

```
In [1]: import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
import matplotlib.pyplot as plt

# Input data files are available in the "../input/" directory.
# For example, running this (by clicking run or pressing Shift+Enter) will list the
# files in the input directory

import os
#print(os.listdir("../input"))

# Any results you write to the current directory are saved as output.
```

```
In [2]: dataset_train = pd.read_csv("trainset.csv")
```

```
In [3]: dataset_train
```

```
Out[3]:
```

	Date	Open	High	Low	Close	Adj Close	Volume
0	2013-01-02	357.385559	361.151062	355.959839	359.288177	359.288177	5115500
1	2013-01-03	360.122742	363.600128	358.031342	359.496826	359.496826	4666500
2	2013-01-04	362.313507	368.339294	361.488861	366.600616	366.600616	5562800
3	2013-01-07	365.348755	367.301056	362.929504	365.001007	365.001007	3332900
4	2013-01-08	365.393463	365.771027	359.874359	364.280701	364.280701	3373900
...	...	...	...	...	...	...	...
1254	2017-12-22	1061.109985	1064.199951	1059.439941	1060.119995	1060.119995	755100
1255	2017-12-26	1058.069946	1060.119995	1050.199951	1056.739990	1056.739990	760600
1256	2017-12-27	1057.390015	1058.369995	1048.050049	1049.369995	1049.369995	1271900
1257	2017-12-28	1051.599976	1054.750000	1044.770020	1048.140015	1048.140015	837100
1258	2017-12-29	1046.719971	1049.699951	1044.900024	1046.400024	1046.400024	887500

1259 rows × 7 columns

```
In [4]: trainset = dataset_train.iloc[:,1:2].values
```

```
In [5]: trainset
```

```
Out[5]: array([[ 357.385559],
 [ 360.122742],
 [ 362.313507],
 ...,
 [1057.390015],
 [1051.599976],
 [1046.719971]])
```

```
In [6]: from sklearn.preprocessing import MinMaxScaler
sc = MinMaxScaler(feature_range = (0,1))
training_scaled = sc.fit_transform(trainset)
```

```
In [7]: training_scaled
```

```
Out[7]: array([[0.01011148],
               [0.01388614],
               [0.01690727],
               ...,
               [0.97543954],
               [0.9674549 ],
               [0.96072522]])
```

```
In [8]: x_train = []
        y_train = []
```

```
In [9]: for i in range(60,1259):
        x_train.append(training_scaled[i-60:i, 0])
        y_train.append(training_scaled[i,0])
        x_train,y_train = np.array(x_train),np.array(y_train)
```

```
In [10]: x_train.shape
```

```
Out[10]: (1199, 60)
```

```
In [11]: x_train = np.reshape(x_train, (x_train.shape[0],x_train.shape[1],1))
```

```
In [12]: from keras.models import Sequential
        from keras.layers import Dense
        from keras.layers import LSTM
        from keras.layers import Dropout
```

```
In [13]: regressor = Sequential()
        regressor.add(LSTM(units = 50,return_sequences = True,input_shape = (x_train.shape
```

```
In [14]: regressor.add(Dropout(0.2))
```

```
In [15]: regressor.add(LSTM(units = 50,return_sequences = True))
        regressor.add(Dropout(0.2))
```

```
In [16]: regressor.add(LSTM(units = 50,return_sequences = True))
        regressor.add(Dropout(0.2))
```

```
In [17]: regressor.add(LSTM(units = 50))
        regressor.add(Dropout(0.2))
```

```
In [18]: regressor.add(Dense(units = 1))
```

```
In [19]: regressor.compile(optimizer = 'adam',loss = 'mean_squared_error')
```

```
In [20]: regressor.fit(x_train,y_train,epochs = 100, batch_size = 32)
```

```
Epoch 1/100
38/38 [=====] - 13s 114ms/step - loss: 0.0249
Epoch 2/100
38/38 [=====] - 4s 117ms/step - loss: 0.0045
Epoch 3/100
38/38 [=====] - 4s 113ms/step - loss: 0.0043
Epoch 4/100
38/38 [=====] - 4s 112ms/step - loss: 0.0040
Epoch 5/100
38/38 [=====] - 4s 113ms/step - loss: 0.0038
Epoch 6/100
38/38 [=====] - 4s 112ms/step - loss: 0.0036
Epoch 7/100
38/38 [=====] - 4s 114ms/step - loss: 0.0039
Epoch 8/100
38/38 [=====] - 4s 113ms/step - loss: 0.0034
Epoch 9/100
38/38 [=====] - 4s 114ms/step - loss: 0.0032
Epoch 10/100
38/38 [=====] - 4s 113ms/step - loss: 0.0033
Epoch 11/100
38/38 [=====] - 4s 113ms/step - loss: 0.0031
Epoch 12/100
38/38 [=====] - 4s 113ms/step - loss: 0.0028
Epoch 13/100
38/38 [=====] - 4s 115ms/step - loss: 0.0028
Epoch 14/100
38/38 [=====] - 5s 121ms/step - loss: 0.0027
Epoch 15/100
38/38 [=====] - 5s 121ms/step - loss: 0.0024
Epoch 16/100
38/38 [=====] - 5s 122ms/step - loss: 0.0025
Epoch 17/100
38/38 [=====] - 5s 121ms/step - loss: 0.0030
Epoch 18/100
38/38 [=====] - 5s 127ms/step - loss: 0.0025
Epoch 19/100
38/38 [=====] - 5s 121ms/step - loss: 0.0028
Epoch 20/100
38/38 [=====] - 5s 120ms/step - loss: 0.0023
Epoch 21/100
38/38 [=====] - 5s 121ms/step - loss: 0.0030
Epoch 22/100
38/38 [=====] - 5s 121ms/step - loss: 0.0023
Epoch 23/100
38/38 [=====] - 5s 121ms/step - loss: 0.0022
Epoch 24/100
38/38 [=====] - 5s 120ms/step - loss: 0.0026
Epoch 25/100
38/38 [=====] - 5s 120ms/step - loss: 0.0023
Epoch 26/100
38/38 [=====] - 5s 119ms/step - loss: 0.0022
Epoch 27/100
38/38 [=====] - 5s 119ms/step - loss: 0.0023
Epoch 28/100
38/38 [=====] - 5s 121ms/step - loss: 0.0026
Epoch 29/100
38/38 [=====] - 5s 121ms/step - loss: 0.0020
Epoch 30/100
38/38 [=====] - 5s 120ms/step - loss: 0.0022
Epoch 31/100
38/38 [=====] - 5s 120ms/step - loss: 0.0020
Epoch 32/100
38/38 [=====] - 5s 121ms/step - loss: 0.0020
```

```
Epoch 33/100
38/38 [=====] - 5s 120ms/step - loss: 0.0025
Epoch 34/100
38/38 [=====] - 5s 121ms/step - loss: 0.0021
Epoch 35/100
38/38 [=====] - 5s 121ms/step - loss: 0.0019
Epoch 36/100
38/38 [=====] - 5s 120ms/step - loss: 0.0020
Epoch 37/100
38/38 [=====] - 5s 121ms/step - loss: 0.0021
Epoch 38/100
38/38 [=====] - 5s 123ms/step - loss: 0.0020
Epoch 39/100
38/38 [=====] - 5s 121ms/step - loss: 0.0017
Epoch 40/100
38/38 [=====] - 5s 121ms/step - loss: 0.0020
Epoch 41/100
38/38 [=====] - 5s 120ms/step - loss: 0.0018
Epoch 42/100
38/38 [=====] - 5s 120ms/step - loss: 0.0017
Epoch 43/100
38/38 [=====] - 5s 121ms/step - loss: 0.0017
Epoch 44/100
38/38 [=====] - 5s 120ms/step - loss: 0.0017
Epoch 45/100
38/38 [=====] - 5s 121ms/step - loss: 0.0017
Epoch 46/100
38/38 [=====] - 5s 122ms/step - loss: 0.0015
Epoch 47/100
38/38 [=====] - 5s 122ms/step - loss: 0.0017
Epoch 48/100
38/38 [=====] - 5s 121ms/step - loss: 0.0016
Epoch 49/100
38/38 [=====] - 5s 123ms/step - loss: 0.0018
Epoch 50/100
38/38 [=====] - 5s 125ms/step - loss: 0.0017
Epoch 51/100
38/38 [=====] - 5s 122ms/step - loss: 0.0017
Epoch 52/100
38/38 [=====] - 5s 121ms/step - loss: 0.0015
Epoch 53/100
38/38 [=====] - 5s 120ms/step - loss: 0.0017
Epoch 54/100
38/38 [=====] - 5s 125ms/step - loss: 0.0016
Epoch 55/100
38/38 [=====] - 5s 127ms/step - loss: 0.0015
Epoch 56/100
38/38 [=====] - 5s 120ms/step - loss: 0.0016
Epoch 57/100
38/38 [=====] - 5s 120ms/step - loss: 0.0014
Epoch 58/100
38/38 [=====] - 5s 138ms/step - loss: 0.0014
Epoch 59/100
38/38 [=====] - 5s 140ms/step - loss: 0.0013
Epoch 60/100
38/38 [=====] - 5s 139ms/step - loss: 0.0015
Epoch 61/100
38/38 [=====] - 8s 199ms/step - loss: 0.0015
Epoch 62/100
38/38 [=====] - 7s 175ms/step - loss: 0.0014
Epoch 63/100
38/38 [=====] - 6s 149ms/step - loss: 0.0014
Epoch 64/100
38/38 [=====] - 7s 180ms/step - loss: 0.0014
```

```
Epoch 65/100
38/38 [=====] - 7s 183ms/step - loss: 0.0014
Epoch 66/100
38/38 [=====] - 7s 175ms/step - loss: 0.0013
Epoch 67/100
38/38 [=====] - 6s 152ms/step - loss: 0.0014
Epoch 68/100
38/38 [=====] - 5s 131ms/step - loss: 0.0014
Epoch 69/100
38/38 [=====] - 5s 125ms/step - loss: 0.0013
Epoch 70/100
38/38 [=====] - 4s 117ms/step - loss: 0.0014
Epoch 71/100
38/38 [=====] - 5s 125ms/step - loss: 0.0012
Epoch 72/100
38/38 [=====] - 5s 124ms/step - loss: 0.0012
Epoch 73/100
38/38 [=====] - 5s 137ms/step - loss: 0.0013
Epoch 74/100
38/38 [=====] - 5s 124ms/step - loss: 0.0012
Epoch 75/100
38/38 [=====] - 5s 120ms/step - loss: 0.0014
Epoch 76/100
38/38 [=====] - 5s 126ms/step - loss: 0.0012
Epoch 77/100
38/38 [=====] - 5s 121ms/step - loss: 0.0012
Epoch 78/100
38/38 [=====] - 5s 121ms/step - loss: 0.0012
Epoch 79/100
38/38 [=====] - 5s 128ms/step - loss: 0.0011
Epoch 80/100
38/38 [=====] - 5s 123ms/step - loss: 0.0012
Epoch 81/100
38/38 [=====] - 5s 120ms/step - loss: 0.0010
Epoch 82/100
38/38 [=====] - 6s 158ms/step - loss: 0.0012
Epoch 83/100
38/38 [=====] - 5s 124ms/step - loss: 0.0013
Epoch 84/100
38/38 [=====] - 5s 134ms/step - loss: 0.0012
Epoch 85/100
38/38 [=====] - 5s 121ms/step - loss: 0.0011
Epoch 86/100
38/38 [=====] - 5s 121ms/step - loss: 0.0012
Epoch 87/100
38/38 [=====] - 5s 121ms/step - loss: 0.0011
Epoch 88/100
38/38 [=====] - 5s 122ms/step - loss: 0.0010
Epoch 89/100
38/38 [=====] - 5s 121ms/step - loss: 0.0011
Epoch 90/100
38/38 [=====] - 5s 122ms/step - loss: 0.0011
Epoch 91/100
38/38 [=====] - 5s 122ms/step - loss: 0.0011
Epoch 92/100
38/38 [=====] - 5s 121ms/step - loss: 0.0011
Epoch 93/100
38/38 [=====] - 5s 124ms/step - loss: 0.0011
Epoch 94/100
38/38 [=====] - 5s 122ms/step - loss: 0.0011
Epoch 95/100
38/38 [=====] - 5s 122ms/step - loss: 0.0010
Epoch 96/100
38/38 [=====] - 5s 122ms/step - loss: 0.0010
```

```

Epoch 97/100
38/38 [=====] - 5s 121ms/step - loss: 0.0010
Epoch 98/100
38/38 [=====] - 5s 122ms/step - loss: 0.0011
Epoch 99/100
38/38 [=====] - 5s 119ms/step - loss: 9.5672e-04
Epoch 100/100
38/38 [=====] - 5s 119ms/step - loss: 9.4282e-04
Out[20]: <keras.callbacks.History at 0x1a828e3ae20>

```

```
In [21]: dataset_test = pd.read_csv("testset.csv")
```

```
In [22]: real_stock_price = dataset_test.iloc[:,1:2].values
```

```
In [23]: dataset_total = pd.concat((dataset_train['Open'],dataset_test['Open']),axis = 0)
dataset_total
```

```

Out[23]: 0      357.385559
1      360.122742
2      362.313507
3      365.348755
4      365.393463
...
120    1143.599976
121    1128.000000
122    1121.339966
123    1102.089966
124    1120.000000
Name: Open, Length: 1384, dtype: float64

```

```
In [24]: inputs = dataset_total[len(dataset_total) - len(dataset_test)-60:].values
inputs
```

```
Out[24]: array([ 955.48999 , 966.700012, 980.          , 980.          , 973.719971,
 987.450012, 992.          , 992.099976, 990.289978, 991.77002 ,
 986.          , 989.440002, 989.52002 , 970.          , 968.369995,
 980.          , 1009.190002, 1014.          , 1015.219971, 1017.210022,
1021.76001 , 1022.109985, 1028.98999 , 1027.27002 , 1030.52002 ,
1033.98999 , 1026.459961, 1023.419983, 1022.590027, 1019.210022,
1022.52002 , 1034.01001 , 1020.26001 , 1023.309998, 1035.          ,
1035.869995, 1040.          , 1055.089966, 1042.680054, 1022.369995,
1015.799988, 1012.659973, 995.940002, 1001.5          , 1020.429993,
1037.48999 , 1035.5          , 1039.630005, 1046.119995, 1045.          ,
1054.609985, 1066.079956, 1075.199951, 1071.780029, 1064.949951,
1061.109985, 1058.069946, 1057.390015, 1051.599976, 1046.719971,
1048.339966, 1064.310059, 1088.          , 1094.          , 1102.22998 ,
1109.400024, 1097.099976, 1106.300049, 1102.410034, 1132.51001 ,
1126.219971, 1131.410034, 1131.829956, 1137.48999 , 1159.849976,
1177.329956, 1172.530029, 1175.079956, 1176.47998 , 1167.829956,
1170.569946, 1162.609985, 1122.          , 1090.599976, 1027.180054,
1081.540039, 1055.410034, 1017.25          , 1048.          , 1045.          ,
1048.949951, 1079.069946, 1088.410034, 1090.569946, 1106.469971,
1116.189941, 1112.640015, 1127.800049, 1141.23999 , 1123.030029,
1107.869995, 1053.079956, 1075.140015, 1099.219971, 1089.189941,
1115.319946, 1136.          , 1163.849976, 1170.          , 1145.209961,
1149.959961, 1154.140015, 1120.01001 , 1099.          , 1092.73999 ,
1081.880005, 1047.030029, 1046.          , 1063.          , 998.          ,
1011.630005, 1022.820007, 1013.909973, 993.409973, 1041.329956,
1020.          , 1016.799988, 1026.439941, 1027.98999 , 1025.040039,
1040.880005, 1037.          , 1051.369995, 1077.430054, 1069.400024,
1082.          , 1077.859985, 1052.          , 1025.52002 , 1029.51001 ,
1046.          , 1030.01001 , 1013.659973, 1028.099976, 1019.          ,
1016.900024, 1049.22998 , 1058.540039, 1058.099976, 1086.030029,
1093.599976, 1100.          , 1090.          , 1077.310059, 1079.890015,
1061.859985, 1074.060059, 1083.560059, 1065.130005, 1079.          ,
1079.02002 , 1064.890015, 1063.030029, 1067.560059, 1099.349976,
1122.329956, 1140.98999 , 1142.170044, 1131.319946, 1118.180054,
1118.599976, 1131.069946, 1141.119995, 1143.849976, 1148.859985,
1143.650024, 1158.5          , 1175.310059, 1174.849976, 1159.140015,
1143.599976, 1128.          , 1121.339966, 1102.089966, 1120.          ])
```

```
In [25]: inputs = inputs.reshape(-1,1)
```

```
In [26]: inputs
```

```
Out[26]: array([[ 955.48999 ],
 [ 966.700012],
 [ 980.        ],
 [ 980.        ],
 [ 973.719971],
 [ 987.450012],
 [ 992.        ],
 [ 992.099976],
 [ 990.289978],
 [ 991.77002 ],
 [ 986.        ],
 [ 989.440002],
 [ 989.52002 ],
 [ 970.        ],
 [ 968.369995],
 [ 980.        ],
 [1009.190002],
 [1014.        ],
 [1015.219971],
 [1017.210022],
 [1021.76001 ],
 [1022.109985],
 [1028.98999 ],
 [1027.27002 ],
 [1030.52002 ],
 [1033.98999 ],
 [1026.459961],
 [1023.419983],
 [1022.590027],
 [1019.210022],
 [1022.52002 ],
 [1034.01001 ],
 [1020.26001 ],
 [1023.309998],
 [1035.        ],
 [1035.869995],
 [1040.        ],
 [1055.089966],
 [1042.680054],
 [1022.369995],
 [1015.799988],
 [1012.659973],
 [ 995.940002],
 [1001.5       ],
 [1020.429993],
 [1037.48999 ],
 [1035.5       ],
 [1039.630005],
 [1046.119995],
 [1045.        ],
 [1054.609985],
 [1066.079956],
 [1075.199951],
 [1071.780029],
 [1064.949951],
 [1061.109985],
 [1058.069946],
 [1057.390015],
 [1051.599976],
 [1046.719971],
 [1048.339966],
 [1064.310059],
 [1088.        ],
 [1094.        ],
```



[1102.22998 ],  
[1109.400024],  
[1097.099976],  
[1106.300049],  
[1102.410034],  
[1132.51001 ],  
[1126.219971],  
[1131.410034],  
[1131.829956],  
[1137.48999 ],  
[1159.849976],  
[1177.329956],  
[1172.530029],  
[1175.079956],  
[1176.47998 ],  
[1167.829956],  
[1170.569946],  
[1162.609985],  
[1122. ],  
[1090.599976],  
[1027.180054],  
[1081.540039],  
[1055.410034],  
[1017.25 ],  
[1048. ],  
[1045. ],  
[1048.949951],  
[1079.069946],  
[1088.410034],  
[1090.569946],  
[1106.469971],  
[1116.189941],  
[1112.640015],  
[1127.800049],  
[1141.23999 ],  
[1123.030029],  
[1107.869995],  
[1053.079956],  
[1075.140015],  
[1099.219971],  
[1089.189941],  
[1115.319946],  
[1136. ],  
[1163.849976],  
[1170. ],  
[1145.209961],  
[1149.959961],  
[1154.140015],  
[1120.01001 ],  
[1099. ],  
[1092.73999 ],  
[1081.880005],  
[1047.030029],  
[1046. ],  
[1063. ],  
[ 998. ],  
[1011.630005],  
[1022.820007],  
[1013.909973],  
[ 993.409973],  
[1041.329956],  
[1020. ],  
[1016.799988],  
[1026.439941],

```
[1027.98999 ],
[1025.040039],
[1040.880005],
[1037.      ],
[1051.369995],
[1077.430054],
[1069.400024],
[1082.      ],
[1077.859985],
[1052.      ],
[1025.52002 ],
[1029.51001 ],
[1046.      ],
[1030.01001 ],
[1013.659973],
[1028.099976],
[1019.      ],
[1016.900024],
[1049.22998 ],
[1058.540039],
[1058.099976],
[1086.030029],
[1093.599976],
[1100.      ],
[1090.      ],
[1077.310059],
[1079.890015],
[1061.859985],
[1074.060059],
[1083.560059],
[1065.130005],
[1079.      ],
[1079.02002 ],
[1064.890015],
[1063.030029],
[1067.560059],
[1099.349976],
[1122.329956],
[1140.98999 ],
[1142.170044],
[1131.319946],
[1118.180054],
[1118.599976],
[1131.069946],
[1141.119995],
[1143.849976],
[1148.859985],
[1143.650024],
[1158.5      ],
[1175.310059],
[1174.849976],
[1159.140015],
[1143.599976],
[1128.      ],
[1121.339966],
[1102.089966],
[1120.      ]])
```

```
In [27]: inputs = sc.transform(inputs)
         inputs.shape
```

```
Out[27]: (185, 1)
```

```
In [28]: x_test = []  
         for i in range(60,185):  
             x_test.append(inputs[i-60:i,0])
```

```
In [29]: x_test = np.array(x_test)  
         x_test.shape
```

Out[29]: (125, 60)

```
In [30]: x_test = np.reshape(x_test, (x_test.shape[0],x_test.shape[1],1))  
         x_test.shape
```

Out[30]: (125, 60, 1)

```
In [31]: predicted_price = regressor.predict(x_test)
```

4/4 [=====] - 2s 40ms/step

```
In [32]: predicted_price = sc.inverse_transform(predicted_price)  
         predicted_price
```

```
Out[32]: array([[1062.5486],
               [1061.2917],
               [1063.7489],
               [1072.1361],
               [1082.6061],
               [1092.1124],
               [1099.5701],
               [1101.9546],
               [1102.7546],
               [1102.7412],
               [1108.0972],
               [1114.7013],
               [1120.7512],
               [1125.1423],
               [1128.8447],
               [1135.6974],
               [1146.101 ],
               [1154.7587],
               [1160.4332],
               [1163.7854],
               [1164.2369],
               [1164.1534],
               [1163.2083],
               [1155.5398],
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```

```
In [33]: plt.plot(real_stock_price,color = 'red', label = 'Real Price')  
plt.plot(predicted_price, color = 'blue', label = 'Predicted Price')
```

```
plt.title('Google Stock Price Prediction')  
plt.xlabel('Time')  
plt.ylabel('Google Stock Price')  
plt.legend()  
plt.show()
```

