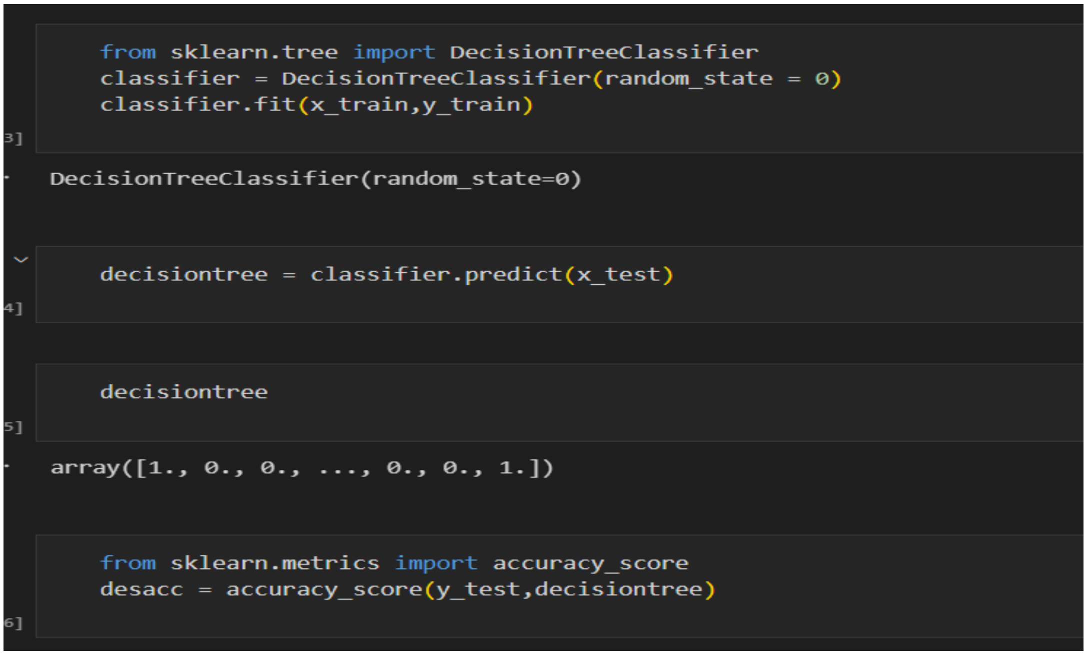
Training The Model In Multiple Algorithms

Now our data is cleaned and it’s time to build the model. We can train our data on different algorithms. For this project we are applying four classification algorithms. The best model is saved based on its performance.

Decision Tree Model

A function named decisionTree is created and train and test data are passed as the parameters. Inside the function, DecisionTreeClassifier algorithm is initialised and training data is passed to the model with the .fit() function. Test data is predicted with .predict() function and saved in a new variable. For evaluating the model, a confusion matrix and classification report is done.

We are going to use x_train and y_train obtained above in train_test_split section to train our **Decision Tree Classifier** model. We’re using the fit method and passing the parameters as shown below.



```
from sklearn.tree import DecisionTreeClassifier
classifier = DecisionTreeClassifier(random_state = 0)
classifier.fit(x_train,y_train)
```

```
DecisionTreeClassifier(random_state=0)
```

```
decisiontree = classifier.predict(x_test)
```

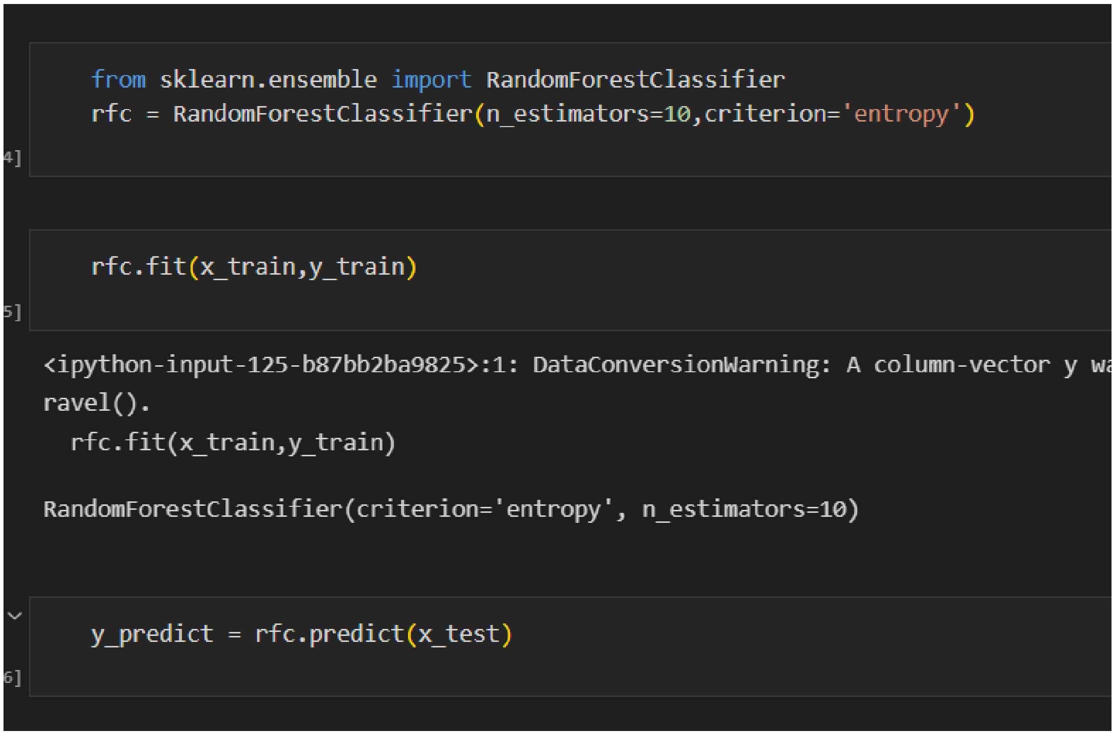
```
decisiontree
```

```
array([1., 0., 0., ..., 0., 0., 1.])
```

```
from sklearn.metrics import accuracy_score
desacc = accuracy_score(y_test,decisiontree)
```

Random Forest Model:

A function named random Forest is created and train and test data are passed as the parameters. Inside the function, Random Forest Classifier algorithm is initialized and training data is passed to the model with .fit() function. Test data is predicted with. predict() function and saved in a new variable. For evaluating the model, a confusion matrix and classification report is done.



```
from sklearn.ensemble import RandomForestClassifier
rfc = RandomForestClassifier(n_estimators=10,criterion='entropy')
```

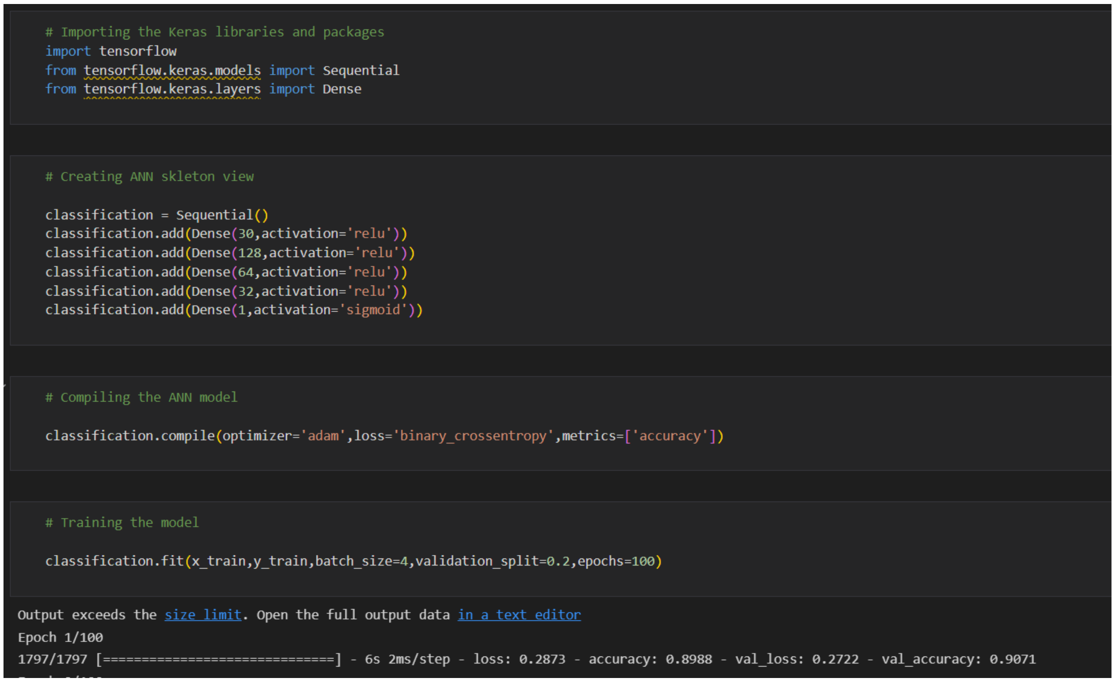
```
rfc.fit(x_train,y_train)
```

```
<ipython-input-125-b87bb2ba9825>:1: DataConversionWarning: A column-vector y wa
ravel().
  rfc.fit(x_train,y_train)

RandomForestClassifier(criterion='entropy', n_estimators=10)
```

```
y_predict = rfc.predict(x_test)
```

ANN Model:

Building and training an Artificial Neural Network (ANN) using the Keras library with TensorFlow as the backend. The ANN is initialised as an instance of the Sequential class, which is a linear stack of layers. Then, the input layer and two hidden layers are added to the model using the Dense class, where the number of units and activation function are specified. The output layer is also added using the Dense class with a sigmoid activation function. The model is then compiled with the Adam optimizer, binary cross-entropy loss function, and accuracy metric. Finally, the model is fit to the training data with a batch size of 100, 20% validation split, and 100 epochs.



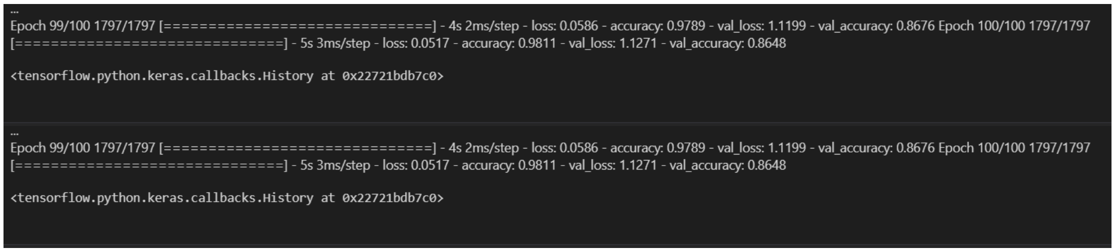
```
# Importing the Keras libraries and packages
import tensorflow
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense
```

```
# Creating ANN skleton view

classification = Sequential()
classification.add(Dense(30,activation='relu'))
classification.add(Dense(128,activation='relu'))
classification.add(Dense(64,activation='relu'))
classification.add(Dense(32,activation='relu'))
classification.add(Dense(1,activation='sigmoid'))
```

```
# Compiling the ANN model

classification.compile(optimizer='adam',loss='binary_crossentropy',metrics=['accuracy'])
```

```
# Training the model

classification.fit(x_train,y_train,batch_size=4,validation_split=0.2,epochs=100)
```

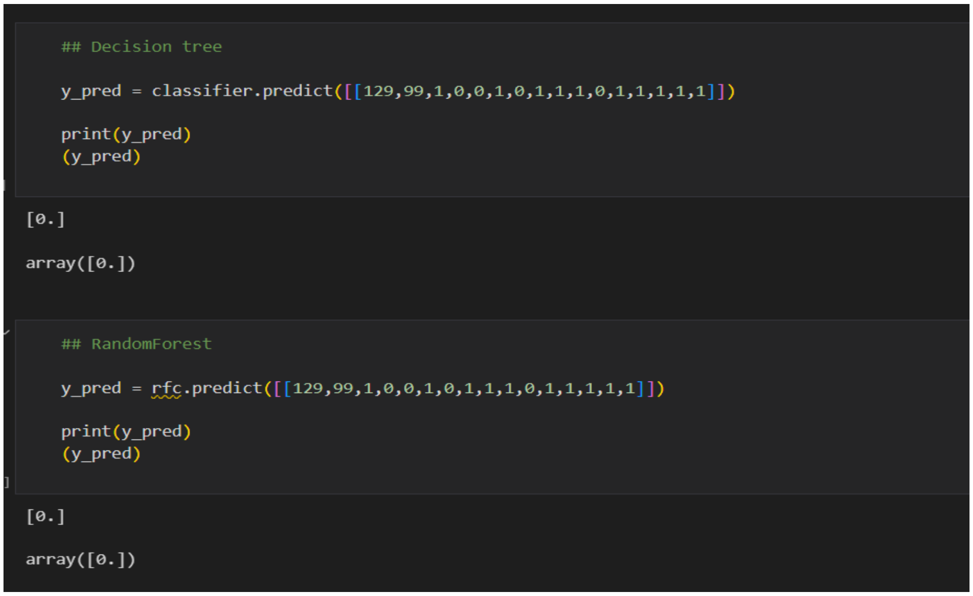
```
Output exceeds the size_limit. Open the full output data in a text editor
Epoch 1/100
1797/1797 [==============================] - 6s 2ms/step - loss: 0.2873 - accuracy: 0.8988 - val_loss: 0.2722 - val_accuracy: 0.9071
```



```
...
Epoch 99/100 1797/1797 [==============================] - 4s 2ms/step - loss: 0.0586 - accuracy: 0.9789 - val_loss: 1.1199 - val_accuracy: 0.8676 Epoch 100/100 1797/1797
[==============================] - 5s 3ms/step - loss: 0.0517 - accuracy: 0.9811 - val_loss: 1.1271 - val_accuracy: 0.8648

<tensorflow.python.keras.callbacks.History at 0x22721bdb7c0>
```

```
...
Epoch 99/100 1797/1797 [==============================] - 4s 2ms/step - loss: 0.0586 - accuracy: 0.9789 - val_loss: 1.1199 - val_accuracy: 0.8676 Epoch 100/100 1797/1797
[==============================] - 5s 3ms/step - loss: 0.0517 - accuracy: 0.9811 - val_loss: 1.1271 - val_accuracy: 0.8648

<tensorflow.python.keras.callbacks.History at 0x22721bdb7c0>
```

Test The Model:



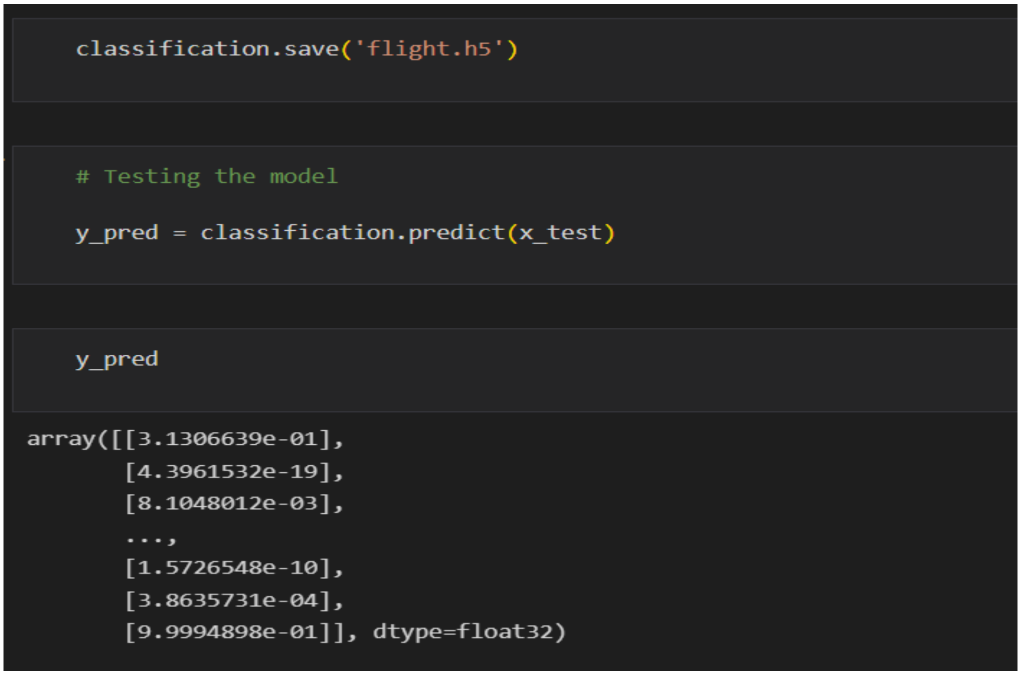
```
## Decision tree

y_pred = classifier.predict([[129,99,1,0,0,1,0,1,1,1,0,1,1,1,1,1]])

print(y_pred)
(y_pred)
```

```
[0.]

array([0.])
```

```
## RandomForest

y_pred = rfc.predict([[129,99,1,0,0,1,0,1,1,1,0,1,1,1,1,1]])

print(y_pred)
(y_pred)
```

```
[0.]

array([0.])
```

In ANN we first have to save the model to the test the inputs.

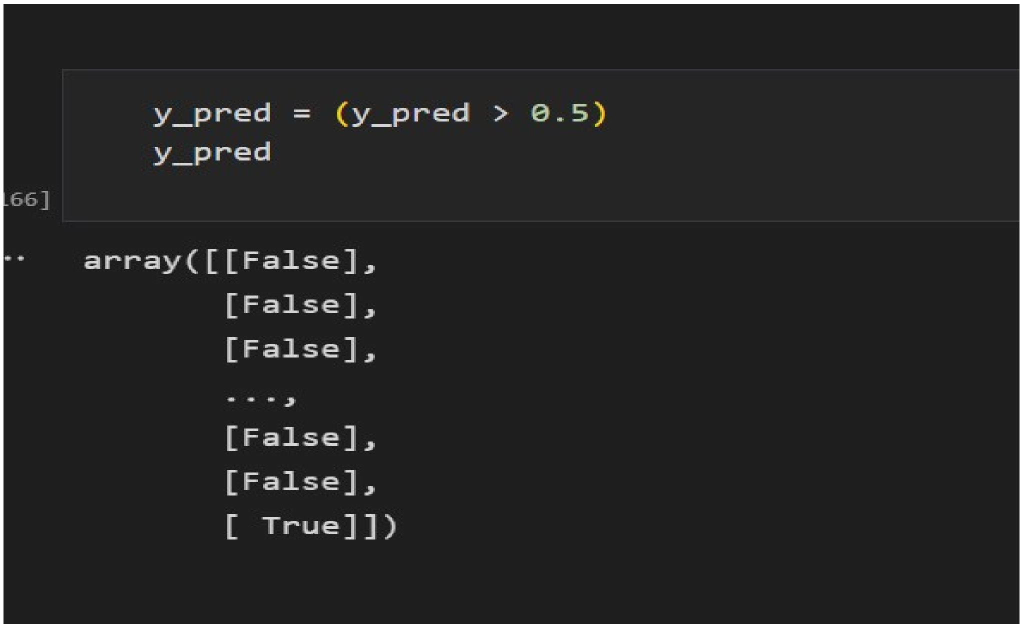


```
classification.save('flight.h5')
```

```
# Testing the model

y_pred = classification.predict(x_test)
```

```
y_pred
```

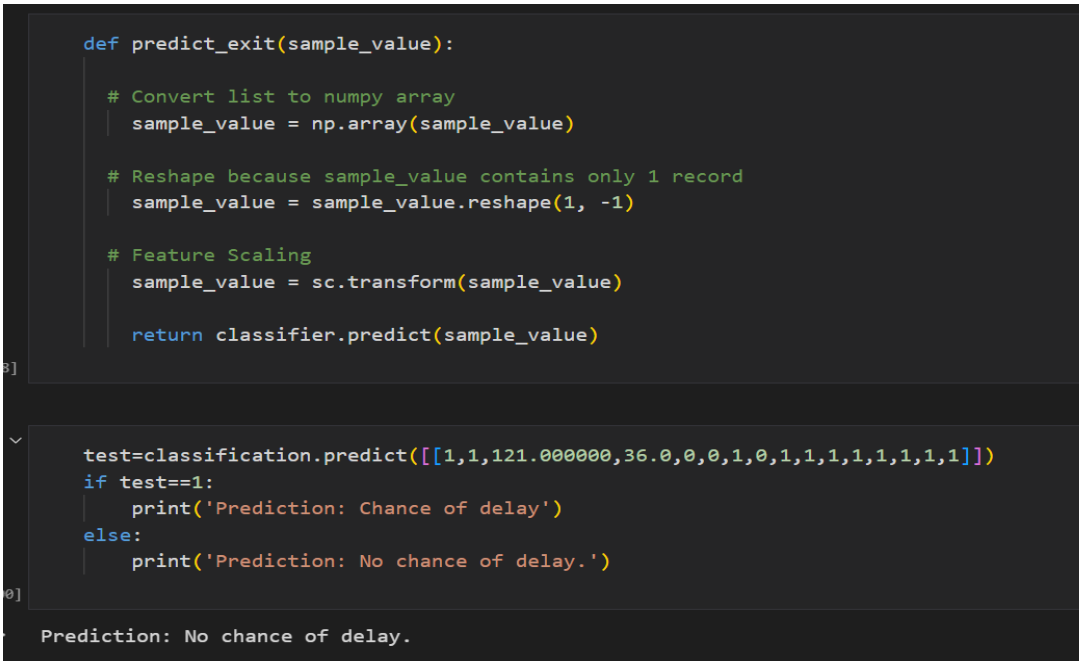
```
array([[3.1306639e-01],
       [4.3961532e-19],
       [8.1048012e-03],
       ...,
       [1.5726548e-10],
       [3.8635731e-04],
       [9.9994898e-01]], dtype=float32)
```



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

```
array([[False],
       [False],
       [False],
       ...,
       [False],
       [False],
       [ True]])
```

This code defines a function named "predict_exit" which takes in a sample_value as an input. The function then converts the input sample_value from a list to a numpy array. It reshapes the sample_value array as it contains only one record. Then, it applies feature scaling to the reshaped sample_value array using a scaler object 'sc' that should have been previously defined and fitted. Finally, the function returns the prediction of the classifier on the scaled sample_value.



```
def predict_exit(sample_value):

    # Convert list to numpy array
    sample_value = np.array(sample_value)

    # Reshape because sample_value contains only 1 record
    sample_value = sample_value.reshape(1, -1)

    # Feature Scaling
    sample_value = sc.transform(sample_value)

    return classifier.predict(sample_value)
```

```
test=classification.predict([[1,1,121.000000,36.0,0,0,1,0,1,1,1,1,1,1,1,1]])
if test==1:
    print('Prediction: Chance of delay')
else:
    print('Prediction: No chance of delay.')
```

```
Prediction: No chance of delay.
```