acc:
0.7914 - val_loss: 0.4985 - val_acc: 0.7879
Epoch 118/700
10/10 [==============================] - 1s 57ms/step - loss: 0.4787 - acc:
0.7914 - val_loss: 0.4983 - val_acc: 0.7879
Epoch 119/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4784 - acc:
0.7914 - val_loss: 0.4980 - val_acc: 0.7835
Epoch 120/700
10/10 [==============================] - 1s 63ms/step - loss: 0.4780 - acc:
0.7914 - val_loss: 0.4978 - val_acc: 0.7835
Epoch 121/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4776 - acc:
0.7914 - val_loss: 0.4975 - val_acc: 0.7792
Epoch 122/700
10/10 [==============================] - 1s 56ms/step - loss: 0.4772 - acc:
0.7914 - val_loss: 0.4973 - val_acc: 0.7749
Epoch 123/700
10/10 [==============================] - 1s 52ms/step - loss: 0.4768 - acc:
0.7920 - val_loss: 0.4970 - val_acc: 0.7706
Epoch 124/700
10/10 [==============================] - 1s 65ms/step - loss: 0.4764 - acc:
0.7933 - val_loss: 0.4968 - val_acc: 0.7706
Epoch 125/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4761 - acc:
0.7933 - val_loss: 0.4965 - val_acc: 0.7706
Epoch 126/700
10/10 [==============================] - 1s 62ms/step - loss: 0.4757 - acc:
0.7933 - val_loss: 0.4963 - val_acc: 0.7706
Epoch 127/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4753 - acc:
0.7933 - val_loss: 0.4961 - val_acc: 0.7706
Epoch 128/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4749 - acc:
0.7933 - val_loss: 0.4958 - val_acc: 0.7706
Epoch 129/700
```

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10/10 [==============================] - 1s 58ms/step - loss: 0.4746 - acc:
0.7933 - val_loss: 0.4956 - val_acc: 0.7706
Epoch 130/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4742 - acc:
0.7933 - val_loss: 0.4953 - val_acc: 0.7706
Epoch 131/700
10/10 [==============================] - 1s 57ms/step - loss: 0.4738 - acc:
0.7924 - val_loss: 0.4951 - val_acc: 0.7706
Epoch 132/700
10/10 [==============================] - 1s 62ms/step - loss: 0.4734 - acc:
0.7914 - val_loss: 0.4948 - val_acc: 0.7706
Epoch 133/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4731 - acc:
0.7926 - val_loss: 0.4946 - val_acc: 0.7706
Epoch 134/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4727 - acc:
0.7933 - val_loss: 0.4944 - val_acc: 0.7706
Epoch 135/700
10/10 [==============================] - 1s 62ms/step - loss: 0.4723 - acc:
0.7939 - val_loss: 0.4941 - val_acc: 0.7706
Epoch 136/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4720 - acc:
0.7952 - val_loss: 0.4939 - val_acc: 0.7706
Epoch 137/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4716 - acc:
0.7952 - val_loss: 0.4937 - val_acc: 0.7706
Epoch 138/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4712 - acc:
0.7952 - val_loss: 0.4934 - val_acc: 0.7706
Epoch 139/700
10/10 [==============================] - 1s 62ms/step - loss: 0.4709 - acc:
0.7952 - val_loss: 0.4932 - val_acc: 0.7706
Epoch 140/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4705 - acc:
0.7955 - val_loss: 0.4930 - val_acc: 0.7706
Epoch 141/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4701 - acc:
0.7970 - val_loss: 0.4928 - val_acc: 0.7706
Epoch 142/700
10/10 [==============================] - 1s 72ms/step - loss: 0.4698 - acc:
0.7970 - val_loss: 0.4925 - val_acc: 0.7706
Epoch 143/700
10/10 [==============================] - 1s 80ms/step - loss: 0.4694 - acc:
0.7953 - val_loss: 0.4923 - val_acc: 0.7706
Epoch 144/700
10/10 [==============================] - 1s 72ms/step - loss: 0.4690 - acc:
0.7965 - val_loss: 0.4921 - val_acc: 0.7706
Epoch 145/700
```

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10/10 [==============================] - 1s 59ms/step - loss: 0.4687 - acc:
0.7970 - val_loss: 0.4919 - val_acc: 0.7706
Epoch 146/700
10/10 [==============================] - 1s 62ms/step - loss: 0.4683 - acc:
0.7970 - val_loss: 0.4916 - val_acc: 0.7706
Epoch 147/700
10/10 [==============================] - 1s 84ms/step - loss: 0.4679 - acc:
0.7970 - val_loss: 0.4914 - val_acc: 0.7706
Epoch 148/700
10/10 [==============================] - 1s 56ms/step - loss: 0.4676 - acc:
0.7970 - val_loss: 0.4912 - val_acc: 0.7706
Epoch 149/700
10/10 [==============================] - 1s 57ms/step - loss: 0.4672 - acc:
0.7970 - val_loss: 0.4910 - val_acc: 0.7706
Epoch 150/700
10/10 [==============================] - 1s 51ms/step - loss: 0.4669 - acc:
0.7957 - val_loss: 0.4908 - val_acc: 0.7706
Epoch 151/700
10/10 [==============================] - 1s 54ms/step - loss: 0.4665 - acc:
0.7952 - val_loss: 0.4906 - val_acc: 0.7706
Epoch 152/700
10/10 [==============================] - 0s 49ms/step - loss: 0.4662 - acc:
0.7952 - val_loss: 0.4904 - val_acc: 0.7706
Epoch 153/700
10/10 [==============================] - 0s 48ms/step - loss: 0.4658 - acc:
0.7952 - val_loss: 0.4902 - val_acc: 0.7706
Epoch 154/700
10/10 [==============================] - 1s 55ms/step - loss: 0.4655 - acc:
0.7952 - val_loss: 0.4900 - val_acc: 0.7706
Epoch 155/700
10/10 [==============================] - 0s 50ms/step - loss: 0.4651 - acc:
0.7952 - val_loss: 0.4898 - val_acc: 0.7662
Epoch 156/700
10/10 [==============================] - 1s 55ms/step - loss: 0.4648 - acc:
0.7939 - val_loss: 0.4896 - val_acc: 0.7662
Epoch 157/700
10/10 [==============================] - 1s 53ms/step - loss: 0.4644 - acc:
0.7933 - val_loss: 0.4894 - val_acc: 0.7662
Epoch 158/700
10/10 [==============================] - 1s 50ms/step - loss: 0.4641 - acc:
0.7933 - val_loss: 0.4892 - val_acc: 0.7662
Epoch 159/700
10/10 [==============================] - 1s 51ms/step - loss: 0.4637 - acc:
0.7933 - val_loss: 0.4890 - val_acc: 0.7662
Epoch 160/700
10/10 [==============================] - 1s 54ms/step - loss: 0.4634 - acc:
0.7933 - val_loss: 0.4888 - val_acc: 0.7662
Epoch 161/700
```

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10/10 [==============================] - 1s 55ms/step - loss: 0.4630 - acc:
0.7933 - val_loss: 0.4886 - val_acc: 0.7662
Epoch 162/700
10/10 [==============================] - 0s 49ms/step - loss: 0.4627 - acc:
0.7933 - val_loss: 0.4884 - val_acc: 0.7662
Epoch 163/700
10/10 [==============================] - 0s 49ms/step - loss: 0.4623 - acc:
0.7933 - val_loss: 0.4882 - val_acc: 0.7662
Epoch 164/700
10/10 [==============================] - 1s 54ms/step - loss: 0.4620 - acc:
0.7933 - val_loss: 0.4880 - val_acc: 0.7662
Epoch 165/700
10/10 [==============================] - 1s 52ms/step - loss: 0.4617 - acc:
0.7933 - val_loss: 0.4879 - val_acc: 0.7662
Epoch 166/700
10/10 [==============================] - 1s 54ms/step - loss: 0.4613 - acc:
0.7937 - val_loss: 0.4877 - val_acc: 0.7662
Epoch 167/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4610 - acc:
0.7952 - val_loss: 0.4875 - val_acc: 0.7662
Epoch 168/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4606 - acc:
0.7952 - val_loss: 0.4873 - val_acc: 0.7662
Epoch 169/700
10/10 [==============================] - 0s 50ms/step - loss: 0.4603 - acc:
0.7952 - val_loss: 0.4871 - val_acc: 0.7662
Epoch 170/700
10/10 [==============================] - 1s 53ms/step - loss: 0.4600 - acc:
0.7952 - val_loss: 0.4870 - val_acc: 0.7662
Epoch 171/700
10/10 [==============================] - 1s 64ms/step - loss: 0.4596 - acc:
0.7952 - val_loss: 0.4868 - val_acc: 0.7662
Epoch 172/700
10/10 [==============================] - 1s 69ms/step - loss: 0.4593 - acc:
0.7952 - val_loss: 0.4866 - val_acc: 0.7662
Epoch 173/700
10/10 [==============================] - 1s 74ms/step - loss: 0.4590 - acc:
0.7952 - val_loss: 0.4865 - val_acc: 0.7662
Epoch 174/700
10/10 [==============================] - 1s 72ms/step - loss: 0.4586 - acc:
0.7955 - val_loss: 0.4863 - val_acc: 0.7662
Epoch 175/700
10/10 [==============================] - 1s 64ms/step - loss: 0.4583 - acc:
0.7970 - val_loss: 0.4862 - val_acc: 0.7706
Epoch 176/700
10/10 [==============================] - 1s 50ms/step - loss: 0.4580 - acc:
0.7970 - val_loss: 0.4860 - val_acc: 0.7706
Epoch 177/700
```

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10/10 [==============================] - 1s 59ms/step - loss: 0.4576 - acc:
0.7970 - val_loss: 0.4859 - val_acc: 0.7706
Epoch 178/700
10/10 [==============================] - 1s 53ms/step - loss: 0.4573 - acc:
0.7970 - val_loss: 0.4857 - val_acc: 0.7749
Epoch 179/700
10/10 [==============================] - 1s 72ms/step - loss: 0.4570 - acc:
0.7953 - val_loss: 0.4855 - val_acc: 0.7749
Epoch 180/700
10/10 [==============================] - 1s 65ms/step - loss: 0.4566 - acc:
0.7952 - val_loss: 0.4854 - val_acc: 0.7749
Epoch 181/700
10/10 [==============================] - 1s 75ms/step - loss: 0.4563 - acc:
0.7952 - val_loss: 0.4852 - val_acc: 0.7749
Epoch 182/700
10/10 [==============================] - 1s 64ms/step - loss: 0.4560 - acc:
0.7952 - val_loss: 0.4851 - val_acc: 0.7749
Epoch 183/700
10/10 [==============================] - 1s 69ms/step - loss: 0.4556 - acc:
0.7957 - val_loss: 0.4850 - val_acc: 0.7749
Epoch 184/700
10/10 [==============================] - 1s 72ms/step - loss: 0.4553 - acc:
0.7970 - val_loss: 0.4848 - val_acc: 0.7749
Epoch 185/700
10/10 [==============================] - 1s 70ms/step - loss: 0.4550 - acc:
0.7970 - val_loss: 0.4847 - val_acc: 0.7749
Epoch 186/700
10/10 [==============================] - 1s 72ms/step - loss: 0.4546 - acc:
0.7970 - val_loss: 0.4845 - val_acc: 0.7749
Epoch 187/700
10/10 [==============================] - 0s 47ms/step - loss: 0.4543 - acc:
0.7970 - val_loss: 0.4844 - val_acc: 0.7749
Epoch 188/700
10/10 [==============================] - 1s 56ms/step - loss: 0.4540 - acc:
0.7970 - val_loss: 0.4842 - val_acc: 0.7749
Epoch 189/700
10/10 [==============================] - 0s 47ms/step - loss: 0.4537 - acc:
0.7970 - val_loss: 0.4841 - val_acc: 0.7749
Epoch 190/700
10/10 [==============================] - 0s 50ms/step - loss: 0.4533 - acc:
0.7970 - val_loss: 0.4840 - val_acc: 0.7749
Epoch 191/700
10/10 [==============================] - 0s 49ms/step - loss: 0.4530 - acc:
0.7970 - val_loss: 0.4838 - val_acc: 0.7749
Epoch 192/700
10/10 [==============================] - 1s 55ms/step - loss: 0.4527 - acc:
0.7970 - val_loss: 0.4837 - val_acc: 0.7749
Epoch 193/700
```

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10/10 [==============================] - 0s 47ms/step - loss: 0.4524 - acc:
0.7987 - val_loss: 0.4836 - val_acc: 0.7749
Epoch 194/700
10/10 [==============================] - 1s 57ms/step - loss: 0.4521 - acc:
0.8007 - val_loss: 0.4834 - val_acc: 0.7749
Epoch 195/700
10/10 [==============================] - 0s 49ms/step - loss: 0.4517 - acc:
0.8007 - val_loss: 0.4833 - val_acc: 0.7749
Epoch 196/700
10/10 [==============================] - 0s 49ms/step - loss: 0.4514 - acc:
0.8007 - val_loss: 0.4832 - val_acc: 0.7749
Epoch 197/700
10/10 [==============================] - 0s 49ms/step - loss: 0.4511 - acc:
0.8007 - val_loss: 0.4830 - val_acc: 0.7749
Epoch 198/700
10/10 [==============================] - 1s 51ms/step - loss: 0.4508 - acc:
0.8007 - val_loss: 0.4829 - val_acc: 0.7749
Epoch 199/700
10/10 [==============================] - 0s 48ms/step - loss: 0.4505 - acc:
0.8007 - val_loss: 0.4828 - val_acc: 0.7749
Epoch 200/700
10/10 [==============================] - 0s 49ms/step - loss: 0.4501 - acc:
0.8007 - val_loss: 0.4827 - val_acc: 0.7749
Epoch 201/700
10/10 [==============================] - 0s 46ms/step - loss: 0.4498 - acc:
0.8007 - val_loss: 0.4825 - val_acc: 0.7749
Epoch 202/700
10/10 [==============================] - 0s 48ms/step - loss: 0.4495 - acc:
0.8007 - val_loss: 0.4824 - val_acc: 0.7749
Epoch 203/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4492 - acc:
0.8007 - val_loss: 0.4823 - val_acc: 0.7749
Epoch 204/700
10/10 [==============================] - 0s 48ms/step - loss: 0.4489 - acc:
0.8002 - val_loss: 0.4822 - val_acc: 0.7749
Epoch 205/700
10/10 [==============================] - 0s 48ms/step - loss: 0.4486 - acc:
0.7989 - val_loss: 0.4820 - val_acc: 0.7749
Epoch 206/700
10/10 [==============================] - 1s 53ms/step - loss: 0.4482 - acc:
0.7989 - val_loss: 0.4819 - val_acc: 0.7749
Epoch 207/700
10/10 [==============================] - 0s 50ms/step - loss: 0.4479 - acc:
0.7989 - val_loss: 0.4818 - val_acc: 0.7749
Epoch 208/700
10/10 [==============================] - 1s 56ms/step - loss: 0.4476 - acc:
0.8004 - val_loss: 0.4817 - val_acc: 0.7749
Epoch 209/700
```

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10/10 [==============================] - 0s 49ms/step - loss: 0.4473 - acc:
0.8007 - val_loss: 0.4816 - val_acc: 0.7749
Epoch 210/700
10/10 [==============================] - 0s 49ms/step - loss: 0.4470 - acc:
0.8007 - val_loss: 0.4815 - val_acc: 0.7749
Epoch 211/700
10/10 [==============================] - 1s 52ms/step - loss: 0.4467 - acc:
0.8007 - val_loss: 0.4813 - val_acc: 0.7749
Epoch 212/700
10/10 [==============================] - 0s 50ms/step - loss: 0.4464 - acc:
0.8007 - val_loss: 0.4812 - val_acc: 0.7749
Epoch 213/700
10/10 [==============================] - 0s 49ms/step - loss: 0.4461 - acc:
0.8017 - val_loss: 0.4811 - val_acc: 0.7749
Epoch 214/700
10/10 [==============================] - 0s 48ms/step - loss: 0.4458 - acc:
0.8035 - val_loss: 0.4810 - val_acc: 0.7749
Epoch 215/700
10/10 [==============================] - 0s 50ms/step - loss: 0.4455 - acc:
0.8045 - val_loss: 0.4809 - val_acc: 0.7749
Epoch 216/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4452 - acc:
0.8045 - val_loss: 0.4808 - val_acc: 0.7749
Epoch 217/700
10/10 [==============================] - 1s 50ms/step - loss: 0.4449 - acc:
0.8045 - val_loss: 0.4807 - val_acc: 0.7792
Epoch 218/700
10/10 [==============================] - 1s 51ms/step - loss: 0.4446 - acc:
0.8050 - val_loss: 0.4806 - val_acc: 0.7792
Epoch 219/700
10/10 [==============================] - 1s 53ms/step - loss: 0.4443 - acc:
0.8063 - val_loss: 0.4805 - val_acc: 0.7792
Epoch 220/700
10/10 [==============================] - 1s 56ms/step - loss: 0.4440 - acc:
0.8063 - val_loss: 0.4804 - val_acc: 0.7792
Epoch 221/700
10/10 [==============================] - 1s 56ms/step - loss: 0.4437 - acc:
0.8063 - val_loss: 0.4803 - val_acc: 0.7792
Epoch 222/700
10/10 [==============================] - 1s 51ms/step - loss: 0.4434 - acc:
0.8069 - val_loss: 0.4802 - val_acc: 0.7792
Epoch 223/700
10/10 [==============================] - 1s 51ms/step - loss: 0.4431 - acc:
0.8082 - val_loss: 0.4801 - val_acc: 0.7835
Epoch 224/700
10/10 [==============================] - 1s 53ms/step - loss: 0.4428 - acc:
0.8076 - val_loss: 0.4800 - val_acc: 0.7835
Epoch 225/700
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10/10 [==============================] - 1s 52ms/step - loss: 0.4425 - acc:
0.8063 - val_loss: 0.4799 - val_acc: 0.7835
Epoch 226/700
10/10 [==============================] - 1s 54ms/step - loss: 0.4422 - acc:
0.8063 - val_loss: 0.4798 - val_acc: 0.7835
Epoch 227/700
10/10 [==============================] - 0s 50ms/step - loss: 0.4419 - acc:
0.8063 - val_loss: 0.4797 - val_acc: 0.7835
Epoch 228/700
10/10 [==============================] - 1s 50ms/step - loss: 0.4416 - acc:
0.8063 - val_loss: 0.4796 - val_acc: 0.7835
Epoch 229/700
10/10 [==============================] - 1s 51ms/step - loss: 0.4413 - acc:
0.8063 - val_loss: 0.4796 - val_acc: 0.7835
Epoch 230/700
10/10 [==============================] - 1s 57ms/step - loss: 0.4410 - acc:
0.8063 - val_loss: 0.4795 - val_acc: 0.7835
Epoch 231/700
10/10 [==============================] - 1s 52ms/step - loss: 0.4407 - acc:
0.8080 - val_loss: 0.4794 - val_acc: 0.7835
Epoch 232/700
10/10 [==============================] - 1s 56ms/step - loss: 0.4404 - acc:
0.8082 - val_loss: 0.4793 - val_acc: 0.7835
Epoch 233/700
10/10 [==============================] - 1s 51ms/step - loss: 0.4401 - acc:
0.8082 - val_loss: 0.4792 - val_acc: 0.7835
Epoch 234/700
10/10 [==============================] - 1s 51ms/step - loss: 0.4399 - acc:
0.8082 - val_loss: 0.4791 - val_acc: 0.7835
Epoch 235/700
10/10 [==============================] - 1s 51ms/step - loss: 0.4396 - acc:
0.8082 - val_loss: 0.4790 - val_acc: 0.7835
Epoch 236/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4393 - acc:
0.8082 - val_loss: 0.4789 - val_acc: 0.7835
Epoch 237/700
10/10 [==============================] - 1s 53ms/step - loss: 0.4390 - acc:
0.8082 - val_loss: 0.4789 - val_acc: 0.7835
Epoch 238/700
10/10 [==============================] - 1s 51ms/step - loss: 0.4387 - acc:
0.8082 - val_loss: 0.4788 - val_acc: 0.7835
Epoch 239/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4384 - acc:
0.8082 - val_loss: 0.4787 - val_acc: 0.7835
Epoch 240/700
10/10 [==============================] - 1s 54ms/step - loss: 0.4381 - acc:
0.8076 - val_loss: 0.4786 - val_acc: 0.7835
Epoch 241/700
```

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10/10 [==============================] - 1s 55ms/step - loss: 0.4378 - acc:
0.8063 - val_loss: 0.4786 - val_acc: 0.7835
Epoch 242/700
10/10 [==============================] - 1s 56ms/step - loss: 0.4376 - acc:
0.8063 - val_loss: 0.4785 - val_acc: 0.7835
Epoch 243/700
10/10 [==============================] - 1s 54ms/step - loss: 0.4373 - acc:
0.8063 - val_loss: 0.4784 - val_acc: 0.7835
Epoch 244/700
10/10 [==============================] - 1s 51ms/step - loss: 0.4370 - acc:
0.8063 - val_loss: 0.4783 - val_acc: 0.7792
Epoch 245/700
10/10 [==============================] - 0s 49ms/step - loss: 0.4367 - acc:
0.8063 - val_loss: 0.4783 - val_acc: 0.7792
Epoch 246/700
10/10 [==============================] - 0s 48ms/step - loss: 0.4364 - acc:
0.8063 - val_loss: 0.4782 - val_acc: 0.7792
Epoch 247/700
10/10 [==============================] - 0s 48ms/step - loss: 0.4361 - acc:
0.8082 - val_loss: 0.4781 - val_acc: 0.7792
Epoch 248/700
10/10 [==============================] - 0s 46ms/step - loss: 0.4359 - acc:
0.8082 - val_loss: 0.4781 - val_acc: 0.7835
Epoch 249/700
10/10 [==============================] - 0s 47ms/step - loss: 0.4356 - acc:
0.8082 - val_loss: 0.4780 - val_acc: 0.7835
Epoch 250/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4353 - acc:
0.8082 - val_loss: 0.4779 - val_acc: 0.7835
Epoch 251/700
10/10 [==============================] - 1s 54ms/step - loss: 0.4350 - acc:
0.8082 - val_loss: 0.4779 - val_acc: 0.7835
Epoch 252/700
10/10 [==============================] - 0s 46ms/step - loss: 0.4347 - acc:
0.8082 - val_loss: 0.4778 - val_acc: 0.7835
Epoch 253/700
10/10 [==============================] - 0s 49ms/step - loss: 0.4345 - acc:
0.8101 - val_loss: 0.4778 - val_acc: 0.7835
Epoch 254/700
10/10 [==============================] - 0s 47ms/step - loss: 0.4342 - acc:
0.8101 - val_loss: 0.4777 - val_acc: 0.7835
Epoch 255/700
10/10 [==============================] - 0s 49ms/step - loss: 0.4339 - acc:
0.8101 - val_loss: 0.4777 - val_acc: 0.7792
Epoch 256/700
10/10 [==============================] - 1s 54ms/step - loss: 0.4336 - acc:
0.8121 - val_loss: 0.4776 - val_acc: 0.7792
Epoch 257/700
```

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10/10 [==============================] - 0s 49ms/step - loss: 0.4333 - acc:
0.8138 - val_loss: 0.4775 - val_acc: 0.7792
Epoch 258/700
10/10 [==============================] - 1s 50ms/step - loss: 0.4331 - acc:
0.8138 - val_loss: 0.4775 - val_acc: 0.7792
Epoch 259/700
10/10 [==============================] - 1s 76ms/step - loss: 0.4328 - acc:
0.8138 - val_loss: 0.4774 - val_acc: 0.7792
Epoch 260/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4325 - acc:
0.8138 - val_loss: 0.4774 - val_acc: 0.7792
Epoch 261/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4322 - acc:
0.8138 - val_loss: 0.4773 - val_acc: 0.7792
Epoch 262/700
10/10 [==============================] - 1s 57ms/step - loss: 0.4320 - acc:
0.8138 - val_loss: 0.4773 - val_acc: 0.7792
Epoch 263/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4317 - acc:
0.8138 - val_loss: 0.4772 - val_acc: 0.7792
Epoch 264/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4314 - acc:
0.8138 - val_loss: 0.4772 - val_acc: 0.7792
Epoch 265/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4311 - acc:
0.8138 - val_loss: 0.4771 - val_acc: 0.7792
Epoch 266/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4309 - acc:
0.8138 - val_loss: 0.4771 - val_acc: 0.7792
Epoch 267/700
10/10 [==============================] - 1s 63ms/step - loss: 0.4306 - acc:
0.8138 - val_loss: 0.4770 - val_acc: 0.7792
Epoch 268/700
10/10 [==============================] - 1s 65ms/step - loss: 0.4303 - acc:
0.8138 - val_loss: 0.4770 - val_acc: 0.7792
Epoch 269/700
10/10 [==============================] - 1s 56ms/step - loss: 0.4300 - acc:
0.8138 - val_loss: 0.4769 - val_acc: 0.7792
Epoch 270/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4298 - acc:
0.8138 - val_loss: 0.4769 - val_acc: 0.7792
Epoch 271/700
10/10 [==============================] - 1s 57ms/step - loss: 0.4295 - acc:
0.8138 - val_loss: 0.4768 - val_acc: 0.7792
Epoch 272/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4292 - acc:
0.8138 - val_loss: 0.4768 - val_acc: 0.7792
Epoch 273/700
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10/10 [==============================] - 1s 60ms/step - loss: 0.4290 - acc:
0.8138 - val_loss: 0.4768 - val_acc: 0.7792
Epoch 274/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4287 - acc:
0.8138 - val_loss: 0.4767 - val_acc: 0.7792
Epoch 275/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4284 - acc:
0.8138 - val_loss: 0.4767 - val_acc: 0.7792
Epoch 276/700
10/10 [==============================] - 1s 62ms/step - loss: 0.4282 - acc:
0.8119 - val_loss: 0.4767 - val_acc: 0.7749
Epoch 277/700
10/10 [==============================] - 1s 57ms/step - loss: 0.4279 - acc:
0.8119 - val_loss: 0.4766 - val_acc: 0.7749
Epoch 278/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4276 - acc:
0.8119 - val_loss: 0.4766 - val_acc: 0.7749
Epoch 279/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4274 - acc:
0.8128 - val_loss: 0.4766 - val_acc: 0.7706
Epoch 280/700
10/10 [==============================] - 1s 62ms/step - loss: 0.4271 - acc:
0.8138 - val_loss: 0.4765 - val_acc: 0.7706
Epoch 281/700
10/10 [==============================] - 1s 62ms/step - loss: 0.4268 - acc:
0.8138 - val_loss: 0.4765 - val_acc: 0.7706
Epoch 282/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4266 - acc:
0.8138 - val_loss: 0.4764 - val_acc: 0.7706
Epoch 283/700
10/10 [==============================] - 1s 62ms/step - loss: 0.4263 - acc:
0.8138 - val_loss: 0.4764 - val_acc: 0.7706
Epoch 284/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4260 - acc:
0.8138 - val_loss: 0.4764 - val_acc: 0.7706
Epoch 285/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4258 - acc:
0.8138 - val_loss: 0.4763 - val_acc: 0.7706
Epoch 286/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4255 - acc:
0.8138 - val_loss: 0.4763 - val_acc: 0.7706
Epoch 287/700
10/10 [==============================] - 1s 56ms/step - loss: 0.4252 - acc:
0.8138 - val_loss: 0.4763 - val_acc: 0.7662
Epoch 288/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4250 - acc:
0.8127 - val_loss: 0.4762 - val_acc: 0.7662
Epoch 289/700
```

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10/10 [==============================] - 1s 61ms/step - loss: 0.4247 - acc:
0.8119 - val_loss: 0.4762 - val_acc: 0.7662
Epoch 290/700
10/10 [==============================] - 1s 72ms/step - loss: 0.4244 - acc:
0.8119 - val_loss: 0.4762 - val_acc: 0.7662
Epoch 291/700
10/10 [==============================] - 1s 71ms/step - loss: 0.4242 - acc:
0.8119 - val_loss: 0.4761 - val_acc: 0.7662
Epoch 292/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4239 - acc:
0.8119 - val_loss: 0.4761 - val_acc: 0.7662
Epoch 293/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4237 - acc:
0.8119 - val_loss: 0.4761 - val_acc: 0.7662
Epoch 294/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4234 - acc:
0.8119 - val_loss: 0.4761 - val_acc: 0.7662
Epoch 295/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4231 - acc:
0.8119 - val_loss: 0.4760 - val_acc: 0.7662
Epoch 296/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4229 - acc:
0.8119 - val_loss: 0.4760 - val_acc: 0.7662
Epoch 297/700
10/10 [==============================] - 1s 63ms/step - loss: 0.4226 - acc:
0.8119 - val_loss: 0.4760 - val_acc: 0.7662
Epoch 298/700
10/10 [==============================] - 1s 55ms/step - loss: 0.4224 - acc:
0.8119 - val_loss: 0.4760 - val_acc: 0.7662
Epoch 299/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4221 - acc:
0.8127 - val_loss: 0.4760 - val_acc: 0.7662
Epoch 300/700
10/10 [==============================] - 1s 63ms/step - loss: 0.4219 - acc:
0.8138 - val_loss: 0.4759 - val_acc: 0.7662
Epoch 301/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4216 - acc:
0.8138 - val_loss: 0.4759 - val_acc: 0.7662
Epoch 302/700
10/10 [==============================] - 1s 62ms/step - loss: 0.4213 - acc:
0.8138 - val_loss: 0.4759 - val_acc: 0.7662
Epoch 303/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4211 - acc:
0.8138 - val_loss: 0.4759 - val_acc: 0.7706
Epoch 304/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4208 - acc:
0.8138 - val_loss: 0.4759 - val_acc: 0.7706
Epoch 305/700
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10/10 [==============================] - 1s 68ms/step - loss: 0.4206 - acc:
0.8138 - val_loss: 0.4759 - val_acc: 0.7662
Epoch 306/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4203 - acc:
0.8138 - val_loss: 0.4758 - val_acc: 0.7662
Epoch 307/700
10/10 [==============================] - 1s 69ms/step - loss: 0.4201 - acc:
0.8138 - val_loss: 0.4758 - val_acc: 0.7662
Epoch 308/700
10/10 [==============================] - 1s 75ms/step - loss: 0.4198 - acc:
0.8138 - val_loss: 0.4758 - val_acc: 0.7662
Epoch 309/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4195 - acc:
0.8140 - val_loss: 0.4758 - val_acc: 0.7662
Epoch 310/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4193 - acc:
0.8156 - val_loss: 0.4758 - val_acc: 0.7662
Epoch 311/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4190 - acc:
0.8156 - val_loss: 0.4758 - val_acc: 0.7662
Epoch 312/700
10/10 [==============================] - 1s 57ms/step - loss: 0.4188 - acc:
0.8156 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 313/700
10/10 [==============================] - 1s 56ms/step - loss: 0.4185 - acc:
0.8156 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 314/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4183 - acc:
0.8156 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 315/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4180 - acc:
0.8156 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 316/700
10/10 [==============================] - 1s 57ms/step - loss: 0.4178 - acc:
0.8158 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 317/700
10/10 [==============================] - 1s 63ms/step - loss: 0.4175 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 318/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4173 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 319/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4170 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 320/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4167 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 321/700
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10/10 [==============================] - 1s 59ms/step - loss: 0.4165 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 322/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4162 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 323/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4160 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 324/700
10/10 [==============================] - 1s 57ms/step - loss: 0.4157 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 325/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4155 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 326/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4152 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 327/700
10/10 [==============================] - 1s 73ms/step - loss: 0.4150 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 328/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4147 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 329/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4145 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 330/700
10/10 [==============================] - 1s 56ms/step - loss: 0.4142 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 331/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4139 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 332/700
10/10 [==============================] - 1s 62ms/step - loss: 0.4137 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 333/700
10/10 [==============================] - 1s 68ms/step - loss: 0.4134 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 334/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4132 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 335/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4129 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 336/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4126 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 337/700
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10/10 [==============================] - 1s 61ms/step - loss: 0.4124 - acc:
0.8175 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 338/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4121 - acc:
0.8179 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 339/700
10/10 [==============================] - 1s 66ms/step - loss: 0.4119 - acc:
0.8194 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 340/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4116 - acc:
0.8194 - val_loss: 0.4758 - val_acc: 0.7619
Epoch 341/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4114 - acc:
0.8194 - val_loss: 0.4759 - val_acc: 0.7619
Epoch 342/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4111 - acc:
0.8209 - val_loss: 0.4759 - val_acc: 0.7619
Epoch 343/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4108 - acc:
0.8212 - val_loss: 0.4759 - val_acc: 0.7619
Epoch 344/700
10/10 [==============================] - 1s 62ms/step - loss: 0.4106 - acc:
0.8212 - val_loss: 0.4759 - val_acc: 0.7619
Epoch 345/700
10/10 [==============================] - 1s 68ms/step - loss: 0.4103 - acc:
0.8212 - val_loss: 0.4759 - val_acc: 0.7619
Epoch 346/700
10/10 [==============================] - 1s 68ms/step - loss: 0.4101 - acc:
0.8212 - val_loss: 0.4759 - val_acc: 0.7619
Epoch 347/700
10/10 [==============================] - 1s 66ms/step - loss: 0.4098 - acc:
0.8212 - val_loss: 0.4760 - val_acc: 0.7619
Epoch 348/700
10/10 [==============================] - 1s 62ms/step - loss: 0.4096 - acc:
0.8212 - val_loss: 0.4760 - val_acc: 0.7619
Epoch 349/700
10/10 [==============================] - 1s 71ms/step - loss: 0.4093 - acc:
0.8212 - val_loss: 0.4760 - val_acc: 0.7619
Epoch 350/700
10/10 [==============================] - 1s 88ms/step - loss: 0.4091 - acc:
0.8225 - val_loss: 0.4760 - val_acc: 0.7619
Epoch 351/700
10/10 [==============================] - 1s 71ms/step - loss: 0.4088 - acc:
0.8231 - val_loss: 0.4761 - val_acc: 0.7619
Epoch 352/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4086 - acc:
0.8231 - val_loss: 0.4761 - val_acc: 0.7619
Epoch 353/700
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10/10 [==============================] - 1s 63ms/step - loss: 0.4083 - acc:
0.8231 - val_loss: 0.4761 - val_acc: 0.7619
Epoch 354/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4081 - acc:
0.8231 - val_loss: 0.4761 - val_acc: 0.7619
Epoch 355/700
10/10 [==============================] - 1s 62ms/step - loss: 0.4078 - acc:
0.8231 - val_loss: 0.4762 - val_acc: 0.7619
Epoch 356/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4076 - acc:
0.8231 - val_loss: 0.4762 - val_acc: 0.7619
Epoch 357/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4073 - acc:
0.8231 - val_loss: 0.4762 - val_acc: 0.7619
Epoch 358/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4071 - acc:
0.8212 - val_loss: 0.4763 - val_acc: 0.7619
Epoch 359/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4068 - acc:
0.8212 - val_loss: 0.4763 - val_acc: 0.7619
Epoch 360/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4066 - acc:
0.8212 - val_loss: 0.4763 - val_acc: 0.7619
Epoch 361/700
10/10 [==============================] - 1s 64ms/step - loss: 0.4063 - acc:
0.8231 - val_loss: 0.4764 - val_acc: 0.7619
Epoch 362/700
10/10 [==============================] - 1s 80ms/step - loss: 0.4061 - acc:
0.8231 - val_loss: 0.4764 - val_acc: 0.7619
Epoch 363/700
10/10 [==============================] - 1s 63ms/step - loss: 0.4058 - acc:
0.8231 - val_loss: 0.4764 - val_acc: 0.7619
Epoch 364/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4056 - acc:
0.8231 - val_loss: 0.4765 - val_acc: 0.7662
Epoch 365/700
10/10 [==============================] - 1s 60ms/step - loss: 0.4053 - acc:
0.8231 - val_loss: 0.4765 - val_acc: 0.7662
Epoch 366/700
10/10 [==============================] - 1s 57ms/step - loss: 0.4051 - acc:
0.8231 - val_loss: 0.4765 - val_acc: 0.7662
Epoch 367/700
10/10 [==============================] - 1s 55ms/step - loss: 0.4048 - acc:
0.8240 - val_loss: 0.4766 - val_acc: 0.7662
Epoch 368/700
10/10 [==============================] - 1s 62ms/step - loss: 0.4046 - acc:
0.8250 - val_loss: 0.4766 - val_acc: 0.7662
Epoch 369/700
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10/10 [==============================] - 1s 59ms/step - loss: 0.4043 - acc:
0.8250 - val_loss: 0.4766 - val_acc: 0.7662
Epoch 370/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4041 - acc:
0.8250 - val_loss: 0.4767 - val_acc: 0.7662
Epoch 371/700
10/10 [==============================] - 1s 63ms/step - loss: 0.4038 - acc:
0.8250 - val_loss: 0.4767 - val_acc: 0.7662
Epoch 372/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4036 - acc:
0.8250 - val_loss: 0.4767 - val_acc: 0.7662
Epoch 373/700
10/10 [==============================] - 1s 59ms/step - loss: 0.4033 - acc:
0.8250 - val_loss: 0.4768 - val_acc: 0.7662
Epoch 374/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4031 - acc:
0.8250 - val_loss: 0.4768 - val_acc: 0.7662
Epoch 375/700
10/10 [==============================] - 1s 55ms/step - loss: 0.4028 - acc:
0.8250 - val_loss: 0.4768 - val_acc: 0.7662
Epoch 376/700
10/10 [==============================] - 1s 70ms/step - loss: 0.4026 - acc:
0.8255 - val_loss: 0.4769 - val_acc: 0.7662
Epoch 377/700
10/10 [==============================] - 1s 62ms/step - loss: 0.4023 - acc:
0.8268 - val_loss: 0.4769 - val_acc: 0.7619
Epoch 378/700
10/10 [==============================] - 1s 70ms/step - loss: 0.4021 - acc:
0.8268 - val_loss: 0.4769 - val_acc: 0.7662
Epoch 379/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4018 - acc:
0.8285 - val_loss: 0.4769 - val_acc: 0.7662
Epoch 380/700
10/10 [==============================] - 1s 69ms/step - loss: 0.4016 - acc:
0.8291 - val_loss: 0.4770 - val_acc: 0.7662
Epoch 381/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4014 - acc:
0.8305 - val_loss: 0.4770 - val_acc: 0.7662
Epoch 382/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4011 - acc:
0.8305 - val_loss: 0.4770 - val_acc: 0.7662
Epoch 383/700
10/10 [==============================] - 1s 61ms/step - loss: 0.4009 - acc:
0.8291 - val_loss: 0.4771 - val_acc: 0.7662
Epoch 384/700
10/10 [==============================] - 1s 58ms/step - loss: 0.4006 - acc:
0.8287 - val_loss: 0.4771 - val_acc: 0.7662
Epoch 385/700
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10/10 [==============================] - 1s 59ms/step - loss: 0.4004 - acc:
0.8274 - val_loss: 0.4771 - val_acc: 0.7662
Epoch 386/700
10/10 [==============================] - 1s 66ms/step - loss: 0.4001 - acc:
0.8268 - val_loss: 0.4772 - val_acc: 0.7662
Epoch 387/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3998 - acc:
0.8268 - val_loss: 0.4772 - val_acc: 0.7662
Epoch 388/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3996 - acc:
0.8268 - val_loss: 0.4772 - val_acc: 0.7662
Epoch 389/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3993 - acc:
0.8268 - val_loss: 0.4773 - val_acc: 0.7662
Epoch 390/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3991 - acc:
0.8272 - val_loss: 0.4773 - val_acc: 0.7662
Epoch 391/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3988 - acc:
0.8287 - val_loss: 0.4773 - val_acc: 0.7662
Epoch 392/700
10/10 [==============================] - 1s 64ms/step - loss: 0.3986 - acc:
0.8305 - val_loss: 0.4774 - val_acc: 0.7662
Epoch 393/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3983 - acc:
0.8305 - val_loss: 0.4774 - val_acc: 0.7662
Epoch 394/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3981 - acc:
0.8305 - val_loss: 0.4775 - val_acc: 0.7662
Epoch 395/700
10/10 [==============================] - 1s 56ms/step - loss: 0.3978 - acc:
0.8331 - val_loss: 0.4775 - val_acc: 0.7662
Epoch 396/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3976 - acc:
0.8343 - val_loss: 0.4775 - val_acc: 0.7662
Epoch 397/700
10/10 [==============================] - 1s 61ms/step - loss: 0.3973 - acc:
0.8343 - val_loss: 0.4776 - val_acc: 0.7662
Epoch 398/700
10/10 [==============================] - 1s 61ms/step - loss: 0.3971 - acc:
0.8343 - val_loss: 0.4776 - val_acc: 0.7706
Epoch 399/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3968 - acc:
0.8343 - val_loss: 0.4777 - val_acc: 0.7706
Epoch 400/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3966 - acc:
0.8343 - val_loss: 0.4777 - val_acc: 0.7706
Epoch 401/700
```

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10/10 [==============================] - 1s 63ms/step - loss: 0.3963 - acc:
0.8343 - val_loss: 0.4778 - val_acc: 0.7706
Epoch 402/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3961 - acc:
0.8343 - val_loss: 0.4778 - val_acc: 0.7706
Epoch 403/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3958 - acc:
0.8343 - val_loss: 0.4779 - val_acc: 0.7706
Epoch 404/700
10/10 [==============================] - 1s 55ms/step - loss: 0.3956 - acc:
0.8367 - val_loss: 0.4779 - val_acc: 0.7706
Epoch 405/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3953 - acc:
0.8380 - val_loss: 0.4780 - val_acc: 0.7706
Epoch 406/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3951 - acc:
0.8380 - val_loss: 0.4780 - val_acc: 0.7706
Epoch 407/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3948 - acc:
0.8380 - val_loss: 0.4781 - val_acc: 0.7706
Epoch 408/700
10/10 [==============================] - 1s 61ms/step - loss: 0.3946 - acc:
0.8380 - val_loss: 0.4782 - val_acc: 0.7706
Epoch 409/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3943 - acc:
0.8380 - val_loss: 0.4782 - val_acc: 0.7706
Epoch 410/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3941 - acc:
0.8397 - val_loss: 0.4783 - val_acc: 0.7706
Epoch 411/700
10/10 [==============================] - 1s 63ms/step - loss: 0.3938 - acc:
0.8399 - val_loss: 0.4783 - val_acc: 0.7706
Epoch 412/700
10/10 [==============================] - 1s 61ms/step - loss: 0.3936 - acc:
0.8399 - val_loss: 0.4784 - val_acc: 0.7706
Epoch 413/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3933 - acc:
0.8399 - val_loss: 0.4785 - val_acc: 0.7706
Epoch 414/700
10/10 [==============================] - 1s 67ms/step - loss: 0.3931 - acc:
0.8399 - val_loss: 0.4785 - val_acc: 0.7706
Epoch 415/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3928 - acc:
0.8399 - val_loss: 0.4786 - val_acc: 0.7706
Epoch 416/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3926 - acc:
0.8404 - val_loss: 0.4786 - val_acc: 0.7706
Epoch 417/700
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10/10 [==============================] - 1s 58ms/step - loss: 0.3923 - acc:
0.8417 - val_loss: 0.4787 - val_acc: 0.7706
Epoch 418/700
10/10 [==============================] - 1s 61ms/step - loss: 0.3921 - acc:
0.8417 - val_loss: 0.4788 - val_acc: 0.7706
Epoch 419/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3918 - acc:
0.8417 - val_loss: 0.4788 - val_acc: 0.7706
Epoch 420/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3916 - acc:
0.8417 - val_loss: 0.4789 - val_acc: 0.7706
Epoch 421/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3913 - acc:
0.8417 - val_loss: 0.4790 - val_acc: 0.7706
Epoch 422/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3911 - acc:
0.8417 - val_loss: 0.4790 - val_acc: 0.7706
Epoch 423/700
10/10 [==============================] - 1s 55ms/step - loss: 0.3908 - acc:
0.8417 - val_loss: 0.4791 - val_acc: 0.7706
Epoch 424/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3905 - acc:
0.8417 - val_loss: 0.4792 - val_acc: 0.7706
Epoch 425/700
10/10 [==============================] - 1s 65ms/step - loss: 0.3903 - acc:
0.8432 - val_loss: 0.4792 - val_acc: 0.7706
Epoch 426/700
10/10 [==============================] - 1s 63ms/step - loss: 0.3900 - acc:
0.8436 - val_loss: 0.4793 - val_acc: 0.7706
Epoch 427/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3898 - acc:
0.8436 - val_loss: 0.4794 - val_acc: 0.7706
Epoch 428/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3895 - acc:
0.8436 - val_loss: 0.4794 - val_acc: 0.7706
Epoch 429/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3893 - acc:
0.8436 - val_loss: 0.4795 - val_acc: 0.7706
Epoch 430/700
10/10 [==============================] - 1s 69ms/step - loss: 0.3890 - acc:
0.8454 - val_loss: 0.4796 - val_acc: 0.7706
Epoch 431/700
10/10 [==============================] - 1s 63ms/step - loss: 0.3888 - acc:
0.8454 - val_loss: 0.4796 - val_acc: 0.7706
Epoch 432/700
10/10 [==============================] - 1s 56ms/step - loss: 0.3885 - acc:
0.8454 - val_loss: 0.4797 - val_acc: 0.7706
Epoch 433/700
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10/10 [==============================] - 1s 60ms/step - loss: 0.3883 - acc:
0.8454 - val_loss: 0.4798 - val_acc: 0.7706
Epoch 434/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3880 - acc:
0.8454 - val_loss: 0.4799 - val_acc: 0.7706
Epoch 435/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3878 - acc:
0.8454 - val_loss: 0.4799 - val_acc: 0.7706
Epoch 436/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3875 - acc:
0.8454 - val_loss: 0.4800 - val_acc: 0.7706
Epoch 437/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3873 - acc:
0.8454 - val_loss: 0.4801 - val_acc: 0.7706
Epoch 438/700
10/10 [==============================] - 1s 70ms/step - loss: 0.3870 - acc:
0.8454 - val_loss: 0.4801 - val_acc: 0.7706
Epoch 439/700
10/10 [==============================] - 1s 74ms/step - loss: 0.3867 - acc:
0.8436 - val_loss: 0.4802 - val_acc: 0.7706
Epoch 440/700
10/10 [==============================] - 1s 67ms/step - loss: 0.3865 - acc:
0.8436 - val_loss: 0.4802 - val_acc: 0.7706
Epoch 441/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3862 - acc:
0.8436 - val_loss: 0.4803 - val_acc: 0.7706
Epoch 442/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3859 - acc:
0.8436 - val_loss: 0.4804 - val_acc: 0.7706
Epoch 443/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3857 - acc:
0.8436 - val_loss: 0.4804 - val_acc: 0.7706
Epoch 444/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3854 - acc:
0.8456 - val_loss: 0.4805 - val_acc: 0.7706
Epoch 445/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3852 - acc:
0.8473 - val_loss: 0.4805 - val_acc: 0.7706
Epoch 446/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3849 - acc:
0.8473 - val_loss: 0.4806 - val_acc: 0.7706
Epoch 447/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3846 - acc:
0.8473 - val_loss: 0.4807 - val_acc: 0.7706
Epoch 448/700
10/10 [==============================] - 1s 53ms/step - loss: 0.3844 - acc:
0.8473 - val_loss: 0.4808 - val_acc: 0.7706
Epoch 449/700
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10/10 [==============================] - 1s 60ms/step - loss: 0.3841 - acc:
0.8473 - val_loss: 0.4808 - val_acc: 0.7749
Epoch 450/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3838 - acc:
0.8473 - val_loss: 0.4809 - val_acc: 0.7749
Epoch 451/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3836 - acc:
0.8473 - val_loss: 0.4810 - val_acc: 0.7749
Epoch 452/700
10/10 [==============================] - 1s 63ms/step - loss: 0.3833 - acc:
0.8473 - val_loss: 0.4811 - val_acc: 0.7749
Epoch 453/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3830 - acc:
0.8473 - val_loss: 0.4812 - val_acc: 0.7749
Epoch 454/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3827 - acc:
0.8473 - val_loss: 0.4812 - val_acc: 0.7749
Epoch 455/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3825 - acc:
0.8473 - val_loss: 0.4813 - val_acc: 0.7749
Epoch 456/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3822 - acc:
0.8462 - val_loss: 0.4814 - val_acc: 0.7749
Epoch 457/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3819 - acc:
0.8454 - val_loss: 0.4815 - val_acc: 0.7749
Epoch 458/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3816 - acc:
0.8454 - val_loss: 0.4816 - val_acc: 0.7749
Epoch 459/700
10/10 [==============================] - 1s 61ms/step - loss: 0.3814 - acc:
0.8454 - val_loss: 0.4817 - val_acc: 0.7749
Epoch 460/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3811 - acc:
0.8454 - val_loss: 0.4818 - val_acc: 0.7749
Epoch 461/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3808 - acc:
0.8454 - val_loss: 0.4819 - val_acc: 0.7749
Epoch 462/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3806 - acc:
0.8454 - val_loss: 0.4820 - val_acc: 0.7749
Epoch 463/700
10/10 [==============================] - 1s 56ms/step - loss: 0.3803 - acc:
0.8454 - val_loss: 0.4821 - val_acc: 0.7749
Epoch 464/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3800 - acc:
0.8454 - val_loss: 0.4822 - val_acc: 0.7749
Epoch 465/700
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10/10 [==============================] - 1s 64ms/step - loss: 0.3797 - acc:
0.8456 - val_loss: 0.4823 - val_acc: 0.7749
Epoch 466/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3795 - acc:
0.8473 - val_loss: 0.4824 - val_acc: 0.7749
Epoch 467/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3792 - acc:
0.8473 - val_loss: 0.4825 - val_acc: 0.7749
Epoch 468/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3789 - acc:
0.8473 - val_loss: 0.4826 - val_acc: 0.7749
Epoch 469/700
10/10 [==============================] - 1s 63ms/step - loss: 0.3786 - acc:
0.8473 - val_loss: 0.4827 - val_acc: 0.7749
Epoch 470/700
10/10 [==============================] - 1s 61ms/step - loss: 0.3784 - acc:
0.8473 - val_loss: 0.4828 - val_acc: 0.7749
Epoch 471/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3781 - acc:
0.8488 - val_loss: 0.4829 - val_acc: 0.7749
Epoch 472/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3778 - acc:
0.8492 - val_loss: 0.4830 - val_acc: 0.7749
Epoch 473/700
10/10 [==============================] - 1s 55ms/step - loss: 0.3776 - acc:
0.8510 - val_loss: 0.4831 - val_acc: 0.7749
Epoch 474/700
10/10 [==============================] - 1s 63ms/step - loss: 0.3773 - acc:
0.8510 - val_loss: 0.4832 - val_acc: 0.7749
Epoch 475/700
10/10 [==============================] - 1s 55ms/step - loss: 0.3770 - acc:
0.8510 - val_loss: 0.4833 - val_acc: 0.7749
Epoch 476/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3767 - acc:
0.8510 - val_loss: 0.4834 - val_acc: 0.7749
Epoch 477/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3765 - acc:
0.8510 - val_loss: 0.4835 - val_acc: 0.7749
Epoch 478/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3762 - acc:
0.8510 - val_loss: 0.4836 - val_acc: 0.7749
Epoch 479/700
10/10 [==============================] - 1s 65ms/step - loss: 0.3759 - acc:
0.8510 - val_loss: 0.4837 - val_acc: 0.7749
Epoch 480/700
10/10 [==============================] - 1s 70ms/step - loss: 0.3756 - acc:
0.8525 - val_loss: 0.4839 - val_acc: 0.7749
Epoch 481/700
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10/10 [==============================] - 1s 90ms/step - loss: 0.3754 - acc:
0.8529 - val_loss: 0.4840 - val_acc: 0.7749
Epoch 482/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3751 - acc:
0.8529 - val_loss: 0.4841 - val_acc: 0.7749
Epoch 483/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3748 - acc:
0.8529 - val_loss: 0.4842 - val_acc: 0.7749
Epoch 484/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3745 - acc:
0.8529 - val_loss: 0.4843 - val_acc: 0.7749
Epoch 485/700
10/10 [==============================] - 1s 66ms/step - loss: 0.3743 - acc:
0.8529 - val_loss: 0.4844 - val_acc: 0.7749
Epoch 486/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3740 - acc:
0.8529 - val_loss: 0.4845 - val_acc: 0.7749
Epoch 487/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3737 - acc:
0.8529 - val_loss: 0.4846 - val_acc: 0.7749
Epoch 488/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3734 - acc:
0.8529 - val_loss: 0.4847 - val_acc: 0.7749
Epoch 489/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3732 - acc:
0.8529 - val_loss: 0.4848 - val_acc: 0.7749
Epoch 490/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3729 - acc:
0.8529 - val_loss: 0.4849 - val_acc: 0.7749
Epoch 491/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3726 - acc:
0.8529 - val_loss: 0.4850 - val_acc: 0.7749
Epoch 492/700
10/10 [==============================] - 1s 56ms/step - loss: 0.3723 - acc:
0.8529 - val_loss: 0.4851 - val_acc: 0.7749
Epoch 493/700
10/10 [==============================] - 1s 56ms/step - loss: 0.3720 - acc:
0.8529 - val_loss: 0.4853 - val_acc: 0.7749
Epoch 494/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3717 - acc:
0.8529 - val_loss: 0.4854 - val_acc: 0.7749
Epoch 495/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3715 - acc:
0.8529 - val_loss: 0.4855 - val_acc: 0.7749
Epoch 496/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3712 - acc:
0.8529 - val_loss: 0.4856 - val_acc: 0.7706
Epoch 497/700
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10/10 [==============================] - 1s 56ms/step - loss: 0.3709 - acc:
0.8529 - val_loss: 0.4858 - val_acc: 0.7706
Epoch 498/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3706 - acc:
0.8529 - val_loss: 0.4859 - val_acc: 0.7706
Epoch 499/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3703 - acc:
0.8529 - val_loss: 0.4860 - val_acc: 0.7706
Epoch 500/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3700 - acc:
0.8542 - val_loss: 0.4862 - val_acc: 0.7706
Epoch 501/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3697 - acc:
0.8547 - val_loss: 0.4863 - val_acc: 0.7706
Epoch 502/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3694 - acc:
0.8547 - val_loss: 0.4864 - val_acc: 0.7706
Epoch 503/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3691 - acc:
0.8547 - val_loss: 0.4866 - val_acc: 0.7706
Epoch 504/700
10/10 [==============================] - 1s 61ms/step - loss: 0.3688 - acc:
0.8557 - val_loss: 0.4867 - val_acc: 0.7706
Epoch 505/700
10/10 [==============================] - 1s 61ms/step - loss: 0.3685 - acc:
0.8566 - val_loss: 0.4868 - val_acc: 0.7706
Epoch 506/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3682 - acc:
0.8566 - val_loss: 0.4870 - val_acc: 0.7706
Epoch 507/700
10/10 [==============================] - 1s 61ms/step - loss: 0.3679 - acc:
0.8566 - val_loss: 0.4871 - val_acc: 0.7706
Epoch 508/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3676 - acc:
0.8583 - val_loss: 0.4872 - val_acc: 0.7706
Epoch 509/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3674 - acc:
0.8585 - val_loss: 0.4874 - val_acc: 0.7706
Epoch 510/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3671 - acc:
0.8585 - val_loss: 0.4875 - val_acc: 0.7706
Epoch 511/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3668 - acc:
0.8585 - val_loss: 0.4877 - val_acc: 0.7706
Epoch 512/700
10/10 [==============================] - 1s 66ms/step - loss: 0.3665 - acc:
0.8585 - val_loss: 0.4878 - val_acc: 0.7706
Epoch 513/700
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10/10 [==============================] - 1s 63ms/step - loss: 0.3662 - acc:
0.8585 - val_loss: 0.4879 - val_acc: 0.7706
Epoch 514/700
10/10 [==============================] - 1s 63ms/step - loss: 0.3659 - acc:
0.8585 - val_loss: 0.4881 - val_acc: 0.7706
Epoch 515/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3656 - acc:
0.8585 - val_loss: 0.4882 - val_acc: 0.7706
Epoch 516/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3653 - acc:
0.8585 - val_loss: 0.4884 - val_acc: 0.7706
Epoch 517/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3650 - acc:
0.8585 - val_loss: 0.4885 - val_acc: 0.7706
Epoch 518/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3648 - acc:
0.8585 - val_loss: 0.4886 - val_acc: 0.7706
Epoch 519/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3645 - acc:
0.8585 - val_loss: 0.4888 - val_acc: 0.7706
Epoch 520/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3642 - acc:
0.8585 - val_loss: 0.4889 - val_acc: 0.7706
Epoch 521/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3639 - acc:
0.8585 - val_loss: 0.4891 - val_acc: 0.7706
Epoch 522/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3636 - acc:
0.8585 - val_loss: 0.4892 - val_acc: 0.7706
Epoch 523/700
10/10 [==============================] - 1s 63ms/step - loss: 0.3634 - acc:
0.8585 - val_loss: 0.4894 - val_acc: 0.7706
Epoch 524/700
10/10 [==============================] - 1s 61ms/step - loss: 0.3631 - acc:
0.8585 - val_loss: 0.4895 - val_acc: 0.7706
Epoch 525/700
10/10 [==============================] - 1s 61ms/step - loss: 0.3628 - acc:
0.8585 - val_loss: 0.4897 - val_acc: 0.7706
Epoch 526/700
10/10 [==============================] - 1s 63ms/step - loss: 0.3625 - acc:
0.8585 - val_loss: 0.4898 - val_acc: 0.7706
Epoch 527/700
10/10 [==============================] - 1s 56ms/step - loss: 0.3622 - acc:
0.8585 - val_loss: 0.4900 - val_acc: 0.7706
Epoch 528/700
10/10 [==============================] - 1s 64ms/step - loss: 0.3620 - acc:
0.8585 - val_loss: 0.4901 - val_acc: 0.7706
Epoch 529/700
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10/10 [==============================] - 1s 71ms/step - loss: 0.3617 - acc:
0.8585 - val_loss: 0.4903 - val_acc: 0.7706
Epoch 530/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3614 - acc:
0.8585 - val_loss: 0.4904 - val_acc: 0.7706
Epoch 531/700
10/10 [==============================] - 1s 64ms/step - loss: 0.3611 - acc:
0.8585 - val_loss: 0.4906 - val_acc: 0.7706
Epoch 532/700
10/10 [==============================] - 1s 61ms/step - loss: 0.3608 - acc:
0.8585 - val_loss: 0.4907 - val_acc: 0.7706
Epoch 533/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3606 - acc:
0.8590 - val_loss: 0.4909 - val_acc: 0.7706
Epoch 534/700
10/10 [==============================] - 1s 87ms/step - loss: 0.3603 - acc:
0.8620 - val_loss: 0.4910 - val_acc: 0.7706
Epoch 535/700
10/10 [==============================] - 1s 67ms/step - loss: 0.3600 - acc:
0.8622 - val_loss: 0.4912 - val_acc: 0.7706
Epoch 536/700
10/10 [==============================] - 1s 63ms/step - loss: 0.3597 - acc:
0.8622 - val_loss: 0.4913 - val_acc: 0.7706
Epoch 537/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3594 - acc:
0.8622 - val_loss: 0.4915 - val_acc: 0.7706
Epoch 538/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3592 - acc:
0.8637 - val_loss: 0.4916 - val_acc: 0.7706
Epoch 539/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3589 - acc:
0.8641 - val_loss: 0.4918 - val_acc: 0.7706
Epoch 540/700
10/10 [==============================] - 1s 70ms/step - loss: 0.3586 - acc:
0.8641 - val_loss: 0.4919 - val_acc: 0.7706
Epoch 541/700
10/10 [==============================] - 2s 153ms/step - loss: 0.3583 - acc:
0.8641 - val_loss: 0.4921 - val_acc: 0.7706
Epoch 542/700
10/10 [==============================] - 2s 182ms/step - loss: 0.3580 - acc:
0.8641 - val_loss: 0.4922 - val_acc: 0.7706
Epoch 543/700
10/10 [==============================] - 2s 153ms/step - loss: 0.3577 - acc:
0.8659 - val_loss: 0.4924 - val_acc: 0.7706
Epoch 544/700
10/10 [==============================] - 1s 136ms/step - loss: 0.3575 - acc:
0.8659 - val_loss: 0.4926 - val_acc: 0.7706
Epoch 545/700
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10/10 [==============================] - 1s 65ms/step - loss: 0.3572 - acc:
0.8659 - val_loss: 0.4927 - val_acc: 0.7706
Epoch 546/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3569 - acc:
0.8659 - val_loss: 0.4929 - val_acc: 0.7749
Epoch 547/700
10/10 [==============================] - 1s 116ms/step - loss: 0.3566 - acc:
0.8659 - val_loss: 0.4930 - val_acc: 0.7749
Epoch 548/700
10/10 [==============================] - 1s 98ms/step - loss: 0.3563 - acc:
0.8659 - val_loss: 0.4932 - val_acc: 0.7749
Epoch 549/700
10/10 [==============================] - 1s 65ms/step - loss: 0.3561 - acc:
0.8659 - val_loss: 0.4933 - val_acc: 0.7749
Epoch 550/700
10/10 [==============================] - 1s 79ms/step - loss: 0.3558 - acc:
0.8646 - val_loss: 0.4935 - val_acc: 0.7749
Epoch 551/700
10/10 [==============================] - 1s 65ms/step - loss: 0.3555 - acc:
0.8641 - val_loss: 0.4937 - val_acc: 0.7749
Epoch 552/700
10/10 [==============================] - 1s 123ms/step - loss: 0.3552 - acc:
0.8641 - val_loss: 0.4938 - val_acc: 0.7749
Epoch 553/700
10/10 [==============================] - 1s 82ms/step - loss: 0.3549 - acc:
0.8641 - val_loss: 0.4940 - val_acc: 0.7749
Epoch 554/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3547 - acc:
0.8641 - val_loss: 0.4941 - val_acc: 0.7749
Epoch 555/700
10/10 [==============================] - 1s 108ms/step - loss: 0.3544 - acc:
0.8641 - val_loss: 0.4943 - val_acc: 0.7749
Epoch 556/700
10/10 [==============================] - 1s 50ms/step - loss: 0.3541 - acc:
0.8624 - val_loss: 0.4944 - val_acc: 0.7749
Epoch 557/700
10/10 [==============================] - 1s 64ms/step - loss: 0.3538 - acc:
0.8622 - val_loss: 0.4946 - val_acc: 0.7749
Epoch 558/700
10/10 [==============================] - 1s 53ms/step - loss: 0.3535 - acc:
0.8622 - val_loss: 0.4948 - val_acc: 0.7749
Epoch 559/700
10/10 [==============================] - 0s 49ms/step - loss: 0.3533 - acc:
0.8622 - val_loss: 0.4949 - val_acc: 0.7749
Epoch 560/700
10/10 [==============================] - 1s 56ms/step - loss: 0.3530 - acc:
0.8622 - val_loss: 0.4951 - val_acc: 0.7749
Epoch 561/700
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10/10 [==============================] - 1s 54ms/step - loss: 0.3527 - acc:
0.8622 - val_loss: 0.4952 - val_acc: 0.7749
Epoch 562/700
10/10 [==============================] - 1s 51ms/step - loss: 0.3524 - acc:
0.8639 - val_loss: 0.4954 - val_acc: 0.7749
Epoch 563/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3522 - acc:
0.8641 - val_loss: 0.4956 - val_acc: 0.7749
Epoch 564/700
10/10 [==============================] - 1s 51ms/step - loss: 0.3519 - acc:
0.8641 - val_loss: 0.4957 - val_acc: 0.7749
Epoch 565/700
10/10 [==============================] - 1s 134ms/step - loss: 0.3516 - acc:
0.8641 - val_loss: 0.4959 - val_acc: 0.7749
Epoch 566/700
10/10 [==============================] - 1s 85ms/step - loss: 0.3514 - acc:
0.8641 - val_loss: 0.4961 - val_acc: 0.7749
Epoch 567/700
10/10 [==============================] - 1s 80ms/step - loss: 0.3511 - acc:
0.8641 - val_loss: 0.4962 - val_acc: 0.7749
Epoch 568/700
10/10 [==============================] - 1s 71ms/step - loss: 0.3508 - acc:
0.8641 - val_loss: 0.4964 - val_acc: 0.7749
Epoch 569/700
10/10 [==============================] - 0s 49ms/step - loss: 0.3505 - acc:
0.8641 - val_loss: 0.4966 - val_acc: 0.7749
Epoch 570/700
10/10 [==============================] - 1s 104ms/step - loss: 0.3503 - acc:
0.8641 - val_loss: 0.4967 - val_acc: 0.7749
Epoch 571/700
10/10 [==============================] - 1s 106ms/step - loss: 0.3500 - acc:
0.8641 - val_loss: 0.4969 - val_acc: 0.7749
Epoch 572/700
10/10 [==============================] - 0s 44ms/step - loss: 0.3497 - acc:
0.8659 - val_loss: 0.4971 - val_acc: 0.7749
Epoch 573/700
10/10 [==============================] - 0s 48ms/step - loss: 0.3495 - acc:
0.8659 - val_loss: 0.4973 - val_acc: 0.7749
Epoch 574/700
10/10 [==============================] - 0s 45ms/step - loss: 0.3492 - acc:
0.8659 - val_loss: 0.4974 - val_acc: 0.7749
Epoch 575/700
10/10 [==============================] - 1s 107ms/step - loss: 0.3489 - acc:
0.8659 - val_loss: 0.4976 - val_acc: 0.7749
Epoch 576/700
10/10 [==============================] - 1s 88ms/step - loss: 0.3486 - acc:
0.8659 - val_loss: 0.4978 - val_acc: 0.7706
Epoch 577/700
```

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10/10 [==============================] - 1s 58ms/step - loss: 0.3484 - acc:
0.8659 - val_loss: 0.4979 - val_acc: 0.7706
Epoch 578/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3481 - acc:
0.8659 - val_loss: 0.4981 - val_acc: 0.7706
Epoch 579/700
10/10 [==============================] - 1s 128ms/step - loss: 0.3478 - acc:
0.8659 - val_loss: 0.4983 - val_acc: 0.7706
Epoch 580/700
10/10 [==============================] - 1s 95ms/step - loss: 0.3476 - acc:
0.8659 - val_loss: 0.4984 - val_acc: 0.7706
Epoch 581/700
10/10 [==============================] - 1s 90ms/step - loss: 0.3473 - acc:
0.8659 - val_loss: 0.4986 - val_acc: 0.7706
Epoch 582/700
10/10 [==============================] - 1s 110ms/step - loss: 0.3470 - acc:
0.8659 - val_loss: 0.4988 - val_acc: 0.7706
Epoch 583/700
10/10 [==============================] - 1s 56ms/step - loss: 0.3467 - acc:
0.8659 - val_loss: 0.4989 - val_acc: 0.7706
Epoch 584/700
10/10 [==============================] - 1s 66ms/step - loss: 0.3465 - acc:
0.8678 - val_loss: 0.4991 - val_acc: 0.7706
Epoch 585/700
10/10 [==============================] - 1s 95ms/step - loss: 0.3462 - acc:
0.8680 - val_loss: 0.4993 - val_acc: 0.7706
Epoch 586/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3459 - acc:
0.8696 - val_loss: 0.4994 - val_acc: 0.7706
Epoch 587/700
10/10 [==============================] - 1s 51ms/step - loss: 0.3457 - acc:
0.8696 - val_loss: 0.4996 - val_acc: 0.7706
Epoch 588/700
10/10 [==============================] - 1s 67ms/step - loss: 0.3454 - acc:
0.8706 - val_loss: 0.4998 - val_acc: 0.7706
Epoch 589/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3451 - acc:
0.8715 - val_loss: 0.5000 - val_acc: 0.7706
Epoch 590/700
10/10 [==============================] - 1s 54ms/step - loss: 0.3448 - acc:
0.8715 - val_loss: 0.5001 - val_acc: 0.7706
Epoch 591/700
10/10 [==============================] - 1s 64ms/step - loss: 0.3446 - acc:
0.8715 - val_loss: 0.5003 - val_acc: 0.7706
Epoch 592/700
10/10 [==============================] - 1s 94ms/step - loss: 0.3443 - acc:
0.8715 - val_loss: 0.5005 - val_acc: 0.7706
Epoch 593/700
```

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10/10 [==============================] - 1s 77ms/step - loss: 0.3440 - acc:
0.8715 - val_loss: 0.5006 - val_acc: 0.7706
Epoch 594/700
10/10 [==============================] - 1s 97ms/step - loss: 0.3438 - acc:
0.8715 - val_loss: 0.5008 - val_acc: 0.7706
Epoch 595/700
10/10 [==============================] - 1s 97ms/step - loss: 0.3435 - acc:
0.8715 - val_loss: 0.5010 - val_acc: 0.7706
Epoch 596/700
10/10 [==============================] - 1s 104ms/step - loss: 0.3432 - acc:
0.8715 - val_loss: 0.5011 - val_acc: 0.7706
Epoch 597/700
10/10 [==============================] - 1s 87ms/step - loss: 0.3430 - acc:
0.8715 - val_loss: 0.5013 - val_acc: 0.7706
Epoch 598/700
10/10 [==============================] - 1s 79ms/step - loss: 0.3427 - acc:
0.8715 - val_loss: 0.5015 - val_acc: 0.7706
Epoch 599/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3424 - acc:
0.8715 - val_loss: 0.5016 - val_acc: 0.7706
Epoch 600/700
10/10 [==============================] - 1s 64ms/step - loss: 0.3421 - acc:
0.8732 - val_loss: 0.5018 - val_acc: 0.7706
Epoch 601/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3419 - acc:
0.8734 - val_loss: 0.5020 - val_acc: 0.7706
Epoch 602/700
10/10 [==============================] - 1s 92ms/step - loss: 0.3416 - acc:
0.8734 - val_loss: 0.5021 - val_acc: 0.7706
Epoch 603/700
10/10 [==============================] - 1s 89ms/step - loss: 0.3413 - acc:
0.8734 - val_loss: 0.5023 - val_acc: 0.7706
Epoch 604/700
10/10 [==============================] - 1s 68ms/step - loss: 0.3411 - acc:
0.8734 - val_loss: 0.5025 - val_acc: 0.7706
Epoch 605/700
10/10 [==============================] - 1s 75ms/step - loss: 0.3408 - acc:
0.8734 - val_loss: 0.5026 - val_acc: 0.7706
Epoch 606/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3405 - acc:
0.8734 - val_loss: 0.5028 - val_acc: 0.7706
Epoch 607/700
10/10 [==============================] - 1s 64ms/step - loss: 0.3403 - acc:
0.8734 - val_loss: 0.5030 - val_acc: 0.7706
Epoch 608/700
10/10 [==============================] - 1s 71ms/step - loss: 0.3400 - acc:
0.8736 - val_loss: 0.5031 - val_acc: 0.7706
Epoch 609/700
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10/10 [==============================] - 1s 68ms/step - loss: 0.3397 - acc:
0.8752 - val_loss: 0.5033 - val_acc: 0.7706
Epoch 610/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3395 - acc:
0.8752 - val_loss: 0.5035 - val_acc: 0.7706
Epoch 611/700
10/10 [==============================] - 1s 61ms/step - loss: 0.3392 - acc:
0.8752 - val_loss: 0.5037 - val_acc: 0.7706
Epoch 612/700
10/10 [==============================] - 1s 55ms/step - loss: 0.3389 - acc:
0.8752 - val_loss: 0.5038 - val_acc: 0.7706
Epoch 613/700
10/10 [==============================] - 1s 56ms/step - loss: 0.3387 - acc:
0.8752 - val_loss: 0.5040 - val_acc: 0.7706
Epoch 614/700
10/10 [==============================] - 1s 56ms/step - loss: 0.3384 - acc:
0.8752 - val_loss: 0.5042 - val_acc: 0.7706
Epoch 615/700
10/10 [==============================] - 1s 68ms/step - loss: 0.3381 - acc:
0.8752 - val_loss: 0.5043 - val_acc: 0.7706
Epoch 616/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3379 - acc:
0.8752 - val_loss: 0.5045 - val_acc: 0.7706
Epoch 617/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3376 - acc:
0.8752 - val_loss: 0.5047 - val_acc: 0.7706
Epoch 618/700
10/10 [==============================] - 1s 61ms/step - loss: 0.3373 - acc:
0.8752 - val_loss: 0.5048 - val_acc: 0.7706
Epoch 619/700
10/10 [==============================] - 1s 61ms/step - loss: 0.3371 - acc:
0.8752 - val_loss: 0.5050 - val_acc: 0.7706
Epoch 620/700
10/10 [==============================] - 1s 138ms/step - loss: 0.3368 - acc:
0.8752 - val_loss: 0.5052 - val_acc: 0.7706
Epoch 621/700
10/10 [==============================] - 2s 167ms/step - loss: 0.3365 - acc:
0.8764 - val_loss: 0.5053 - val_acc: 0.7706
Epoch 622/700
10/10 [==============================] - 0s 48ms/step - loss: 0.3363 - acc:
0.8771 - val_loss: 0.5055 - val_acc: 0.7706
Epoch 623/700
10/10 [==============================] - 1s 74ms/step - loss: 0.3360 - acc:
0.8771 - val_loss: 0.5056 - val_acc: 0.7706
Epoch 624/700
10/10 [==============================] - 1s 75ms/step - loss: 0.3358 - acc:
0.8771 - val_loss: 0.5058 - val_acc: 0.7706
Epoch 625/700
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10/10 [==============================] - 0s 45ms/step - loss: 0.3355 - acc:
0.8771 - val_loss: 0.5060 - val_acc: 0.7706
Epoch 626/700
10/10 [==============================] - 0s 45ms/step - loss: 0.3352 - acc:
0.8771 - val_loss: 0.5061 - val_acc: 0.7706
Epoch 627/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3350 - acc:
0.8771 - val_loss: 0.5063 - val_acc: 0.7706
Epoch 628/700
10/10 [==============================] - 1s 67ms/step - loss: 0.3347 - acc:
0.8771 - val_loss: 0.5064 - val_acc: 0.7706
Epoch 629/700
10/10 [==============================] - 0s 46ms/step - loss: 0.3344 - acc:
0.8771 - val_loss: 0.5066 - val_acc: 0.7706
Epoch 630/700
10/10 [==============================] - 0s 44ms/step - loss: 0.3342 - acc:
0.8771 - val_loss: 0.5067 - val_acc: 0.7706
Epoch 631/700
10/10 [==============================] - 0s 48ms/step - loss: 0.3339 - acc:
0.8771 - val_loss: 0.5069 - val_acc: 0.7706
Epoch 632/700
10/10 [==============================] - 0s 46ms/step - loss: 0.3337 - acc:
0.8771 - val_loss: 0.5070 - val_acc: 0.7706
Epoch 633/700
10/10 [==============================] - 0s 46ms/step - loss: 0.3334 - acc:
0.8771 - val_loss: 0.5072 - val_acc: 0.7706
Epoch 634/700
10/10 [==============================] - 1s 66ms/step - loss: 0.3331 - acc:
0.8771 - val_loss: 0.5073 - val_acc: 0.7706
Epoch 635/700
10/10 [==============================] - 0s 44ms/step - loss: 0.3329 - acc:
0.8771 - val_loss: 0.5075 - val_acc: 0.7706
Epoch 636/700
10/10 [==============================] - 0s 44ms/step - loss: 0.3326 - acc:
0.8771 - val_loss: 0.5076 - val_acc: 0.7706
Epoch 637/700
10/10 [==============================] - 1s 126ms/step - loss: 0.3324 - acc:
0.8771 - val_loss: 0.5078 - val_acc: 0.7706
Epoch 638/700
10/10 [==============================] - 1s 132ms/step - loss: 0.3321 - acc:
0.8771 - val_loss: 0.5079 - val_acc: 0.7706
Epoch 639/700
10/10 [==============================] - 1s 82ms/step - loss: 0.3318 - acc:
0.8771 - val_loss: 0.5081 - val_acc: 0.7706
Epoch 640/700
10/10 [==============================] - 1s 56ms/step - loss: 0.3316 - acc:
0.8771 - val_loss: 0.5083 - val_acc: 0.7706
Epoch 641/700
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10/10 [==============================] - 1s 52ms/step - loss: 0.3313 - acc:
0.8771 - val_loss: 0.5084 - val_acc: 0.7706
Epoch 642/700
10/10 [==============================] - 1s 63ms/step - loss: 0.3311 - acc:
0.8771 - val_loss: 0.5086 - val_acc: 0.7706
Epoch 643/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3308 - acc:
0.8771 - val_loss: 0.5087 - val_acc: 0.7706
Epoch 644/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3305 - acc:
0.8771 - val_loss: 0.5089 - val_acc: 0.7662
Epoch 645/700
10/10 [==============================] - 1s 88ms/step - loss: 0.3303 - acc:
0.8771 - val_loss: 0.5091 - val_acc: 0.7662
Epoch 646/700
10/10 [==============================] - 1s 89ms/step - loss: 0.3300 - acc:
0.8771 - val_loss: 0.5092 - val_acc: 0.7662
Epoch 647/700
10/10 [==============================] - 1s 93ms/step - loss: 0.3298 - acc:
0.8771 - val_loss: 0.5094 - val_acc: 0.7662
Epoch 648/700
10/10 [==============================] - 1s 67ms/step - loss: 0.3295 - acc:
0.8771 - val_loss: 0.5095 - val_acc: 0.7662
Epoch 649/700
10/10 [==============================] - 1s 66ms/step - loss: 0.3292 - acc:
0.8771 - val_loss: 0.5097 - val_acc: 0.7662
Epoch 650/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3290 - acc:
0.8771 - val_loss: 0.5098 - val_acc: 0.7662
Epoch 651/700
10/10 [==============================] - 1s 65ms/step - loss: 0.3287 - acc:
0.8771 - val_loss: 0.5100 - val_acc: 0.7662
Epoch 652/700
10/10 [==============================] - 1s 96ms/step - loss: 0.3285 - acc:
0.8771 - val_loss: 0.5102 - val_acc: 0.7662
Epoch 653/700
10/10 [==============================] - 1s 104ms/step - loss: 0.3282 - acc:
0.8771 - val_loss: 0.5103 - val_acc: 0.7662
Epoch 654/700
10/10 [==============================] - 1s 63ms/step - loss: 0.3279 - acc:
0.8771 - val_loss: 0.5105 - val_acc: 0.7662
Epoch 655/700
10/10 [==============================] - 1s 64ms/step - loss: 0.3277 - acc:
0.8771 - val_loss: 0.5107 - val_acc: 0.7662
Epoch 656/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3274 - acc:
0.8771 - val_loss: 0.5109 - val_acc: 0.7662
Epoch 657/700
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10/10 [==============================] - 1s 62ms/step - loss: 0.3272 - acc:
0.8771 - val_loss: 0.5110 - val_acc: 0.7662
Epoch 658/700
10/10 [==============================] - 1s 83ms/step - loss: 0.3269 - acc:
0.8771 - val_loss: 0.5112 - val_acc: 0.7662
Epoch 659/700
10/10 [==============================] - 1s 96ms/step - loss: 0.3266 - acc:
0.8771 - val_loss: 0.5114 - val_acc: 0.7662
Epoch 660/700
10/10 [==============================] - 1s 86ms/step - loss: 0.3264 - acc:
0.8771 - val_loss: 0.5116 - val_acc: 0.7662
Epoch 661/700
10/10 [==============================] - 1s 108ms/step - loss: 0.3261 - acc:
0.8771 - val_loss: 0.5117 - val_acc: 0.7662
Epoch 662/700
10/10 [==============================] - 1s 76ms/step - loss: 0.3258 - acc:
0.8788 - val_loss: 0.5119 - val_acc: 0.7662
Epoch 663/700
10/10 [==============================] - 1s 72ms/step - loss: 0.3256 - acc:
0.8790 - val_loss: 0.5121 - val_acc: 0.7662
Epoch 664/700
10/10 [==============================] - 1s 85ms/step - loss: 0.3253 - acc:
0.8790 - val_loss: 0.5123 - val_acc: 0.7662
Epoch 665/700
10/10 [==============================] - 1s 97ms/step - loss: 0.3250 - acc:
0.8790 - val_loss: 0.5124 - val_acc: 0.7662
Epoch 666/700
10/10 [==============================] - 1s 67ms/step - loss: 0.3248 - acc:
0.8790 - val_loss: 0.5126 - val_acc: 0.7662
Epoch 667/700
10/10 [==============================] - 1s 86ms/step - loss: 0.3245 - acc:
0.8790 - val_loss: 0.5128 - val_acc: 0.7662
Epoch 668/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3242 - acc:
0.8801 - val_loss: 0.5129 - val_acc: 0.7662
Epoch 669/700
10/10 [==============================] - 1s 67ms/step - loss: 0.3239 - acc:
0.8808 - val_loss: 0.5131 - val_acc: 0.7662
Epoch 670/700
10/10 [==============================] - 1s 76ms/step - loss: 0.3237 - acc:
0.8808 - val_loss: 0.5133 - val_acc: 0.7662
Epoch 671/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3234 - acc:
0.8808 - val_loss: 0.5134 - val_acc: 0.7662
Epoch 672/700
10/10 [==============================] - 1s 64ms/step - loss: 0.3231 - acc:
0.8808 - val_loss: 0.5136 - val_acc: 0.7662
Epoch 673/700
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10/10 [==============================] - 1s 56ms/step - loss: 0.3229 - acc:
0.8808 - val_loss: 0.5138 - val_acc: 0.7662
Epoch 674/700
10/10 [==============================] - 1s 91ms/step - loss: 0.3226 - acc:
0.8808 - val_loss: 0.5140 - val_acc: 0.7662
Epoch 675/700
10/10 [==============================] - 1s 85ms/step - loss: 0.3223 - acc:
0.8808 - val_loss: 0.5141 - val_acc: 0.7662
Epoch 676/700
10/10 [==============================] - 1s 64ms/step - loss: 0.3221 - acc:
0.8808 - val_loss: 0.5143 - val_acc: 0.7662
Epoch 677/700
10/10 [==============================] - 1s 56ms/step - loss: 0.3218 - acc:
0.8808 - val_loss: 0.5145 - val_acc: 0.7662
Epoch 678/700
10/10 [==============================] - 1s 62ms/step - loss: 0.3215 - acc:
0.8808 - val_loss: 0.5147 - val_acc: 0.7662
Epoch 679/700
10/10 [==============================] - 1s 58ms/step - loss: 0.3213 - acc:
0.8808 - val_loss: 0.5149 - val_acc: 0.7662
Epoch 680/700
10/10 [==============================] - 1s 56ms/step - loss: 0.3210 - acc:
0.8808 - val_loss: 0.5151 - val_acc: 0.7662
Epoch 681/700
10/10 [==============================] - 1s 53ms/step - loss: 0.3207 - acc:
0.8808 - val_loss: 0.5152 - val_acc: 0.7662
Epoch 682/700
10/10 [==============================] - 1s 55ms/step - loss: 0.3204 - acc:
0.8808 - val_loss: 0.5154 - val_acc: 0.7662
Epoch 683/700
10/10 [==============================] - 0s 49ms/step - loss: 0.3202 - acc:
0.8808 - val_loss: 0.5156 - val_acc: 0.7662
Epoch 684/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3199 - acc:
0.8808 - val_loss: 0.5158 - val_acc: 0.7706
Epoch 685/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3196 - acc:
0.8808 - val_loss: 0.5160 - val_acc: 0.7706
Epoch 686/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3193 - acc:
0.8808 - val_loss: 0.5162 - val_acc: 0.7706
Epoch 687/700
10/10 [==============================] - 1s 55ms/step - loss: 0.3191 - acc:
0.8808 - val_loss: 0.5164 - val_acc: 0.7706
Epoch 688/700
10/10 [==============================] - 1s 56ms/step - loss: 0.3188 - acc:
0.8808 - val_loss: 0.5166 - val_acc: 0.7706
Epoch 689/700
```

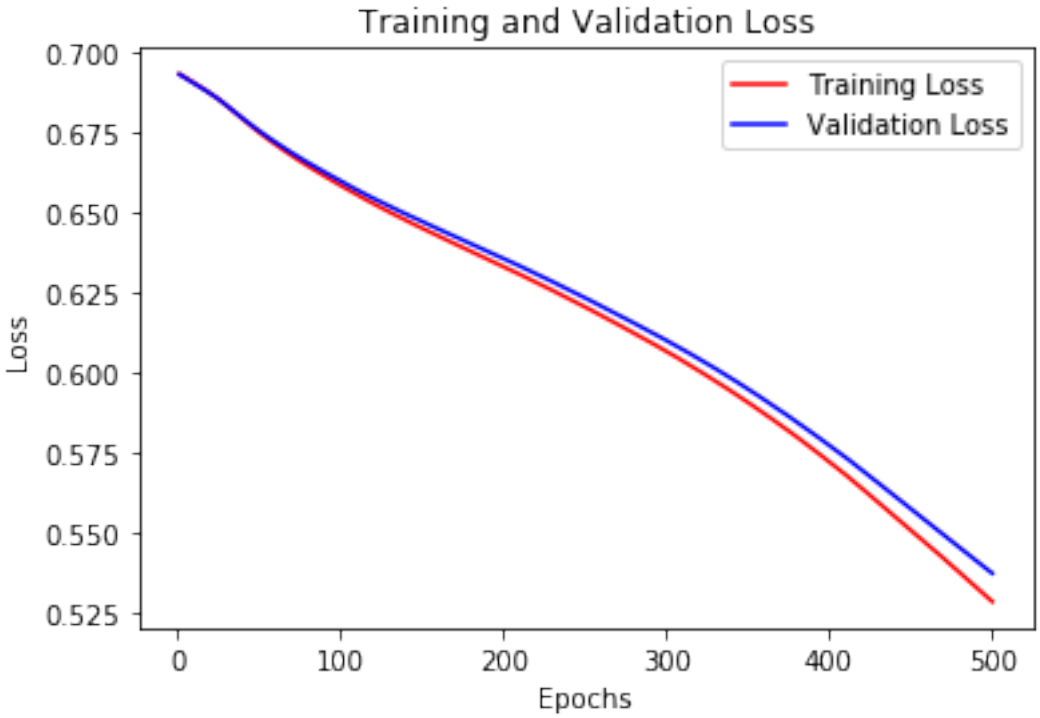
```
10/10 [==============================] - 1s 63ms/step - loss: 0.3185 - acc:
0.8808 - val_loss: 0.5168 - val_acc: 0.7706
Epoch 690/700
10/10 [==============================] - 1s 53ms/step - loss: 0.3182 - acc:
0.8808 - val_loss: 0.5170 - val_acc: 0.7662
Epoch 691/700
10/10 [==============================] - 1s 59ms/step - loss: 0.3179 - acc:
0.8808 - val_loss: 0.5172 - val_acc: 0.7662
Epoch 692/700
10/10 [==============================] - 1s 55ms/step - loss: 0.3177 - acc:
0.8808 - val_loss: 0.5174 - val_acc: 0.7662
Epoch 693/700
10/10 [==============================] - 1s 61ms/step - loss: 0.3174 - acc:
0.8808 - val_loss: 0.5176 - val_acc: 0.7662
Epoch 694/700
10/10 [==============================] - 1s 51ms/step - loss: 0.3171 - acc:
0.8808 - val_loss: 0.5178 - val_acc: 0.7662
Epoch 695/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3168 - acc:
0.8808 - val_loss: 0.5180 - val_acc: 0.7662
Epoch 696/700
10/10 [==============================] - 1s 65ms/step - loss: 0.3165 - acc:
0.8821 - val_loss: 0.5182 - val_acc: 0.7662
Epoch 697/700
10/10 [==============================] - 1s 54ms/step - loss: 0.3163 - acc:
0.8827 - val_loss: 0.5184 - val_acc: 0.7662
Epoch 698/700
10/10 [==============================] - 1s 60ms/step - loss: 0.3160 - acc:
0.8827 - val_loss: 0.5186 - val_acc: 0.7662
Epoch 699/700
10/10 [==============================] - 1s 57ms/step - loss: 0.3157 - acc:
0.8827 - val_loss: 0.5188 - val_acc: 0.7662
Epoch 700/700
10/10 [==============================] - 1s 65ms/step - loss: 0.3154 - acc:
0.8827 - val_loss: 0.5190 - val_acc: 0.7662
```

[353]:
```
loss = history.history['loss']
val_loss = history.history['val_loss']
acc = history.history['acc']
val_acc = history.history['val_acc']
```

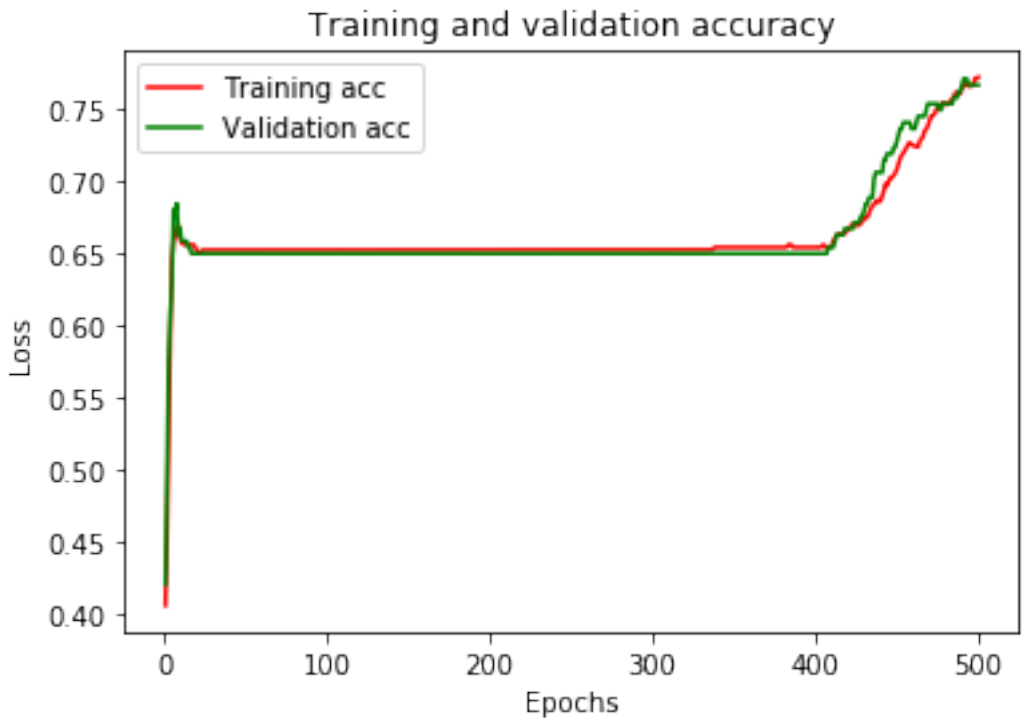
[354]:
```
y_pred_class_nn_mod6 = model.predict_classes(X_test_norm)
y_pred_prob_nn_mod6 = model.predict(X_test_norm)
```

[355]:
```
# Evaluate the losses of the model
    epochs = range(1, len(loss)+1)
    plt.plot(epochs, loss, color='red', label='Training Loss')
    plt.plot(epochs, val_loss, color='blue', label='Validation Loss')
```

```
    plt.title('Training and Validation Loss')
    plt.xlabel('Epochs')
    plt.ylabel('Loss')
    plt.legend()
    plt.show()
```



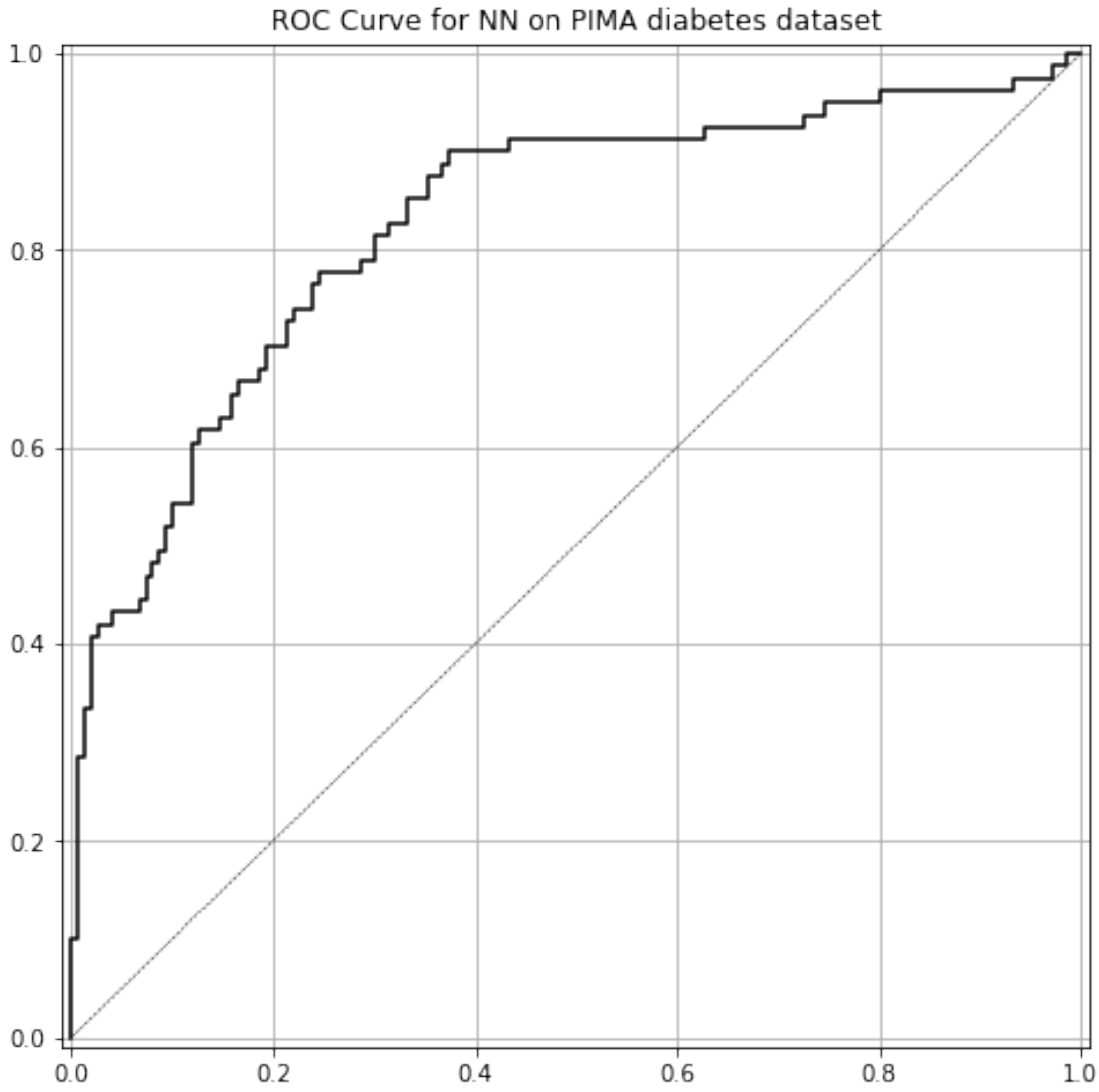
[356]:
```
# Evaluate the accuracy of the model
    plt.plot(epochs, acc, color='red', label='Training acc')
    plt.plot(epochs, val_acc, color='green', label='Validation acc')
    plt.title('Training and validation accuracy')
    plt.xlabel('Epochs')
    plt.ylabel('Loss')
    plt.legend()
    plt.show()
```



[357]:
```
# Print model performance and plot the roc curve
print('accuracy is {:.3f}'.format(accuracy_score(y_test,y_pred_class_nn_mod6)))
print('roc-auc is {:.3f}'.format(roc_auc_score(y_test,y_pred_prob_nn_mod6)))

plot_roc(y_test, y_pred_prob_nn_mod6, 'NN')
```

```
accuracy is 0.766
roc-auc is 0.828
```



Accuracy obtained from this model is 76.6% Now, lets modify the model to accomodate new learning rate and then check the performance.

[502]:
```
model_1 = Sequential()
model_1 = model_4(model_1)
```

[503]:
```
# compile the model
    model_1.compile(
        loss = 'binary_crossentropy',
        optimizer = SGD(lr=0.05, decay=1e-6, momentum=0.9),
        metrics = ['accuracy']
    )
```

[510]:
```
# Train the model for the given number of epochs
    history = model_1.fit(
        X_train_norm, y_train,
        steps_per_epoch=20,
        epochs=200,
        verbose=1,
        validation_data=(X_test, y_test),
        validation_steps=10
    )
```

```
Train on 537 samples, validate on 231 samples
Epoch 1/200
20/20 [==============================] - 1s 68ms/step - loss: 2.8621e-05 - acc:
1.0000 - val_loss: 2.6161 - val_acc: 0.7576
Epoch 2/200
20/20 [==============================] - 1s 67ms/step - loss: 2.7863e-05 - acc:
1.0000 - val_loss: 2.6232 - val_acc: 0.7576
Epoch 3/200
20/20 [==============================] - 1s 68ms/step - loss: 2.7142e-05 - acc:
1.0000 - val_loss: 2.6242 - val_acc: 0.7576
Epoch 4/200
20/20 [==============================] - 1s 71ms/step - loss: 2.6454e-05 - acc:
1.0000 - val_loss: 2.6281 - val_acc: 0.7576
Epoch 5/200
20/20 [==============================] - 1s 68ms/step - loss: 2.5800e-05 - acc:
1.0000 - val_loss: 2.6266 - val_acc: 0.7576
Epoch 6/200
20/20 [==============================] - 1s 71ms/step - loss: 2.5175e-05 - acc:
1.0000 - val_loss: 2.6323 - val_acc: 0.7576
Epoch 7/200
20/20 [==============================] - 1s 72ms/step - loss: 2.4578e-05 - acc:
1.0000 - val_loss: 2.6334 - val_acc: 0.7576
Epoch 8/200
20/20 [==============================] - 1s 68ms/step - loss: 2.4007e-05 - acc:
1.0000 - val_loss: 2.6328 - val_acc: 0.7576
Epoch 9/200
20/20 [==============================] - 1s 68ms/step - loss: 2.3459e-05 - acc:
1.0000 - val_loss: 2.6365 - val_acc: 0.7576
Epoch 10/200
20/20 [==============================] - 1s 68ms/step - loss: 2.2934e-05 - acc:
1.0000 - val_loss: 2.6377 - val_acc: 0.7576
Epoch 11/200
20/20 [==============================] - 1s 71ms/step - loss: 2.2431e-05 - acc:
1.0000 - val_loss: 2.6386 - val_acc: 0.7576
Epoch 12/200
20/20 [==============================] - 1s 70ms/step - loss: 2.1948e-05 - acc:
1.0000 - val_loss: 2.6418 - val_acc: 0.7576
```

```
Epoch 13/200
20/20 [==============================] - 1s 71ms/step - loss: 2.1483e-05 - acc:
1.0000 - val_loss: 2.6438 - val_acc: 0.7576
Epoch 14/200
20/20 [==============================] - 1s 70ms/step - loss: 2.1035e-05 - acc:
1.0000 - val_loss: 2.6464 - val_acc: 0.7576
Epoch 15/200
20/20 [==============================] - 1s 69ms/step - loss: 2.0606e-05 - acc:
1.0000 - val_loss: 2.6472 - val_acc: 0.7576
Epoch 16/200
20/20 [==============================] - 1s 73ms/step - loss: 2.0192e-05 - acc:
1.0000 - val_loss: 2.6474 - val_acc: 0.7576
Epoch 17/200
20/20 [==============================] - 1s 71ms/step - loss: 1.9793e-05 - acc:
1.0000 - val_loss: 2.6508 - val_acc: 0.7576
Epoch 18/200
20/20 [==============================] - 2s 76ms/step - loss: 1.9408e-05 - acc:
1.0000 - val_loss: 2.6480 - val_acc: 0.7619
Epoch 19/200
20/20 [==============================] - 1s 68ms/step - loss: 1.9037e-05 - acc:
1.0000 - val_loss: 2.6522 - val_acc: 0.7619
Epoch 20/200
20/20 [==============================] - 1s 75ms/step - loss: 1.8679e-05 - acc:
1.0000 - val_loss: 2.6515 - val_acc: 0.7619
Epoch 21/200
20/20 [==============================] - 1s 70ms/step - loss: 1.8333e-05 - acc:
1.0000 - val_loss: 2.6518 - val_acc: 0.7619
Epoch 22/200
20/20 [==============================] - 2s 79ms/step - loss: 1.7999e-05 - acc:
1.0000 - val_loss: 2.6543 - val_acc: 0.7619
Epoch 23/200
20/20 [==============================] - 2s 84ms/step - loss: 1.7677e-05 - acc:
1.0000 - val_loss: 2.6582 - val_acc: 0.7619
Epoch 24/200
20/20 [==============================] - 1s 73ms/step - loss: 1.7364e-05 - acc:
1.0000 - val_loss: 2.6583 - val_acc: 0.7619
Epoch 25/200
20/20 [==============================] - 1s 73ms/step - loss: 1.7062e-05 - acc:
1.0000 - val_loss: 2.6565 - val_acc: 0.7619
Epoch 26/200
20/20 [==============================] - 2s 75ms/step - loss: 1.6770e-05 - acc:
1.0000 - val_loss: 2.6619 - val_acc: 0.7619
Epoch 27/200
20/20 [==============================] - 1s 75ms/step - loss: 1.6486e-05 - acc:
1.0000 - val_loss: 2.6620 - val_acc: 0.7619
Epoch 28/200
20/20 [==============================] - 1s 68ms/step - loss: 1.6212e-05 - acc:
1.0000 - val_loss: 2.6635 - val_acc: 0.7619
```

```
Epoch 29/200
20/20 [==============================] - 1s 72ms/step - loss: 1.5945e-05 - acc:
1.0000 - val_loss: 2.6659 - val_acc: 0.7619
Epoch 30/200
20/20 [==============================] - 1s 69ms/step - loss: 1.5685e-05 - acc:
1.0000 - val_loss: 2.6647 - val_acc: 0.7619
Epoch 31/200
20/20 [==============================] - 1s 70ms/step - loss: 1.5434e-05 - acc:
1.0000 - val_loss: 2.6646 - val_acc: 0.7619
Epoch 32/200
20/20 [==============================] - 1s 69ms/step - loss: 1.5190e-05 - acc:
1.0000 - val_loss: 2.6674 - val_acc: 0.7619
Epoch 33/200
20/20 [==============================] - 1s 72ms/step - loss: 1.4953e-05 - acc:
1.0000 - val_loss: 2.6676 - val_acc: 0.7619
Epoch 34/200
20/20 [==============================] - 1s 69ms/step - loss: 1.4722e-05 - acc:
1.0000 - val_loss: 2.6705 - val_acc: 0.7619
Epoch 35/200
20/20 [==============================] - 1s 72ms/step - loss: 1.4499e-05 - acc:
1.0000 - val_loss: 2.6698 - val_acc: 0.7619
Epoch 36/200
20/20 [==============================] - 1s 72ms/step - loss: 1.4281e-05 - acc:
1.0000 - val_loss: 2.6700 - val_acc: 0.7619
Epoch 37/200
20/20 [==============================] - 1s 71ms/step - loss: 1.4070e-05 - acc:
1.0000 - val_loss: 2.6763 - val_acc: 0.7619
Epoch 38/200
20/20 [==============================] - 1s 71ms/step - loss: 1.3864e-05 - acc:
1.0000 - val_loss: 2.6803 - val_acc: 0.7619
Epoch 39/200
20/20 [==============================] - 1s 70ms/step - loss: 1.3664e-05 - acc:
1.0000 - val_loss: 2.6763 - val_acc: 0.7619
Epoch 40/200
20/20 [==============================] - 1s 73ms/step - loss: 1.3469e-05 - acc:
1.0000 - val_loss: 2.6788 - val_acc: 0.7619
Epoch 41/200
20/20 [==============================] - 1s 73ms/step - loss: 1.3280e-05 - acc:
1.0000 - val_loss: 2.6825 - val_acc: 0.7619
Epoch 42/200
20/20 [==============================] - 1s 73ms/step - loss: 1.3095e-05 - acc:
1.0000 - val_loss: 2.6809 - val_acc: 0.7619
Epoch 43/200
20/20 [==============================] - 1s 68ms/step - loss: 1.2915e-05 - acc:
1.0000 - val_loss: 2.6849 - val_acc: 0.7619
Epoch 44/200
20/20 [==============================] - 2s 99ms/step - loss: 1.2740e-05 - acc:
1.0000 - val_loss: 2.6846 - val_acc: 0.7619
```

```
Epoch 45/200
20/20 [==============================] - 1s 73ms/step - loss: 1.2568e-05 - acc:
1.0000 - val_loss: 2.6847 - val_acc: 0.7619
Epoch 46/200
20/20 [==============================] - 1s 70ms/step - loss: 1.2402e-05 - acc:
1.0000 - val_loss: 2.6875 - val_acc: 0.7619
Epoch 47/200
20/20 [==============================] - 1s 69ms/step - loss: 1.2239e-05 - acc:
1.0000 - val_loss: 2.6886 - val_acc: 0.7619
Epoch 48/200
20/20 [==============================] - 2s 75ms/step - loss: 1.2081e-05 - acc:
1.0000 - val_loss: 2.6897 - val_acc: 0.7619
Epoch 49/200
20/20 [==============================] - 2s 75ms/step - loss: 1.1926e-05 - acc:
1.0000 - val_loss: 2.6905 - val_acc: 0.7619
Epoch 50/200
20/20 [==============================] - 1s 74ms/step - loss: 1.1774e-05 - acc:
1.0000 - val_loss: 2.6913 - val_acc: 0.7619
Epoch 51/200
20/20 [==============================] - 1s 72ms/step - loss: 1.1627e-05 - acc:
1.0000 - val_loss: 2.6906 - val_acc: 0.7619
Epoch 52/200
20/20 [==============================] - 1s 68ms/step - loss: 1.1482e-05 - acc:
1.0000 - val_loss: 2.6908 - val_acc: 0.7619
Epoch 53/200
20/20 [==============================] - 1s 74ms/step - loss: 1.1341e-05 - acc:
1.0000 - val_loss: 2.6933 - val_acc: 0.7619
Epoch 54/200
20/20 [==============================] - 1s 71ms/step - loss: 1.1203e-05 - acc:
1.0000 - val_loss: 2.6936 - val_acc: 0.7619
Epoch 55/200
20/20 [==============================] - 1s 70ms/step - loss: 1.1069e-05 - acc:
1.0000 - val_loss: 2.6956 - val_acc: 0.7619
Epoch 56/200
20/20 [==============================] - 1s 68ms/step - loss: 1.0936e-05 - acc:
1.0000 - val_loss: 2.6939 - val_acc: 0.7619
Epoch 57/200
20/20 [==============================] - 1s 71ms/step - loss: 1.0807e-05 - acc:
1.0000 - val_loss: 2.6955 - val_acc: 0.7619
Epoch 58/200
20/20 [==============================] - 1s 69ms/step - loss: 1.0681e-05 - acc:
1.0000 - val_loss: 2.6961 - val_acc: 0.7619
Epoch 59/200
20/20 [==============================] - 1s 72ms/step - loss: 1.0558e-05 - acc:
1.0000 - val_loss: 2.6983 - val_acc: 0.7619
Epoch 60/200
20/20 [==============================] - 1s 73ms/step - loss: 1.0437e-05 - acc:
1.0000 - val_loss: 2.7042 - val_acc: 0.7619
```

```
Epoch 61/200
20/20 [==============================] - 2s 77ms/step - loss: 1.0319e-05 - acc:
1.0000 - val_loss: 2.7035 - val_acc: 0.7619
Epoch 62/200
20/20 [==============================] - 1s 67ms/step - loss: 1.0202e-05 - acc:
1.0000 - val_loss: 2.7006 - val_acc: 0.7619
Epoch 63/200
20/20 [==============================] - 1s 70ms/step - loss: 1.0089e-05 - acc:
1.0000 - val_loss: 2.6998 - val_acc: 0.7619
Epoch 64/200
20/20 [==============================] - 1s 68ms/step - loss: 9.9777e-06 - acc:
1.0000 - val_loss: 2.6957 - val_acc: 0.7619
Epoch 65/200
20/20 [==============================] - 1s 67ms/step - loss: 9.8687e-06 - acc:
1.0000 - val_loss: 2.7049 - val_acc: 0.7619
Epoch 66/200
20/20 [==============================] - 1s 68ms/step - loss: 9.7624e-06 - acc:
1.0000 - val_loss: 2.7015 - val_acc: 0.7619
Epoch 67/200
20/20 [==============================] - 1s 68ms/step - loss: 9.6578e-06 - acc:
1.0000 - val_loss: 2.7067 - val_acc: 0.7619
Epoch 68/200
20/20 [==============================] - 1s 74ms/step - loss: 9.5550e-06 - acc:
1.0000 - val_loss: 2.7071 - val_acc: 0.7619
Epoch 69/200
20/20 [==============================] - 2s 88ms/step - loss: 9.4545e-06 - acc:
1.0000 - val_loss: 2.7058 - val_acc: 0.7619
Epoch 70/200
20/20 [==============================] - 1s 66ms/step - loss: 9.3556e-06 - acc:
1.0000 - val_loss: 2.7048 - val_acc: 0.7619
Epoch 71/200
20/20 [==============================] - 1s 67ms/step - loss: 9.2588e-06 - acc:
1.0000 - val_loss: 2.7066 - val_acc: 0.7619
Epoch 72/200
20/20 [==============================] - 1s 67ms/step - loss: 9.1638e-06 - acc:
1.0000 - val_loss: 2.7092 - val_acc: 0.7619
Epoch 73/200
20/20 [==============================] - 1s 70ms/step - loss: 9.0708e-06 - acc:
1.0000 - val_loss: 2.7090 - val_acc: 0.7619
Epoch 74/200
20/20 [==============================] - 1s 68ms/step - loss: 8.9793e-06 - acc:
1.0000 - val_loss: 2.7086 - val_acc: 0.7619
Epoch 75/200
20/20 [==============================] - 1s 70ms/step - loss: 8.8893e-06 - acc:
1.0000 - val_loss: 2.7142 - val_acc: 0.7619
Epoch 76/200
20/20 [==============================] - 1s 70ms/step - loss: 8.8018e-06 - acc:
1.0000 - val_loss: 2.7091 - val_acc: 0.7619
```

```
Epoch 77/200
20/20 [==============================] - 1s 68ms/step - loss: 8.7149e-06 - acc:
1.0000 - val_loss: 2.7134 - val_acc: 0.7619
Epoch 78/200
20/20 [==============================] - 1s 70ms/step - loss: 8.6303e-06 - acc:
1.0000 - val_loss: 2.7140 - val_acc: 0.7619
Epoch 79/200
20/20 [==============================] - ETA: 0s - loss: 8.5492e-06 - acc: 1.000
- 1s 66ms/step - loss: 8.5471e-06 - acc: 1.0000 - val_loss: 2.7107 - val_acc:
0.7619
Epoch 80/200
20/20 [==============================] - 1s 68ms/step - loss: 8.4655e-06 - acc:
1.0000 - val_loss: 2.7200 - val_acc: 0.7619
Epoch 81/200
20/20 [==============================] - 1s 71ms/step - loss: 8.3852e-06 - acc:
1.0000 - val_loss: 2.7121 - val_acc: 0.7619
Epoch 82/200
20/20 [==============================] - 1s 70ms/step - loss: 8.3064e-06 - acc:
1.0000 - val_loss: 2.7152 - val_acc: 0.7619
Epoch 83/200
20/20 [==============================] - 1s 69ms/step - loss: 8.2279e-06 - acc:
1.0000 - val_loss: 2.7196 - val_acc: 0.7619
Epoch 84/200
20/20 [==============================] - 1s 72ms/step - loss: 8.1520e-06 - acc:
1.0000 - val_loss: 2.7167 - val_acc: 0.7619
Epoch 85/200
20/20 [==============================] - 1s 70ms/step - loss: 8.0766e-06 - acc:
1.0000 - val_loss: 2.7204 - val_acc: 0.7619
Epoch 86/200
20/20 [==============================] - ETA: 0s - loss: 8.0054e-06 - acc: 1.000
- 1s 66ms/step - loss: 8.0036e-06 - acc: 1.0000 - val_loss: 2.7203 - val_acc:
0.7619
Epoch 87/200
20/20 [==============================] - 1s 69ms/step - loss: 7.9305e-06 - acc:
1.0000 - val_loss: 2.7178 - val_acc: 0.7619
Epoch 88/200
20/20 [==============================] - 1s 69ms/step - loss: 7.8591e-06 - acc:
1.0000 - val_loss: 2.7176 - val_acc: 0.7619
Epoch 89/200
20/20 [==============================] - 1s 68ms/step - loss: 7.7891e-06 - acc:
1.0000 - val_loss: 2.7198 - val_acc: 0.7619
Epoch 90/200
20/20 [==============================] - 1s 73ms/step - loss: 7.7203e-06 - acc:
1.0000 - val_loss: 2.7260 - val_acc: 0.7619
Epoch 91/200
20/20 [==============================] - 1s 71ms/step - loss: 7.6526e-06 - acc:
1.0000 - val_loss: 2.7193 - val_acc: 0.7619
Epoch 92/200
```

```
20/20 [==============================] - 1s 67ms/step - loss: 7.5859e-06 - acc:
1.0000 - val_loss: 2.7256 - val_acc: 0.7619
Epoch 93/200
20/20 [==============================] - 1s 68ms/step - loss: 7.5207e-06 - acc:
1.0000 - val_loss: 2.7186 - val_acc: 0.7619
Epoch 94/200
20/20 [==============================] - 1s 70ms/step - loss: 7.4554e-06 - acc:
1.0000 - val_loss: 2.7241 - val_acc: 0.7619
Epoch 95/200
20/20 [==============================] - 1s 69ms/step - loss: 7.3926e-06 - acc:
1.0000 - val_loss: 2.7222 - val_acc: 0.7619
Epoch 96/200
20/20 [==============================] - 1s 71ms/step - loss: 7.3295e-06 - acc:
1.0000 - val_loss: 2.7252 - val_acc: 0.7619
Epoch 97/200
20/20 [==============================] - 1s 70ms/step - loss: 7.2683e-06 - acc:
1.0000 - val_loss: 2.7263 - val_acc: 0.7619
Epoch 98/200
20/20 [==============================] - 1s 70ms/step - loss: 7.2076e-06 - acc:
1.0000 - val_loss: 2.7243 - val_acc: 0.7619
Epoch 99/200
20/20 [==============================] - 1s 67ms/step - loss: 7.1484e-06 - acc:
1.0000 - val_loss: 2.7308 - val_acc: 0.7619
Epoch 100/200
20/20 [==============================] - 1s 72ms/step - loss: 7.0892e-06 - acc:
1.0000 - val_loss: 2.7308 - val_acc: 0.7619
Epoch 101/200
20/20 [==============================] - 1s 71ms/step - loss: 7.0316e-06 - acc:
1.0000 - val_loss: 2.7281 - val_acc: 0.7619
Epoch 102/200
20/20 [==============================] - 1s 68ms/step - loss: 6.9748e-06 - acc:
1.0000 - val_loss: 2.7297 - val_acc: 0.7619
Epoch 103/200
20/20 [==============================] - 1s 70ms/step - loss: 6.9184e-06 - acc:
1.0000 - val_loss: 2.7289 - val_acc: 0.7619
Epoch 104/200
20/20 [==============================] - 1s 69ms/step - loss: 6.8634e-06 - acc:
1.0000 - val_loss: 2.7320 - val_acc: 0.7619
Epoch 105/200
20/20 [==============================] - 2s 77ms/step - loss: 6.8088e-06 - acc:
1.0000 - val_loss: 2.7301 - val_acc: 0.7619
Epoch 106/200
20/20 [==============================] - 2s 81ms/step - loss: 6.7547e-06 - acc:
1.0000 - val_loss: 2.7325 - val_acc: 0.7619
Epoch 107/200
20/20 [==============================] - 2s 82ms/step - loss: 6.7022e-06 - acc:
1.0000 - val_loss: 2.7320 - val_acc: 0.7619
Epoch 108/200
```

```
20/20 [==============================] - 1s 69ms/step - loss: 6.6506e-06 - acc:
1.0000 - val_loss: 2.7337 - val_acc: 0.7619
Epoch 109/200
20/20 [==============================] - 1s 67ms/step - loss: 6.5992e-06 - acc:
1.0000 - val_loss: 2.7329 - val_acc: 0.7619
Epoch 110/200
20/20 [==============================] - 1s 68ms/step - loss: 6.5480e-06 - acc:
1.0000 - val_loss: 2.7329 - val_acc: 0.7619
Epoch 111/200
20/20 [==============================] - 2s 75ms/step - loss: 6.4981e-06 - acc:
1.0000 - val_loss: 2.7320 - val_acc: 0.7619
Epoch 112/200
20/20 [==============================] - 1s 71ms/step - loss: 6.4500e-06 - acc:
1.0000 - val_loss: 2.7366 - val_acc: 0.7619
Epoch 113/200
20/20 [==============================] - 1s 67ms/step - loss: 6.4016e-06 - acc:
1.0000 - val_loss: 2.7358 - val_acc: 0.7619
Epoch 114/200
20/20 [==============================] - 1s 72ms/step - loss: 6.3538e-06 - acc:
1.0000 - val_loss: 2.7355 - val_acc: 0.7619
Epoch 115/200
20/20 [==============================] - 1s 72ms/step - loss: 6.3066e-06 - acc:
1.0000 - val_loss: 2.7336 - val_acc: 0.7619
Epoch 116/200
20/20 [==============================] - 1s 71ms/step - loss: 6.2595e-06 - acc:
1.0000 - val_loss: 2.7351 - val_acc: 0.7619
Epoch 117/200
20/20 [==============================] - 1s 71ms/step - loss: 6.2138e-06 - acc:
1.0000 - val_loss: 2.7383 - val_acc: 0.7619
Epoch 118/200
20/20 [==============================] - 1s 71ms/step - loss: 6.1685e-06 - acc:
1.0000 - val_loss: 2.7372 - val_acc: 0.7619
Epoch 119/200
20/20 [==============================] - 1s 68ms/step - loss: 6.1243e-06 - acc:
1.0000 - val_loss: 2.7371 - val_acc: 0.7619
Epoch 120/200
20/20 [==============================] - 1s 68ms/step - loss: 6.0800e-06 - acc:
1.0000 - val_loss: 2.7394 - val_acc: 0.7619
Epoch 121/200
20/20 [==============================] - 1s 65ms/step - loss: 6.0369e-06 - acc:
1.0000 - val_loss: 2.7329 - val_acc: 0.7619
Epoch 122/200
20/20 [==============================] - 1s 68ms/step - loss: 5.9940e-06 - acc:
1.0000 - val_loss: 2.7403 - val_acc: 0.7619
Epoch 123/200
20/20 [==============================] - 1s 67ms/step - loss: 5.9518e-06 - acc:
1.0000 - val_loss: 2.7383 - val_acc: 0.7619
Epoch 124/200
```

```
20/20 [==============================] - 1s 69ms/step - loss: 5.9101e-06 - acc:
1.0000 - val_loss: 2.7398 - val_acc: 0.7619
Epoch 125/200
20/20 [==============================] - 1s 70ms/step - loss: 5.8691e-06 - acc:
1.0000 - val_loss: 2.7374 - val_acc: 0.7619
Epoch 126/200
20/20 [==============================] - 1s 68ms/step - loss: 5.8281e-06 - acc:
1.0000 - val_loss: 2.7370 - val_acc: 0.7619
Epoch 127/200
20/20 [==============================] - 1s 69ms/step - loss: 5.7883e-06 - acc:
1.0000 - val_loss: 2.7405 - val_acc: 0.7619
Epoch 128/200
20/20 [==============================] - 1s 71ms/step - loss: 5.7486e-06 - acc:
1.0000 - val_loss: 2.7435 - val_acc: 0.7619
Epoch 129/200
20/20 [==============================] - 1s 71ms/step - loss: 5.7095e-06 - acc:
1.0000 - val_loss: 2.7450 - val_acc: 0.7619
Epoch 130/200
20/20 [==============================] - 1s 71ms/step - loss: 5.6710e-06 - acc:
1.0000 - val_loss: 2.7429 - val_acc: 0.7619
Epoch 131/200
20/20 [==============================] - 1s 68ms/step - loss: 5.6327e-06 - acc:
1.0000 - val_loss: 2.7381 - val_acc: 0.7619
Epoch 132/200
20/20 [==============================] - 1s 70ms/step - loss: 5.5954e-06 - acc:
1.0000 - val_loss: 2.7430 - val_acc: 0.7619
Epoch 133/200
20/20 [==============================] - 1s 72ms/step - loss: 5.5587e-06 - acc:
1.0000 - val_loss: 2.7439 - val_acc: 0.7619
Epoch 134/200
20/20 [==============================] - 1s 73ms/step - loss: 5.5218e-06 - acc:
1.0000 - val_loss: 2.7462 - val_acc: 0.7619
Epoch 135/200
20/20 [==============================] - 1s 68ms/step - loss: 5.4849e-06 - acc:
1.0000 - val_loss: 2.7472 - val_acc: 0.7619
Epoch 136/200
20/20 [==============================] - 1s 70ms/step - loss: 5.4498e-06 - acc:
1.0000 - val_loss: 2.7465 - val_acc: 0.7619
Epoch 137/200
20/20 [==============================] - ETA: 0s - loss: 5.4151e-06 - acc: 1.000
- 1s 70ms/step - loss: 5.4142e-06 - acc: 1.0000 - val_loss: 2.7476 - val_acc:
0.7619
Epoch 138/200
20/20 [==============================] - 1s 69ms/step - loss: 5.3794e-06 - acc:
1.0000 - val_loss: 2.7455 - val_acc: 0.7619
Epoch 139/200
20/20 [==============================] - 1s 71ms/step - loss: 5.3452e-06 - acc:
1.0000 - val_loss: 2.7489 - val_acc: 0.7619
```

```
Epoch 140/200
20/20 [==============================] - 1s 68ms/step - loss: 5.3108e-06 - acc:
1.0000 - val_loss: 2.7461 - val_acc: 0.7619
Epoch 141/200
20/20 [==============================] - 1s 69ms/step - loss: 5.2772e-06 - acc:
1.0000 - val_loss: 2.7476 - val_acc: 0.7619
Epoch 142/200
20/20 [==============================] - 1s 70ms/step - loss: 5.2439e-06 - acc:
1.0000 - val_loss: 2.7481 - val_acc: 0.7619
Epoch 143/200
20/20 [==============================] - 1s 71ms/step - loss: 5.2109e-06 - acc:
1.0000 - val_loss: 2.7480 - val_acc: 0.7619
Epoch 144/200
20/20 [==============================] - 1s 72ms/step - loss: 5.1791e-06 - acc:
1.0000 - val_loss: 2.7508 - val_acc: 0.7619
Epoch 145/200
20/20 [==============================] - 1s 66ms/step - loss: 5.1462e-06 - acc:
1.0000 - val_loss: 2.7479 - val_acc: 0.7619
Epoch 146/200
20/20 [==============================] - ETA: 0s - loss: 5.1157e-06 - acc: 1.000
- 1s 70ms/step - loss: 5.1149e-06 - acc: 1.0000 - val_loss: 2.7507 - val_acc:
0.7619
Epoch 147/200
20/20 [==============================] - 1s 71ms/step - loss: 5.0832e-06 - acc:
1.0000 - val_loss: 2.7526 - val_acc: 0.7619
Epoch 148/200
20/20 [==============================] - 1s 68ms/step - loss: 5.0522e-06 - acc:
1.0000 - val_loss: 2.7524 - val_acc: 0.7619
Epoch 149/200
20/20 [==============================] - 1s 72ms/step - loss: 5.0219e-06 - acc:
1.0000 - val_loss: 2.7544 - val_acc: 0.7619
Epoch 150/200
20/20 [==============================] - 1s 67ms/step - loss: 4.9914e-06 - acc:
1.0000 - val_loss: 2.7537 - val_acc: 0.7619
Epoch 151/200
20/20 [==============================] - 1s 72ms/step - loss: 4.9615e-06 - acc:
1.0000 - val_loss: 2.7524 - val_acc: 0.7619
Epoch 152/200
20/20 [==============================] - 1s 71ms/step - loss: 4.9318e-06 - acc:
1.0000 - val_loss: 2.7555 - val_acc: 0.7619
Epoch 153/200
20/20 [==============================] - 1s 69ms/step - loss: 4.9028e-06 - acc:
1.0000 - val_loss: 2.7509 - val_acc: 0.7619
Epoch 154/200
20/20 [==============================] - 2s 80ms/step - loss: 4.8731e-06 - acc:
1.0000 - val_loss: 2.7559 - val_acc: 0.7619
Epoch 155/200
20/20 [==============================] - 2s 82ms/step - loss: 4.8449e-06 - acc:
```

```
1.0000 - val_loss: 2.7564 - val_acc: 0.7619
Epoch 156/200
20/20 [==============================] - 2s 80ms/step - loss: 4.8169e-06 - acc:
1.0000 - val_loss: 2.7565 - val_acc: 0.7619
Epoch 157/200
20/20 [==============================] - 2s 114ms/step - loss: 4.7889e-06 - acc:
1.0000 - val_loss: 2.7537 - val_acc: 0.7619
Epoch 158/200
20/20 [==============================] - 2s 80ms/step - loss: 4.7605e-06 - acc:
1.0000 - val_loss: 2.7562 - val_acc: 0.7619
Epoch 159/200
20/20 [==============================] - 1s 72ms/step - loss: 4.7338e-06 - acc:
1.0000 - val_loss: 2.7576 - val_acc: 0.7619
Epoch 160/200
20/20 [==============================] - 1s 73ms/step - loss: 4.7064e-06 - acc:
1.0000 - val_loss: 2.7582 - val_acc: 0.7619
Epoch 161/200
20/20 [==============================] - 1s 67ms/step - loss: 4.6798e-06 - acc:
1.0000 - val_loss: 2.7608 - val_acc: 0.7619
Epoch 162/200
20/20 [==============================] - 1s 74ms/step - loss: 4.6533e-06 - acc:
1.0000 - val_loss: 2.7586 - val_acc: 0.7619
Epoch 163/200
20/20 [==============================] - 2s 101ms/step - loss: 4.6266e-06 - acc:
1.0000 - val_loss: 2.7581 - val_acc: 0.7619
Epoch 164/200
20/20 [==============================] - 1s 74ms/step - loss: 4.6004e-06 - acc:
1.0000 - val_loss: 2.7602 - val_acc: 0.7619
Epoch 165/200
20/20 [==============================] - 2s 77ms/step - loss: 4.5747e-06 - acc:
1.0000 - val_loss: 2.7590 - val_acc: 0.7619
Epoch 166/200
20/20 [==============================] - 2s 76ms/step - loss: 4.5500e-06 - acc:
1.0000 - val_loss: 2.7621 - val_acc: 0.7619
Epoch 167/200
20/20 [==============================] - 2s 90ms/step - loss: 4.5243e-06 - acc:
1.0000 - val_loss: 2.7627 - val_acc: 0.7619
Epoch 168/200
20/20 [==============================] - 1s 72ms/step - loss: 4.4996e-06 - acc:
1.0000 - val_loss: 2.7613 - val_acc: 0.7619
Epoch 169/200
20/20 [==============================] - 1s 74ms/step - loss: 4.4751e-06 - acc:
1.0000 - val_loss: 2.7588 - val_acc: 0.7619
Epoch 170/200
20/20 [==============================] - 1s 74ms/step - loss: 4.4510e-06 - acc:
1.0000 - val_loss: 2.7618 - val_acc: 0.7619
Epoch 171/200
20/20 [==============================] - 2s 95ms/step - loss: 4.4264e-06 - acc:
```

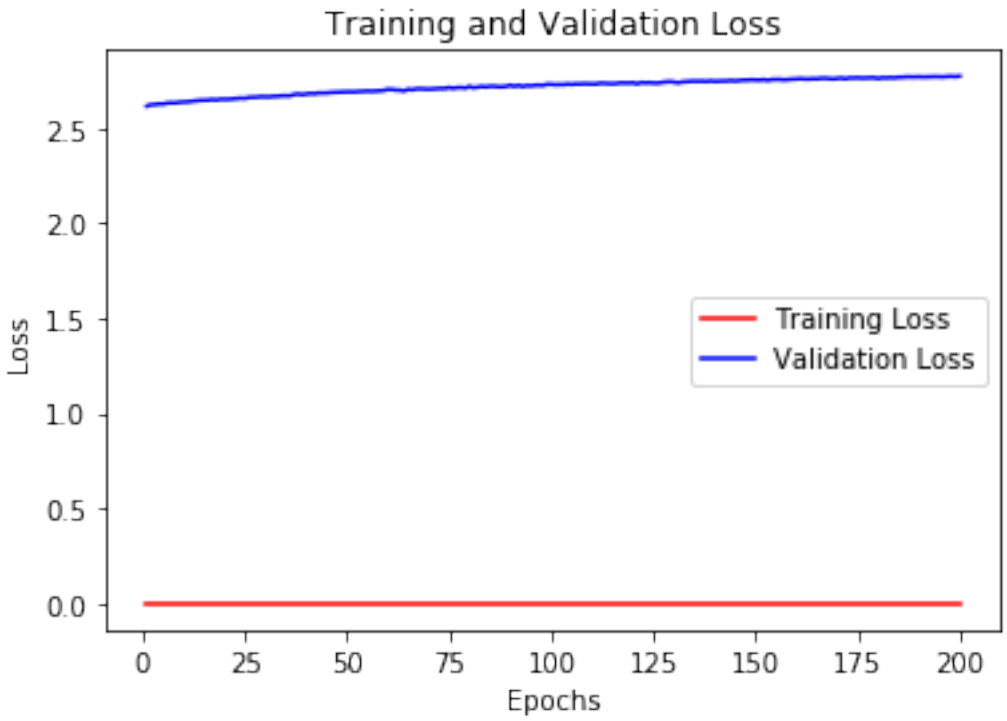
```
1.0000 - val_loss: 2.7640 - val_acc: 0.7619
Epoch 172/200
20/20 [==============================] - 2s 77ms/step - loss: 4.4018e-06 - acc:
1.0000 - val_loss: 2.7592 - val_acc: 0.7619
Epoch 173/200
20/20 [==============================] - 2s 80ms/step - loss: 4.3788e-06 - acc:
1.0000 - val_loss: 2.7646 - val_acc: 0.7619
Epoch 174/200
20/20 [==============================] - 2s 111ms/step - loss: 4.3555e-06 - acc:
1.0000 - val_loss: 2.7637 - val_acc: 0.7619
Epoch 175/200
20/20 [==============================] - 2s 92ms/step - loss: 4.3321e-06 - acc:
1.0000 - val_loss: 2.7655 - val_acc: 0.7619
Epoch 176/200
20/20 [==============================] - 1s 71ms/step - loss: 4.3089e-06 - acc:
1.0000 - val_loss: 2.7633 - val_acc: 0.7619
Epoch 177/200
20/20 [==============================] - 1s 75ms/step - loss: 4.2863e-06 - acc:
1.0000 - val_loss: 2.7636 - val_acc: 0.7619
Epoch 178/200
20/20 [==============================] - 1s 66ms/step - loss: 4.2636e-06 - acc:
1.0000 - val_loss: 2.7642 - val_acc: 0.7619
Epoch 179/200
20/20 [==============================] - 1s 74ms/step - loss: 4.2415e-06 - acc:
1.0000 - val_loss: 2.7657 - val_acc: 0.7619
Epoch 180/200
20/20 [==============================] - 2s 75ms/step - loss: 4.2195e-06 - acc:
1.0000 - val_loss: 2.7610 - val_acc: 0.7619
Epoch 181/200
20/20 [==============================] - 2s 81ms/step - loss: 4.1981e-06 - acc:
1.0000 - val_loss: 2.7656 - val_acc: 0.7619
Epoch 182/200
20/20 [==============================] - 1s 62ms/step - loss: 4.1763e-06 - acc:
1.0000 - val_loss: 2.7641 - val_acc: 0.7619
Epoch 183/200
20/20 [==============================] - 1s 48ms/step - loss: 4.1549e-06 - acc:
1.0000 - val_loss: 2.7666 - val_acc: 0.7619
Epoch 184/200
20/20 [==============================] - 1s 62ms/step - loss: 4.1335e-06 - acc:
1.0000 - val_loss: 2.7643 - val_acc: 0.7619
Epoch 185/200
20/20 [==============================] - 1s 52ms/step - loss: 4.1122e-06 - acc:
1.0000 - val_loss: 2.7678 - val_acc: 0.7619
Epoch 186/200
20/20 [==============================] - 1s 52ms/step - loss: 4.0913e-06 - acc:
1.0000 - val_loss: 2.7678 - val_acc: 0.7619
Epoch 187/200
20/20 [==============================] - 1s 56ms/step - loss: 4.0706e-06 - acc:
```

```
1.0000 - val_loss: 2.7699 - val_acc: 0.7619
Epoch 188/200
20/20 [==============================] - 2s 80ms/step - loss: 4.0501e-06 - acc:
1.0000 - val_loss: 2.7688 - val_acc: 0.7619
Epoch 189/200
20/20 [==============================] - 2s 91ms/step - loss: 4.0301e-06 - acc:
1.0000 - val_loss: 2.7691 - val_acc: 0.7619
Epoch 190/200
20/20 [==============================] - 2s 78ms/step - loss: 4.0100e-06 - acc:
1.0000 - val_loss: 2.7704 - val_acc: 0.7619
Epoch 191/200
20/20 [==============================] - 2s 79ms/step - loss: 3.9902e-06 - acc:
1.0000 - val_loss: 2.7688 - val_acc: 0.7619
Epoch 192/200
20/20 [==============================] - 2s 80ms/step - loss: 3.9711e-06 - acc:
1.0000 - val_loss: 2.7701 - val_acc: 0.7619
Epoch 193/200
20/20 [==============================] - 2s 105ms/step - loss: 3.9511e-06 - acc:
1.0000 - val_loss: 2.7705 - val_acc: 0.7619
Epoch 194/200
20/20 [==============================] - 2s 81ms/step - loss: 3.9318e-06 - acc:
1.0000 - val_loss: 2.7711 - val_acc: 0.7619
Epoch 195/200
20/20 [==============================] - 1s 67ms/step - loss: 3.9127e-06 - acc:
1.0000 - val_loss: 2.7705 - val_acc: 0.7619
Epoch 196/200
20/20 [==============================] - 2s 86ms/step - loss: 3.8940e-06 - acc:
1.0000 - val_loss: 2.7694 - val_acc: 0.7619
Epoch 197/200
20/20 [==============================] - 2s 78ms/step - loss: 3.8747e-06 - acc:
1.0000 - val_loss: 2.7720 - val_acc: 0.7619
Epoch 198/200
20/20 [==============================] - 1s 75ms/step - loss: 3.8560e-06 - acc:
1.0000 - val_loss: 2.7727 - val_acc: 0.7619
Epoch 199/200
20/20 [==============================] - 1s 67ms/step - loss: 3.8374e-06 - acc:
1.0000 - val_loss: 2.7707 - val_acc: 0.7619
Epoch 200/200
20/20 [==============================] - 1s 48ms/step - loss: 3.8197e-06 - acc:
1.0000 - val_loss: 2.7741 - val_acc: 0.7619
```

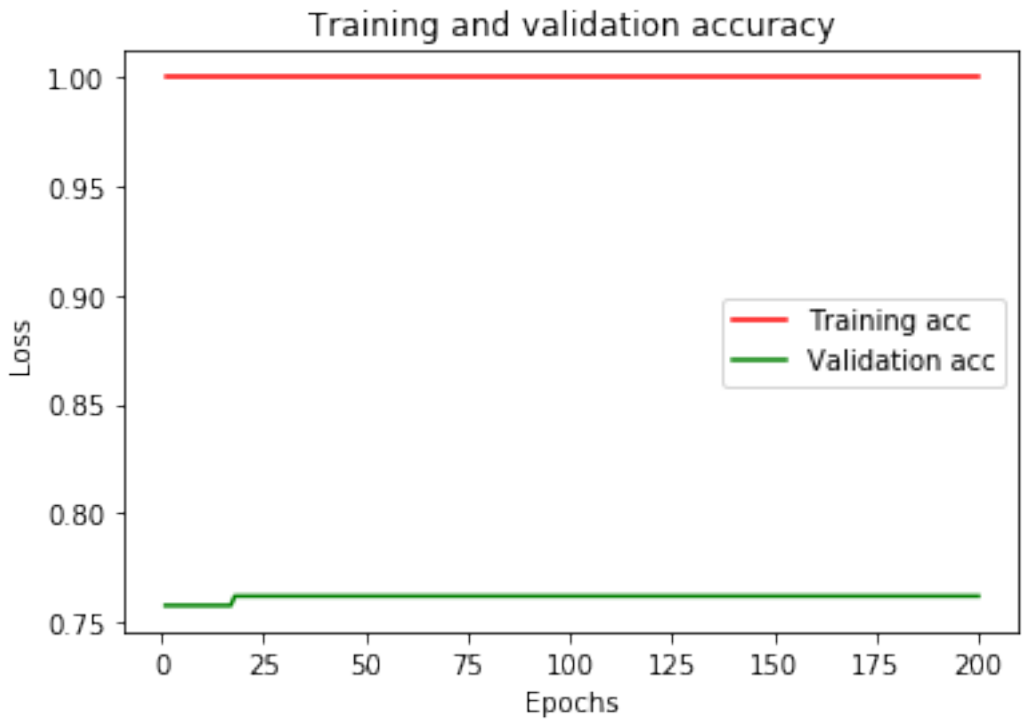
[511]:
```
loss = history.history['loss']
val_loss = history.history['val_loss']
acc = history.history['acc']
val_acc = history.history['val_acc']
```

[512]:
```
y_pred_class_nn_mod7 = model_1.predict_classes(X_test_norm)
y_pred_prob_nn_mod7 = model_1.predict(X_test_norm)
```

[513]:
```
# Evaluate the losses of the model
    epochs = range(1, len(loss)+1)
    plt.plot(epochs, loss, color='red', label='Training Loss')
    plt.plot(epochs, val_loss, color='blue', label='Validation Loss')
    plt.title('Training and Validation Loss')
    plt.xlabel('Epochs')
    plt.ylabel('Loss')
    plt.legend()
    plt.show()
```



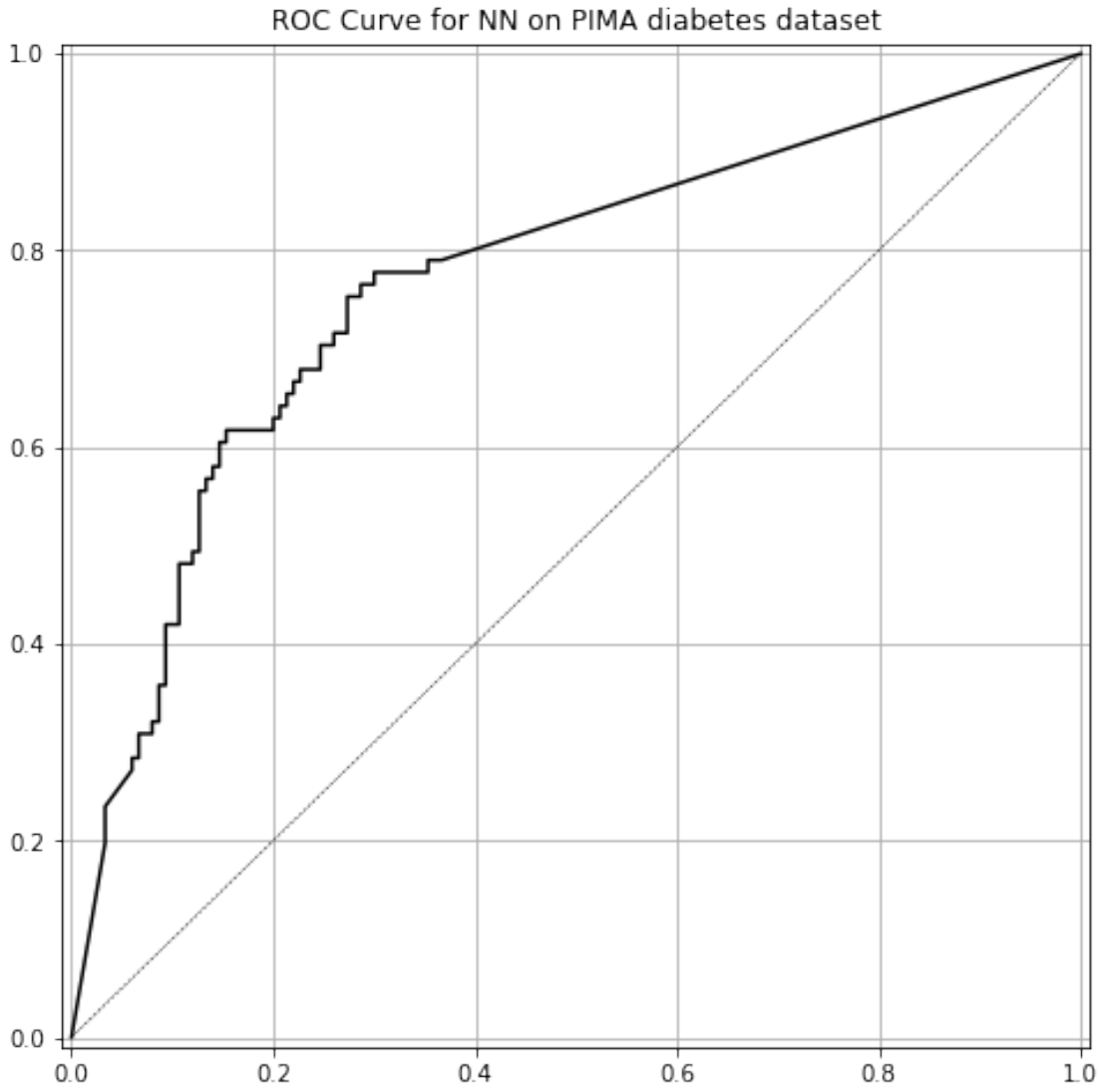
[514]:
```
# Evaluate the accuracy of the model
    plt.plot(epochs, acc, color='red', label='Training acc')
    plt.plot(epochs, val_acc, color='green', label='Validation acc')
    plt.title('Training and validation accuracy')
    plt.xlabel('Epochs')
    plt.ylabel('Loss')
    plt.legend()
    plt.show()
```



[516]:
```
# Print model performance and plot the roc curve
print('accuracy is {:.3f}'.format(accuracy_score(y_test,y_pred_class_nn_mod7)))
print('roc-auc is {:.3f}'.format(roc_auc_score(y_test,y_pred_prob_nn_mod7)))

plot_roc(y_test, y_pred_prob_nn_mod7, 'NN')
```

```
accuracy is 0.762
roc-auc is 0.769
```



Accuracy obtained from this model is 76.2% and AUC-ROC value is 0.769

1.7 Conclusion

We used various machine learning and deep learning techniques to predict the outcome and evaluated the model based on the accuracy score and ROC-AUC curve obtained. During the model building and evaluation, we have calculated and plotted training and validation accuracy curve as well as training and validation losses curves.

Here are the results:
Random Forest Technique : Accuracy score : 72.3%
K-Nearest Neighbors : Accuracy score : 75.3%
Gradient Boosting : Accuracy score : 78.3%
ANN Model 1 : Best Accuracy score: 77.5% AUC-ROC : 0.814

ANN Model 2 : Best Accuracy score: 73.2% AUC-ROC : 0.774

ANN Model 3 : Best Accuracy score: 76.2% AUC-ROC : 0.769

If hyperparameters in deep learning are tuned more and regularization techniques are applied then model performance can be improved and this can give better accuracy then other machine learning models.

We tried developing different models with different number of layers, learning rates and different activation functions.

1.7.1 Contribution:

85% of the code has been developed by me and the rest of the code has been referred from other sources like research paper, blogs and github.

1.7.2 Citation:

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https://towardsdatascience.com/understanding-learning-rates-and-how-it-improves-performance-in-deep-learning-d0d4059c1c10

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