In [1]:
```
# Importing library
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
```

In [2]:
```
# Importing training set
dataset_train = pd.read_csv('Google_Stock_Price_Train.csv')
training_set = dataset_train.iloc[:, 1:2].values
```

In [3]:
```
# feature scaling
from sklearn.preprocessing import MinMaxScaler
sc = MinMaxScaler(feature_range = (0,1))
training_set_scaled = sc.fit_transform(training_set)
```

In [4]:
```
# Creating a data scructure with 60 timesteps and 1 output
X_train = []
Y_train = []
for i in range (60, 1258):
    X_train.append(training_set_scaled[i-60:i, 0])
    Y_train.append(training_set_scaled[i, 0])
X_train, Y_train = np.array(X_train), np.array(Y_train)

# Reshaping
X_train = np.reshape(X_train, (X_train.shape[0], X_train.shape[1], 1))
```

In [5]:
```
# Importing KERAS
from keras.models import Sequential
from keras.layers import Dense
from keras.layers import LSTM
from keras.layers import Dropout
```

In [6]:
```
# Initializing the RNN
regressor = Sequential()

# Adding the first LSTM layer and some dropout regularization
regressor.add(LSTM(units=50, return_sequences=True, input_shape=(X_train.sh
regressor.add(Dropout(0.2))
```

In [7]:
```
# Adding second LSTM layer and some another dropout regularization
regressor.add(LSTM(units=50, return_sequences=True))
regressor.add(Dropout(0.2))
```

In [8]:
```
# Adding third LSTM layer and some another dropout regularization
regressor.add(LSTM(units=50, return_sequences=True))
regressor.add(Dropout(0.2))
```

In [9]:
```
# Adding fourth LSTM layer and some another dropout regularization
regressor.add(LSTM(units=50))
regressor.add(Dropout(0.2))
```

In [10]:
```
# Adding output layer
regressor.add(Dense(units=1))
```

In [11]:
```
# Compiling
regressor.compile(optimizer='adam', loss='mean_squared_error')
```

In [12]:
```
# fitting the RNN to training set
regressor.fit(X_train, Y_train, epochs=150, batch_size=32)
```

```
Epoch 1/150
38/38 [==============================] - 22s 143ms/step - loss: 0.0418
Epoch 2/150
38/38 [==============================] - 5s 130ms/step - loss: 0.0056
Epoch 3/150
38/38 [==============================] - 6s 148ms/step - loss: 0.0059
Epoch 4/150
38/38 [==============================] - 6s 148ms/step - loss: 0.0050
Epoch 5/150
38/38 [==============================] - 5s 130ms/step - loss: 0.0050
Epoch 6/150
38/38 [==============================] - 6s 147ms/step - loss: 0.0047
Epoch 7/150
38/38 [==============================] - 6s 145ms/step - loss: 0.0050
Epoch 8/150
38/38 [==============================] - 5s 130ms/step - loss: 0.0045
Epoch 9/150
38/38 [==============================] - 6s 146ms/step - loss: 0.0045
Epoch 10/150
38/38 [==============================] - 6s 146ms/step - loss: 0.0043
Epoch 11/150
38/38 [==============================] - 5s 126ms/step - loss: 0.0042
Epoch 12/150
38/38 [==============================] - 6s 147ms/step - loss: 0.0038
Epoch 13/150
38/38 [==============================] - 5s 123ms/step - loss: 0.0043
Epoch 14/150
38/38 [==============================] - 5s 126ms/step - loss: 0.0036
Epoch 15/150
38/38 [==============================] - 5s 142ms/step - loss: 0.0040
Epoch 16/150
38/38 [==============================] - 6s 145ms/step - loss: 0.0039
Epoch 17/150
38/38 [==============================] - 5s 136ms/step - loss: 0.0035
Epoch 18/150
38/38 [==============================] - 5s 134ms/step - loss: 0.0034
Epoch 19/150
38/38 [==============================] - 5s 144ms/step - loss: 0.0042
Epoch 20/150
38/38 [==============================] - 5s 135ms/step - loss: 0.0036
Epoch 21/150
38/38 [==============================] - 5s 136ms/step - loss: 0.0035
Epoch 22/150
38/38 [==============================] - 6s 146ms/step - loss: 0.0035
Epoch 23/150
38/38 [==============================] - 5s 138ms/step - loss: 0.0035
Epoch 24/150
38/38 [==============================] - 5s 130ms/step - loss: 0.0031
Epoch 25/150
38/38 [==============================] - 5s 144ms/step - loss: 0.0035
```

```
Epoch 26/150
38/38 [==============================] - 5s 135ms/step - loss: 0.0030
Epoch 27/150
38/38 [==============================] - 5s 123ms/step - loss: 0.0029
Epoch 28/150
38/38 [==============================] - 6s 152ms/step - loss: 0.0029
Epoch 29/150
38/38 [==============================] - 5s 123ms/step - loss: 0.0030
Epoch 30/150
38/38 [==============================] - 5s 121ms/step - loss: 0.0034
Epoch 31/150
38/38 [==============================] - 5s 141ms/step - loss: 0.0030
Epoch 32/150
38/38 [==============================] - 6s 146ms/step - loss: 0.0029
Epoch 33/150
38/38 [==============================] - 5s 127ms/step - loss: 0.0029
Epoch 34/150
38/38 [==============================] - 6s 147ms/step - loss: 0.0027
Epoch 35/150
38/38 [==============================] - 6s 146ms/step - loss: 0.0028
Epoch 36/150
38/38 [==============================] - 5s 122ms/step - loss: 0.0029
Epoch 37/150
38/38 [==============================] - 5s 143ms/step - loss: 0.0028
Epoch 38/150
38/38 [==============================] - 6s 147ms/step - loss: 0.0028
Epoch 39/150
38/38 [==============================] - 5s 127ms/step - loss: 0.0026
Epoch 40/150
38/38 [==============================] - 6s 147ms/step - loss: 0.0029
Epoch 41/150
38/38 [==============================] - 5s 144ms/step - loss: 0.0023
Epoch 42/150
38/38 [==============================] - 5s 129ms/step - loss: 0.0029
Epoch 43/150
38/38 [==============================] - 6s 146ms/step - loss: 0.0025
Epoch 44/150
38/38 [==============================] - 6s 146ms/step - loss: 0.0025
Epoch 45/150
38/38 [==============================] - 5s 131ms/step - loss: 0.0025
Epoch 46/150
38/38 [==============================] - 6s 146ms/step - loss: 0.0023
Epoch 47/150
38/38 [==============================] - 5s 138ms/step - loss: 0.0023
Epoch 48/150
38/38 [==============================] - 5s 127ms/step - loss: 0.0024
Epoch 49/150
38/38 [==============================] - 5s 143ms/step - loss: 0.0026
Epoch 50/150
38/38 [==============================] - 5s 144ms/step - loss: 0.0024
Epoch 51/150
38/38 [==============================] - 5s 128ms/step - loss: 0.0021
Epoch 52/150
38/38 [==============================] - 6s 145ms/step - loss: 0.0021
Epoch 53/150
38/38 [==============================] - 6s 147ms/step - loss: 0.0026
Epoch 54/150
38/38 [==============================] - 5s 129ms/step - loss: 0.0024
Epoch 55/150
38/38 [==============================] - 6s 147ms/step - loss: 0.0020
Epoch 56/150
38/38 [==============================] - 6s 149ms/step - loss: 0.0021
Epoch 57/150
```

```
38/38 [==============================] - 5s 126ms/step - loss: 0.0022
Epoch 58/150
38/38 [==============================] - 5s 142ms/step - loss: 0.0024
Epoch 59/150
38/38 [==============================] - 5s 146ms/step - loss: 0.0022
Epoch 60/150
38/38 [==============================] - 5s 125ms/step - loss: 0.0020
Epoch 61/150
38/38 [==============================] - 5s 144ms/step - loss: 0.0023
Epoch 62/150
38/38 [==============================] - 6s 149ms/step - loss: 0.0020
Epoch 63/150
38/38 [==============================] - 5s 123ms/step - loss: 0.0019
Epoch 64/150
38/38 [==============================] - 6s 148ms/step - loss: 0.0020
Epoch 65/150
38/38 [==============================] - 6s 147ms/step - loss: 0.0020
Epoch 66/150
38/38 [==============================] - 5s 129ms/step - loss: 0.0018
Epoch 67/150
38/38 [==============================] - 6s 146ms/step - loss: 0.0019
Epoch 68/150
38/38 [==============================] - 6s 148ms/step - loss: 0.0020
Epoch 69/150
38/38 [==============================] - 5s 127ms/step - loss: 0.0019
Epoch 70/150
38/38 [==============================] - 5s 141ms/step - loss: 0.0018
Epoch 71/150
38/38 [==============================] - 6s 147ms/step - loss: 0.0018
Epoch 72/150
38/38 [==============================] - 5s 124ms/step - loss: 0.0018
Epoch 73/150
38/38 [==============================] - 5s 144ms/step - loss: 0.0017
Epoch 74/150
38/38 [==============================] - 6s 146ms/step - loss: 0.0018
Epoch 75/150
38/38 [==============================] - 5s 127ms/step - loss: 0.0017
Epoch 76/150
38/38 [==============================] - 6s 147ms/step - loss: 0.0017
Epoch 77/150
38/38 [==============================] - 6s 148ms/step - loss: 0.0016
Epoch 78/150
38/38 [==============================] - 5s 127ms/step - loss: 0.0017
Epoch 79/150
38/38 [==============================] - 6s 149ms/step - loss: 0.0015
Epoch 80/150
38/38 [==============================] - 6s 148ms/step - loss: 0.0018
Epoch 81/150
38/38 [==============================] - 5s 123ms/step - loss: 0.0016
Epoch 82/150
38/38 [==============================] - 5s 138ms/step - loss: 0.0016
Epoch 83/150
38/38 [==============================] - 6s 149ms/step - loss: 0.0017
Epoch 84/150
38/38 [==============================] - 5s 124ms/step - loss: 0.0014
Epoch 85/150
38/38 [==============================] - 5s 138ms/step - loss: 0.0016
Epoch 86/150
38/38 [==============================] - 5s 122ms/step - loss: 0.0015
Epoch 87/150
38/38 [==============================] - 5s 122ms/step - loss: 0.0016
Epoch 88/150
38/38 [==============================] - 4s 110ms/step - loss: 0.0014
```

```
Epoch 89/150
38/38 [==============================] - 5s 128ms/step - loss: 0.0015
Epoch 90/150
38/38 [==============================] - 5s 122ms/step - loss: 0.0017
Epoch 91/150
38/38 [==============================] - 4s 104ms/step - loss: 0.0015
Epoch 92/150
38/38 [==============================] - 4s 118ms/step - loss: 0.0014
Epoch 93/150
38/38 [==============================] - 4s 118ms/step - loss: 0.0014
Epoch 94/150
38/38 [==============================] - 4s 113ms/step - loss: 0.0016
Epoch 95/150
38/38 [==============================] - 5s 130ms/step - loss: 0.0016
Epoch 96/150
38/38 [==============================] - 5s 132ms/step - loss: 0.0015
Epoch 97/150
38/38 [==============================] - 5s 133ms/step - loss: 0.0016
Epoch 98/150
38/38 [==============================] - 5s 122ms/step - loss: 0.0017
Epoch 99/150
38/38 [==============================] - 5s 127ms/step - loss: 0.0012
Epoch 100/150
38/38 [==============================] - 5s 129ms/step - loss: 0.0014
Epoch 101/150
38/38 [==============================] - 5s 128ms/step - loss: 0.0015
Epoch 102/150
38/38 [==============================] - 6s 152ms/step - loss: 0.0015
Epoch 103/150
38/38 [==============================] - 5s 140ms/step - loss: 0.0014
Epoch 104/150
38/38 [==============================] - 5s 126ms/step - loss: 0.0015
Epoch 105/150
38/38 [==============================] - 5s 126ms/step - loss: 0.0015
Epoch 106/150
38/38 [==============================] - 5s 144ms/step - loss: 0.0020
Epoch 107/150
38/38 [==============================] - 5s 137ms/step - loss: 0.0016
Epoch 108/150
38/38 [==============================] - 5s 136ms/step - loss: 0.0012
Epoch 109/150
38/38 [==============================] - 5s 136ms/step - loss: 0.0014
Epoch 110/150
38/38 [==============================] - 5s 138ms/step - loss: 0.0012
Epoch 111/150
38/38 [==============================] - 5s 134ms/step - loss: 0.0013
Epoch 112/150
38/38 [==============================] - 5s 140ms/step - loss: 0.0013
Epoch 113/150
38/38 [==============================] - 5s 140ms/step - loss: 0.0016
Epoch 114/150
38/38 [==============================] - 5s 139ms/step - loss: 0.0014
Epoch 115/150
38/38 [==============================] - 5s 141ms/step - loss: 0.0013
Epoch 116/150
38/38 [==============================] - 6s 146ms/step - loss: 0.0012
Epoch 117/150
38/38 [==============================] - 5s 138ms/step - loss: 0.0012
Epoch 118/150
38/38 [==============================] - 6s 155ms/step - loss: 0.0014
Epoch 119/150
38/38 [==============================] - 5s 142ms/step - loss: 0.0013
Epoch 120/150
```

```
38/38 [==============================] - 6s 147ms/step - loss: 0.0014
Epoch 121/150
38/38 [==============================] - 6s 154ms/step - loss: 0.0015
Epoch 122/150
38/38 [==============================] - 5s 140ms/step - loss: 0.0012
Epoch 123/150
38/38 [==============================] - 6s 153ms/step - loss: 0.0013
Epoch 124/150
38/38 [==============================] - 6s 153ms/step - loss: 0.0013
Epoch 125/150
38/38 [==============================] - 5s 135ms/step - loss: 0.0012
Epoch 126/150
38/38 [==============================] - 6s 153ms/step - loss: 0.0012
Epoch 127/150
38/38 [==============================] - 6s 152ms/step - loss: 0.0012
Epoch 128/150
38/38 [==============================] - 5s 133ms/step - loss: 0.0012
Epoch 129/150
38/38 [==============================] - 6s 153ms/step - loss: 0.0012
Epoch 130/150
38/38 [==============================] - 6s 153ms/step - loss: 0.0011
Epoch 131/150
38/38 [==============================] - 5s 143ms/step - loss: 0.0013
Epoch 132/150
38/38 [==============================] - 6s 148ms/step - loss: 0.0014
Epoch 133/150
38/38 [==============================] - 6s 150ms/step - loss: 0.0011
Epoch 134/150
38/38 [==============================] - 6s 144ms/step - loss: 0.0011
Epoch 135/150
38/38 [==============================] - 6s 151ms/step - loss: 0.0012
Epoch 136/150
38/38 [==============================] - 6s 149ms/step - loss: 0.0012
Epoch 137/150
38/38 [==============================] - 5s 141ms/step - loss: 0.0011
Epoch 138/150
38/38 [==============================] - 6s 149ms/step - loss: 0.0011
Epoch 139/150
38/38 [==============================] - 5s 141ms/step - loss: 0.0010
Epoch 140/150
38/38 [==============================] - 6s 146ms/step - loss: 0.0014
Epoch 141/150
38/38 [==============================] - 6s 148ms/step - loss: 0.0011
Epoch 142/150
38/38 [==============================] - 5s 142ms/step - loss: 0.0011
Epoch 143/150
38/38 [==============================] - 6s 146ms/step - loss: 0.0011
Epoch 144/150
38/38 [==============================] - 6s 149ms/step - loss: 0.0013
Epoch 145/150
38/38 [==============================] - 5s 138ms/step - loss: 0.0011
Epoch 146/150
38/38 [==============================] - 6s 149ms/step - loss: 0.0011
Epoch 147/150
38/38 [==============================] - 6s 149ms/step - loss: 0.0012
Epoch 148/150
38/38 [==============================] - 5s 139ms/step - loss: 0.0011
Epoch 149/150
38/38 [==============================] - 6s 150ms/step - loss: 0.0012
Epoch 150/150
```

Out[12]: <keras.callbacks.History at 0x1dd9289ff10>

In [13]:
```
regressor.save('models/Epoch150')
```

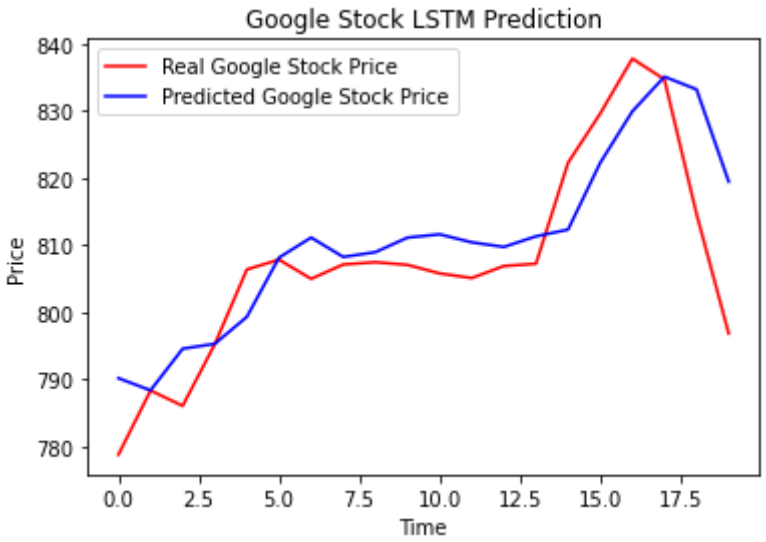
```
WARNING:absl:Found untraced functions such as lstm_cell_layer_call_fn, lstm
_cell_layer_call_and_return_conditional_losses, lstm_cell_1_layer_call_fn,
lstm_cell_1_layer_call_and_return_conditional_losses, lstm_cell_2_layer_cal
l_fn while saving (showing 5 of 8). These functions will not be directly ca
llable after loading.
INFO:tensorflow:Assets written to: models/Epoch150\assets
INFO:tensorflow:Assets written to: models/Epoch150\assets
WARNING:absl:<keras.layers.recurrent.LSTMCell object at 0x000001DD914080D0>
has the same name 'LSTMCell' as a built-in Keras object. Consider renaming
<class 'keras.layers.recurrent.LSTMCell'> to avoid naming conflicts when lo
ading with `tf.keras.models.load_model`. If renaming is not possible, pass
the object in the `custom_objects` parameter of the load function.
WARNING:absl:<keras.layers.recurrent.LSTMCell object at 0x000001DD926A5BE0>
has the same name 'LSTMCell' as a built-in Keras object. Consider renaming
<class 'keras.layers.recurrent.LSTMCell'> to avoid naming conflicts when lo
ading with `tf.keras.models.load_model`. If renaming is not possible, pass
the object in the `custom_objects` parameter of the load function.
WARNING:absl:<keras.layers.recurrent.LSTMCell object at 0x000001DD9275C460>
has the same name 'LSTMCell' as a built-in Keras object. Consider renaming
<class 'keras.layers.recurrent.LSTMCell'> to avoid naming conflicts when lo
ading with `tf.keras.models.load_model`. If renaming is not possible, pass
the object in the `custom_objects` parameter of the load function.
WARNING:absl:<keras.layers.recurrent.LSTMCell object at 0x000001DD927F9370>
has the same name 'LSTMCell' as a built-in Keras object. Consider renaming
<class 'keras.layers.recurrent.LSTMCell'> to avoid naming conflicts when lo
ading with `tf.keras.models.load_model`. If renaming is not possible, pass
the object in the `custom_objects` parameter of the load function.
```

In [14]:
```
# Importing testing set
dataset_test = pd.read_csv('Google_Stock_Price_Test.csv')
real_stock_set = dataset_test.iloc[:, 1:2].values
```

In [15]:
```
# Getting the predicted stock
dataset_total = pd.concat((dataset_train['Open'], dataset_test['Open']), ax
inputs = dataset_total[len(dataset_total) - len(dataset_test) - 60:].values
inputs = inputs.reshape(-1, 1)
inputs = sc.transform(inputs)

X_test = []
for i in range(60, 80):
    X_test.append(inputs[i-60:i, 0])
X_test = np.array(X_test)
X_test = np.reshape(X_test, (X_test.shape[0], X_test.shape[1], 1))

predicted_stock_set = regressor.predict(X_test)
predicted_stock_set = sc.inverse_transform(predicted_stock_set)
```

In [16]:

```
# visualizing
plt.plot(real_stock_set, color='red', label='Real Google Stock Price')
plt.plot(predicted_stock_set, color='blue', label='Predicted Google Stock P
plt.title('Google Stock LSTM Prediction')
plt.xlabel('Time')
plt.ylabel('Price')

plt.legend()
plt.show()
```



In [ ]: