```
import pandas_datareader as pdr
import pandas as pd
import numpy as np
import math
import matplotlib.pyplot as plt
from sklearn.preprocessing import MinMaxScaler
from sklearn.metrics import mean_squared_error
import tensorflow as tf
from tensorflow.python.keras.models import Sequential
from tensorflow.python.keras.layers import Dense
from tensorflow.python.keras.layers import LSTM
%matplotlib inline
```

```
data=pdr.get_data_tiingo('GOOG',api_key=key)
data.to_csv("/content/Google.csv")
df=pd.read_csv('/content/Google.csv')
df.head()
```

```
/usr/local/lib/python3.7/dist-packages/pandas_datareader/tiingo.py:234: Futur
  return pd.concat(dfs, self._concat_axis)
```

	symbol	date	close	high	low	open	volume	adjClose	adjHi
0	GOOG	2017-07-05 00:00:00+00:00	911.71	914.5100	898.50	901.76	1743497	911.71	914.51
1	GOOG	2017-07-06 00:00:00+00:00	906.69	914.9444	899.70	904.12	1409533	906.69	914.94
2	GOOG	2017-07-07 00:00:00+00:00	918.59	921.5400	908.85	908.85	1588034	918.59	921.54
3	GOOG	2017-07-10 00:00:00+00:00	928.80	930.3800	919.59	921.77	1189085	928.80	930.38
4	GOOG	2017-07-11 00:00:00+00:00	930.09	931.4300	922.00	929.54	1093281	930.09	931.43

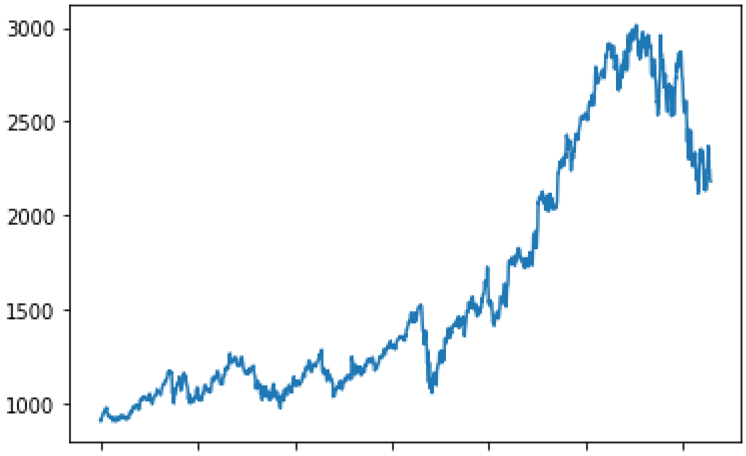
```
df.tail()
```

symbol	date	close	high	low	open	volum
	2022-06-27					
	2022-06-28					

```
df_close = df['close']
```

```
plt.plot(df_close)
```

```
[<matplotlib.lines.Line2D at 0x7f885bafa310>]
```



```
scaler = MinMaxScaler(feature_range = (0,1))
df_close = scaler.fit_transform(np.array(df_close).reshape(-1,1))
```

```
df_close.shape
```

```
(1258, 1)
```

```
df_close
```

```
array([[2.39618129e-03],
       [1.42347404e-05],
       [5.66068175e-03],
       ...,
       [6.35092431e-01],
       [6.07723770e-01],
       [6.04957486e-01]])
```

```
training_size = int(len(df_close) * 0.75)
test_size = len(df_close) - training_size
train_data, test_data = df_close[0:training_size,:], df_close[training_size:len(df
```

```
def create_dataset(dataset, time_step = 1):
    dataX, dataY = [], []
    for i in range(len(dataset) - time_step - 1):
        a = dataset[i:(i+time_step), 0]
        dataX.append(a)
        dataY.append(dataset[i+time_step, 0])
    return np.array(dataX), np.array(dataY)
```

```
time_step = 100
x_train, y_train = create_dataset(train_data, time_step)
x_test, y_test = create_dataset(test_data, time_step)


x_train = x_train.reshape(x_train.shape[0], x_train.shape[1], 1)
x_test = x_test.reshape(x_test.shape[0], x_test.shape[1], 1)


model = Sequential()
model.add(LSTM(50, return_sequences = True, input_shape = (100,1)))
model.add(LSTM(50, return_sequences = True))
model.add(LSTM(50))
model.add(Dense(1))
model.compile(loss = 'mean_squared_error', optimizer = 'adam')


model.summary()
```

```
Model: "sequential"
_________________________________________________________________
Layer (type)                Output Shape              Param #
=================================================================
lstm (LSTM)                 (None, 100, 50)           10400

_________________________________________________________________
lstm_1 (LSTM)               (None, 100, 50)           20200

_________________________________________________________________
lstm_2 (LSTM)               (None, 50)                20200

_________________________________________________________________
dense (Dense)               (None, 1)                 51
=================================================================
Total params: 50,851
Trainable params: 50,851
Non-trainable params: 0
_________________________________________________________________
```

```
model.fit(x_train, y_train, validation_data = (x_test, y_test), epochs = 100, batc
```

```
Epoch 1/100
14/14 [==============================] - 22s 485ms/step - loss: 0.0164 - va
Epoch 2/100
14/14 [==============================] - 11s 794ms/step - loss: 0.0041 - va
Epoch 3/100
14/14 [==============================] - 9s 636ms/step - loss: 0.0013 - val
Epoch 4/100
14/14 [==============================] - 9s 626ms/step - loss: 0.0010 - val
Epoch 5/100
14/14 [==============================] - 6s 406ms/step - loss: 8.5984e-04 -
Epoch 6/100
14/14 [==============================] - 9s 618ms/step - loss: 8.2825e-04 -
Epoch 7/100
14/14 [==============================] - 9s 621ms/step - loss: 8.2466e-04 -
Epoch 8/100
14/14 [==============================] - 8s 536ms/step - loss: 7.8305e-04 -
Epoch 9/100
14/14 [==============================] - 6s 413ms/step - loss: 8.1426e-04 -
Epoch 10/100
14/14 [==============================] - 9s 640ms/step - loss: 7.9395e-04 -
```

```
Epoch 11/100
14/14 [==============================] - 8s 610ms/step - loss: 7.5321e-04 -
Epoch 12/100
14/14 [==============================] - 10s 703ms/step - loss: 7.2480e-04
Epoch 13/100
14/14 [==============================] - 12s 875ms/step - loss: 6.9521e-04
Epoch 14/100
14/14 [==============================] - 10s 700ms/step - loss: 7.0621e-04
Epoch 15/100
14/14 [==============================] - 7s 472ms/step - loss: 7.2621e-04 -
Epoch 16/100
14/14 [==============================] - 8s 599ms/step - loss: 6.4342e-04 -
Epoch 17/100
14/14 [==============================] - 9s 627ms/step - loss: 6.4941e-04 -
Epoch 18/100
14/14 [==============================] - 9s 632ms/step - loss: 6.2717e-04 -
Epoch 19/100
14/14 [==============================] - 6s 386ms/step - loss: 7.0518e-04 -
Epoch 20/100
14/14 [==============================] - 5s 364ms/step - loss: 5.5273e-04 -
Epoch 21/100
14/14 [==============================] - 5s 364ms/step - loss: 5.5870e-04 -
Epoch 22/100
14/14 [==============================] - 6s 424ms/step - loss: 5.4251e-04 -
Epoch 23/100
14/14 [==============================] - 9s 613ms/step - loss: 5.3779e-04 -
Epoch 24/100
14/14 [==============================] - 12s 861ms/step - loss: 5.6538e-04
Epoch 25/100
14/14 [==============================] - 8s 596ms/step - loss: 5.2966e-04 -
Epoch 26/100
14/14 [==============================] - 5s 365ms/step - loss: 4.8967e-04 -
Epoch 27/100
14/14 [==============================] - 5s 363ms/step - loss: 5.7818e-04 -
Epoch 28/100
14/14 [==============================] - 5s 362ms/step - loss: 5.1967e-04 -
Epoch 29/100
```

```
train_predict = model.predict(x_train)
test_predict = model.predict(x_test)
```

```
train_predict = scaler.inverse_transform(train_predict)
test_predict = scaler.inverse_transform(test_predict)
math.sqrt(mean_squared_error(y_train, train_predict))
```

```
1339.4670964275297
```

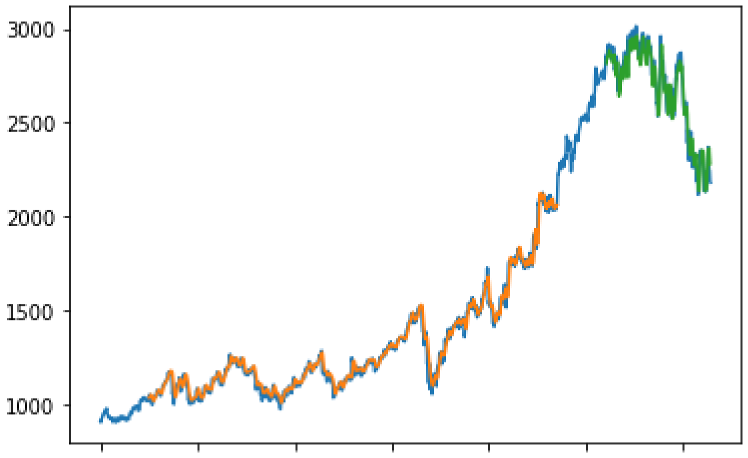
```
math.sqrt(mean_squared_error(y_test, test_predict))
```

```
2678.028806935988
```

```
look_back = 100
trainPredictPlot = np.empty_like(df_close)
trainPredictPlot[:,:] = np.nan
trainPredictPlot[look_back:len(train_predict) + look_back, :] = train_predict
```

```
#Shift test prediction for plotting
testPredictPlot = np.empty_like(df_close)
testPredictPlot[:,:] = np.nan
testPredictPlot[len(train_predict) + (look_back * 2)+1:len(df_close) - 1, :] = tes

#Plot baseline and predictions
plt.plot(scaler.inverse_transform(df_close))
plt.plot(trainPredictPlot)
plt.plot(testPredictPlot)
plt.show()
```



```
len(test_data), x_test.shape
```

```
(315, (214, 100, 1))
```

```
x_input = test_data[207:].reshape(1,-1)
x_input.shape
```

```
(1, 108)
```

```
107
```

```
temp_input = list(x_input)
temp_input = temp_input[0].tolist()
```

```
lst_output=[]
n_steps=x_input.shape[1]
nextNumberOfDays = 30
i=0

while(i<nextNumberOfDays):

    if(len(temp_input)>100):
        x_input=np.array(temp_input[1:])
        print("{} day input {}".format(i,x_input))
        x_input=x_input.reshape(1,-1)
        x_input = x_input.reshape((1, n_steps, 1))
        yhat = model.predict(x_input, verbose=0)
        print("{} day output {}".format(i,yhat))
        temp_input.extend(yhat[0].tolist())
        temp_input=temp_input[1:]
        lst_output.extend(yhat.tolist())
        i=i+1
    else:
        x_input = x_input.reshape((1, n_steps,1))
        yhat = model.predict(x_input, verbose=0)
        print(yhat[0])
        temp_input.extend(yhat[0].tolist())
        print(len(temp_input))
        lst_output.extend(yhat.tolist())
        i=i+1


print(lst_output)
```

```
0 day input [0.77254783 0.80025338 0.83849738 0.84713312 0.86802023 0.86495
 0.90100687 0.88417192 0.9108241  0.91281222 0.91687861 0.92921538
 0.92346929 0.89504726 0.90501632 0.93294014 0.90846113 0.87157417
 0.86482691 0.84153413 0.80154399 0.78804946 0.80618927 0.77740662
 0.78412542 0.80851427 0.78682527 0.75543293 0.70491383 0.73941884
 0.70388893 0.66132231 0.70299214 0.66080986 0.68159733 0.69082618
 0.73301321 0.67770175 0.66739106 0.64294526 0.65718475 0.65126784
 0.64367598 0.6755096  0.65915863 0.67727471 0.63646371 0.6207533
 0.60715913 0.62949343 0.57501708 0.57419621 0.59750797 0.64024066
 0.65200805 0.65293805 0.68718684 0.65699021 0.68020707 0.68228534
 0.682366   0.66034961 0.62722536 0.58403716 0.58705018 0.61738441
 0.58175486 0.5934226  0.63280064 0.63298094 0.63915408 0.69470278
 0.67652502 0.63808173 0.63509243 0.60772377 0.60495749 0.60477066
 0.59681666 0.59349996 0.59233057 0.59284502 0.59472394 0.59766036
 0.60135329 0.60552382 0.60992754 0.61436075 0.61866319 0.62271655
 0.62644142 0.62979287 0.63275474 0.63517648 0.63720912 0.63889992
 0.64029813 0.6414606  0.64244401 0.64330143 0.64407909 0.6448158
 0.64554203 0.64628059 0.64704686 0.64784992 0.64869344]
0 day output [[0.64957714]]
1 day input [0.80025338 0.83849738 0.84713312 0.86802023 0.86495502 0.90100
 0.88417192 0.9108241  0.91281222 0.91687861 0.92921538 0.92346929
 0.89504726 0.90501632 0.93294014 0.90846113 0.87157417 0.86482691
 0.84153413 0.80154399 0.78804946 0.80618927 0.77740662 0.78412542
 0.80851427 0.78682527 0.75543293 0.70491383 0.73941884 0.70388893
 0.66132231 0.70299214 0.66080986 0.68159733 0.69082618 0.73301321
 0.67770175 0.66739106 0.64294526 0.65718475 0.65126784 0.64367598
 0.6755096  0.65915863 0.67727471 0.63646371 0.6207533  0.60715913
 0.62949343 0.57501708 0.57419621 0.59750797 0.64024066 0.65200805
 0.65293805 0.68718684 0.65699021 0.68020707 0.68228534 0.682366
 0.66034961 0.62722536 0.58403716 0.58705018 0.61738441 0.58175486
 0.5934226  0.63280064 0.63298094 0.63915408 0.69470278 0.67652502
 0.63808173 0.63509243 0.60772377 0.60495749 0.60477066 0.59681666
 0.59349996 0.59233057 0.59284502 0.59472394 0.59766036 0.60135329
 0.60552382 0.60992754 0.61436075 0.61866319 0.62271655 0.62644142
 0.62979287 0.63275474 0.63517648 0.63720912 0.63889992 0.64029813
 0.6414606  0.64244401 0.64330143 0.64407909 0.6448158  0.64554203
 0.64628059 0.64704686 0.64784992 0.64869344 0.64957714]
```

```
1 day output [[0.6504977]]
2 day input [0.83849738 0.84713312 0.86802023 0.86495502 0.90100687 0.88417
 0.9108241  0.91281222 0.91687861 0.92921538 0.92346929 0.89504726
 0.90501632 0.93294014 0.90846113 0.87157417 0.86482691 0.84153413
 0.80154399 0.78804946 0.80618927 0.77740662 0.78412542 0.80851427
 0.78682527 0.75543293 0.70491383 0.73941884 0.70388893 0.66132231
 0.70299214 0.66080986 0.68159733 0.69082618 0.73301321 0.67770175
 0.66739106 0.64294526 0.65718475 0.65126784 0.64367598 0.6755096
 0.65915863 0.67727471 0.63646371 0.6207533  0.60715913 0.62949343
 0.57501708 0.57419621 0.59750797 0.64024066 0.65200805 0.65293805
 0.68718684 0.65699021 0.68020707 0.68228534 0.682366   0.66034961
 0.62722536 0.58403716 0.58705018 0.61738441 0.58175486 0.5934226
 0.63280064 0.63298094 0.63915408 0.69470278 0.67652502 0.63808173
 0.63509243 0.60772377 0.60495749 0.60477066 0.59681666 0.59349996
 0.59233057 0.59284502 0.59472394 0.59766036 0.60135329 0.60552382
 0.60992754 0.61436075 0.61866319 0.62271655 0.62644142 0.62979287
 0.63275474 0.63517648 0.63720912 0.63889992 0.64029813 0.6414606
 0.64244401 0.64330143 0.64407909 0.6448158  0.64554203 0.64628059
 0.64704686 0.64784992 0.64869344 0.64957714 0.65049767]
2 day output [[0.65144914]]
```

```
day_new = np.arange(1,101).reshape(20,5)
day_pred = np.arange(101,131).reshape(10,3)
df3 = df_close.tolist()
df3.extend(lst_output)
len(df_close)
```

```
1258
```