In [13]:
```
# Importing library
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
```

In [14]:
```
# Importing training set
dataset_train = pd.read_csv('Google_Stock_Price_Train.csv')
training_set = dataset_train.iloc[:, 1:2].values
```

In [15]:
```
# feature scaling
from sklearn.preprocessing import MinMaxScaler
sc = MinMaxScaler(feature_range = (0,1))
training_set_scaled = sc.fit_transform(training_set)
```

In [16]:
```
# 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 [17]:
```
# Importing KERAS
from keras.models import Sequential
from keras.layers import Dense
from keras.layers import LSTM
from keras.layers import Dropout
```

In [18]:
```
# 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 [19]:
```
# Adding second LSTM layer and some another dropout regularization
regressor.add(LSTM(units=50, return_sequences=True))
regressor.add(Dropout(0.2))
```

In [20]:
```
# Adding third LSTM layer and some another dropout regularization
regressor.add(LSTM(units=50, return_sequences=True))
regressor.add(Dropout(0.2))
```

In [21]:
```
# Adding fourth LSTM layer and some another dropout regularization
regressor.add(LSTM(units=50))
regressor.add(Dropout(0.2))
```

In [22]:
```
# Adding output layer
regressor.add(Dense(units=1))
```

In [23]:
```
# Compiling
regressor.compile(optimizer='adam', loss='mean_squared_error')
```

In [24]:
```
# fitting the RNN to training set
regressor.fit(X_train, Y_train, epochs=100, batch_size=32)
```

```
Epoch 1/100
38/38 [==============================] - 19s 154ms/step - loss: 0.0303
Epoch 2/100
38/38 [==============================] - 5s 135ms/step - loss: 0.0057
Epoch 3/100
38/38 [==============================] - 6s 148ms/step - loss: 0.0056
Epoch 4/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0056
Epoch 5/100
38/38 [==============================] - 5s 130ms/step - loss: 0.0060
Epoch 6/100
38/38 [==============================] - 6s 151ms/step - loss: 0.0052
Epoch 7/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0050
Epoch 8/100
38/38 [==============================] - 5s 134ms/step - loss: 0.0044
Epoch 9/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0047
Epoch 10/100
38/38 [==============================] - 6s 145ms/step - loss: 0.0047
Epoch 11/100
38/38 [==============================] - 5s 135ms/step - loss: 0.0045
Epoch 12/100
38/38 [==============================] - 6s 153ms/step - loss: 0.0041
Epoch 13/100
38/38 [==============================] - 6s 152ms/step - loss: 0.0043
Epoch 14/100
38/38 [==============================] - 5s 135ms/step - loss: 0.0042
Epoch 15/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0039
Epoch 16/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0041
Epoch 17/100
38/38 [==============================] - 5s 128ms/step - loss: 0.0040
Epoch 18/100
38/38 [==============================] - 6s 151ms/step - loss: 0.0036
Epoch 19/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0037
Epoch 20/100
38/38 [==============================] - 5s 134ms/step - loss: 0.0040
Epoch 21/100
38/38 [==============================] - 5s 143ms/step - loss: 0.0036
Epoch 22/100
38/38 [==============================] - 6s 151ms/step - loss: 0.0034
Epoch 23/100
38/38 [==============================] - 5s 136ms/step - loss: 0.0036
Epoch 24/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0033
Epoch 25/100
38/38 [==============================] - 6s 151ms/step - loss: 0.0031
```

```
Epoch 26/100
38/38 [==============================] - 5s 127ms/step - loss: 0.0032
Epoch 27/100
38/38 [==============================] - 6s 151ms/step - loss: 0.0032
Epoch 28/100
38/38 [==============================] - 6s 151ms/step - loss: 0.0029
Epoch 29/100
38/38 [==============================] - 5s 138ms/step - loss: 0.0033
Epoch 30/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0034
Epoch 31/100
38/38 [==============================] - 5s 141ms/step - loss: 0.0028
Epoch 32/100
38/38 [==============================] - 5s 139ms/step - loss: 0.0030
Epoch 33/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0030
Epoch 34/100
38/38 [==============================] - 5s 138ms/step - loss: 0.0031
Epoch 35/100
38/38 [==============================] - 5s 140ms/step - loss: 0.0028
Epoch 36/100
38/38 [==============================] - 6s 149ms/step - loss: 0.0028
Epoch 37/100
38/38 [==============================] - 5s 136ms/step - loss: 0.0026
Epoch 38/100
38/38 [==============================] - 5s 143ms/step - loss: 0.0028
Epoch 39/100
38/38 [==============================] - 6s 149ms/step - loss: 0.0025
Epoch 40/100
38/38 [==============================] - 5s 135ms/step - loss: 0.0027
Epoch 41/100
38/38 [==============================] - 6s 149ms/step - loss: 0.0028
Epoch 42/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0026
Epoch 43/100
38/38 [==============================] - 5s 128ms/step - loss: 0.0025
Epoch 44/100
38/38 [==============================] - 6s 149ms/step - loss: 0.0026
Epoch 45/100
38/38 [==============================] - 6s 151ms/step - loss: 0.0023
Epoch 46/100
38/38 [==============================] - 5s 133ms/step - loss: 0.0024
Epoch 47/100
38/38 [==============================] - 6s 152ms/step - loss: 0.0024
Epoch 48/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0024
Epoch 49/100
38/38 [==============================] - 5s 136ms/step - loss: 0.0023
Epoch 50/100
38/38 [==============================] - 5s 142ms/step - loss: 0.0026
Epoch 51/100
38/38 [==============================] - 5s 138ms/step - loss: 0.0025
Epoch 52/100
38/38 [==============================] - 5s 136ms/step - loss: 0.0023
Epoch 53/100
38/38 [==============================] - 5s 132ms/step - loss: 0.0020
Epoch 54/100
38/38 [==============================] - 5s 139ms/step - loss: 0.0022
Epoch 55/100
38/38 [==============================] - 5s 132ms/step - loss: 0.0021
Epoch 56/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0026
Epoch 57/100
```

```
38/38 [==============================] - 6s 151ms/step - loss: 0.0020
Epoch 58/100
38/38 [==============================] - 5s 131ms/step - loss: 0.0021
Epoch 59/100
38/38 [==============================] - 6s 151ms/step - loss: 0.0021
Epoch 60/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0019
Epoch 61/100
38/38 [==============================] - 5s 128ms/step - loss: 0.0023
Epoch 62/100
38/38 [==============================] - 6s 151ms/step - loss: 0.0021
Epoch 63/100
38/38 [==============================] - 6s 148ms/step - loss: 0.0019
Epoch 64/100
38/38 [==============================] - 5s 130ms/step - loss: 0.0021
Epoch 65/100
38/38 [==============================] - 6s 145ms/step - loss: 0.0020
Epoch 66/100
38/38 [==============================] - 6s 151ms/step - loss: 0.0018
Epoch 67/100
38/38 [==============================] - 5s 132ms/step - loss: 0.0018
Epoch 68/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0019
Epoch 69/100
38/38 [==============================] - 6s 152ms/step - loss: 0.0020
Epoch 70/100
38/38 [==============================] - 5s 133ms/step - loss: 0.0018
Epoch 71/100
38/38 [==============================] - 6s 151ms/step - loss: 0.0019
Epoch 72/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0017
Epoch 73/100
38/38 [==============================] - 5s 132ms/step - loss: 0.0016
Epoch 74/100
38/38 [==============================] - 6s 149ms/step - loss: 0.0017
Epoch 75/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0017
Epoch 76/100
38/38 [==============================] - 5s 128ms/step - loss: 0.0016
Epoch 77/100
38/38 [==============================] - 6s 149ms/step - loss: 0.0016
Epoch 78/100
38/38 [==============================] - 6s 151ms/step - loss: 0.0016
Epoch 79/100
38/38 [==============================] - 5s 131ms/step - loss: 0.0015
Epoch 80/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0016
Epoch 81/100
38/38 [==============================] - 6s 148ms/step - loss: 0.0015
Epoch 82/100
38/38 [==============================] - 5s 133ms/step - loss: 0.0014
Epoch 83/100
38/38 [==============================] - 6s 154ms/step - loss: 0.0015
Epoch 84/100
38/38 [==============================] - 5s 144ms/step - loss: 0.0016
Epoch 85/100
38/38 [==============================] - 5s 138ms/step - loss: 0.0015
Epoch 86/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0015
Epoch 87/100
38/38 [==============================] - 5s 137ms/step - loss: 0.0014
Epoch 88/100
38/38 [==============================] - 5s 136ms/step - loss: 0.0014
```

```
Epoch 89/100
38/38 [==============================] - 6s 151ms/step - loss: 0.0015
Epoch 90/100
38/38 [==============================] - 5s 136ms/step - loss: 0.0017
Epoch 91/100
38/38 [==============================] - 5s 139ms/step - loss: 0.0015
Epoch 92/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0016
Epoch 93/100
38/38 [==============================] - 5s 140ms/step - loss: 0.0015
Epoch 94/100
38/38 [==============================] - 6s 146ms/step - loss: 0.0013
Epoch 95/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0016
Epoch 96/100
38/38 [==============================] - 5s 137ms/step - loss: 0.0015
Epoch 97/100
38/38 [==============================] - 6s 147ms/step - loss: 0.0015
Epoch 98/100
38/38 [==============================] - 6s 148ms/step - loss: 0.0013
Epoch 99/100
38/38 [==============================] - 5s 132ms/step - loss: 0.0016
Epoch 100/100
38/38 [==============================] - 6s 150ms/step - loss: 0.0015
```

Out[24]:

```
<keras.callbacks.History at 0x1fbb3ee5340>
```

In [25]:

```python
regressor.save('models/Epoch100')
```

```
WARNING:absl:Found untraced functions such as lstm_cell_4_layer_call_fn, ls
tm_cell_4_layer_call_and_return_conditional_losses, lstm_cell_5_layer_call_
fn, lstm_cell_5_layer_call_and_return_conditional_losses, lstm_cell_6_layer
_call_fn while saving (showing 5 of 8). These functions will not be directl
y callable after loading.
INFO:tensorflow:Assets written to: models/Epoch100\assets
INFO:tensorflow:Assets written to: models/Epoch100\assets
WARNING:absl:<keras.layers.recurrent.LSTMCell object at 0x000001FBA6BD2160>
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 0x000001FBB50DD3A0>
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 0x000001FBB515F310>
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 0x000001FBB5183CD0>
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 [26]:

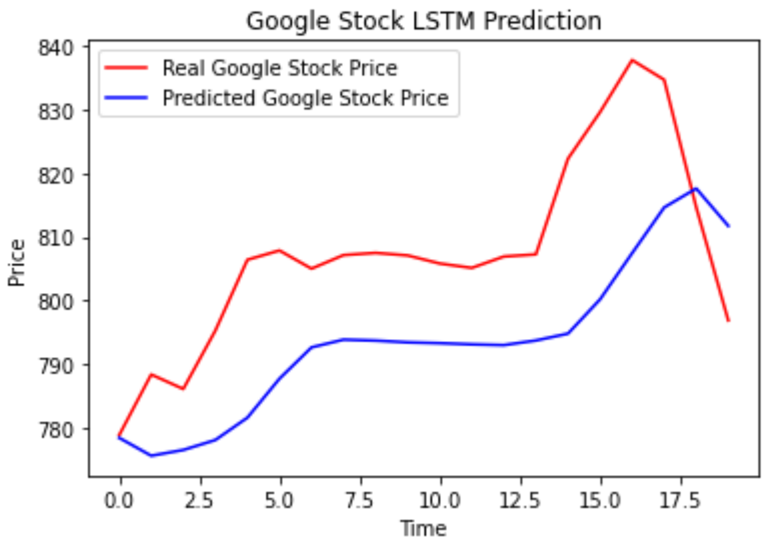
```python
# Importing testing set
dataset_test = pd.read_csv('Google_Stock_Price_Test.csv')
real_stock_set = dataset_test.iloc[:, 1:2].values
```

In [27]:

```
# 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 [28]:

```
# 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 [ ]: