venkatesh-data science intern task1

August 08, 2023

```
[1]: #importing libraries to be used import numpy as np #
     for linear algebra import pandas as pd # data
     preprocessing import matplotlib.pyplot as plt # data
     visualization library import seaborn as sns # data
     visualization library %matplotlib inline import
     warnings
     warnings.filterwarnings('ignore') # ignore warnings

     from sklearn.preprocessing import MinMaxScaler # for normalization
     from keras.models import Sequential from keras.layers import Dense,
     Dropout, LSTM, Bidirectional
```

```
[5]: df = pd.read_csv('/content/drive/MyDrive/Dataset/GOOG .csv') #
     data_importing df.head(10) # fetching first 10 rows of dataset
```

```
[5]: symbol                          date close high        low open \

     0   GOOG 2016-06-14 00:00:00+00:00 718.27 722.47 713.1200 716.48

     1   GOOG 2016-06-15 00:00:00+00:00 718.92 722.98 717.3100 719.00

     2   GOOG 2016-06-16 00:00:00+00:00 710.36 716.65 703.2600 714.91

     3   GOOG 2016-06-17 00:00:00+00:00 691.72 708.82 688.4515 708.65

     4   GOOG 2016-06-20 00:00:00+00:00 693.71 702.48 693.4100 698.77

     5   GOOG 2016-06-21 00:00:00+00:00 695.94 702.77 692.0100 698.40

     6   GOOG 2016-06-22 00:00:00+00:00 697.46 700.86 693.0819 699.06

     7   GOOG 2016-06-23 00:00:00+00:00 701.87 701.95 687.0000 697.45

     8   GOOG 2016-06-24 00:00:00+00:00 675.22 689.40 673.4500 675.17

     9   GOOG 2016-06-27 00:00:00+00:00 668.26 672.30 663.2840 671.00


        volume adjClose adjHigh adjLow adjOpen adjVolume divCash \
0  1306065 718.27    722.47 713.1200 716.48    1306065 0.0

1  1214517 718.92    722.98 717.3100 719.00    1214517 0.0
```

```
2  1982471 710.36   716.65 703.2600 714.91   1982471 0.0

3  3402357 691.72   708.82 688.4515 708.65   3402357 0.0
4  2082538 693.71   702.48 693.4100 698.77   2082538 0.0

5  1465634 695.94   702.77 692.0100 698.40   1465634 0.0

6  1184318 697.46   700.86 693.0819 699.06   1184318 0.0

7  2171415 701.87   701.95 687.0000 697.45   2171415 0.0

8  4449022 675.22      689.40 673.4500 675.17   4449022 0.0

9  2641085 668.26      672.30 663.2840 671.00   2641085 0.0

splitFactor

      0   1.0 1

 1.0 2 1.0 3

1.0 4 1.0 5

 1.0 6 1.0 7

        1.0 8 1.0
        9         1.0
```

```
[6]: # shape of data
     print("Shape of data:",df.shape)
```

```
     Shape of data: (1258, 14)
```

```
[7]: # statistical description of data
     df.describe()
```

```
[7]: close high low open volume \ count 1258.000000 1258.000000
     1258.000000 1258.000000 1.258000e+03 mean 1216.317067
     1227.430934 1204.176430 1215.260779
1.601590e+06
      std 383.333358 387.570872 378.777094             382.446995

6.960172e+05

      min 668.260000 672.300000 663.284000             671.000000

3.467530e+05

      25% 960.802500 968.757500 952.182500             959.005000

1.173522e+06

50% 1132.460000 1143.935000 1117.915000 1131.150000  1.412588e+06

75% 1360.595000 1374.345000 1348.557500 1361.075000   1.812156e+06

max 2521.600000 2526.990000
```

```
2498.290000 2524.920000

6.207027e+06

             adjClose  adjHigh       adjLow   adjOpen adjVolume \
    count 1258.000000 1258.000000 1258.000000 1258.000000 1.258000e+03  mean
         1216.317067 1227.430936 1204.176436 1215.260779
          1.601590e+06

     std  383.333358 387.570873 378.777099              382.446995
          6.960172e+05
     min  668.260000 672.300000 663.284000              671.000000
          3.467530e+05
     25%  960.802500 968.757500 952.182500              959.005000
          1.173522e+06
     50%  1132.460000 1143.935000 1117.915000 1131.150000  1.412588e+06
     75%  1360.595000 1374.345000 1348.557500 1361.075000
          1.812156e+06  max 2521.600000 2526.990000
     2498.290000 2524.920000
          6.207027e+06 divCash splitFactor
     count 1258.0      1258.0
     mean     0.0        1.0
     std      0.0        0.0
     min      0.0        1.0
     25%      0.0        1.0
     50%      0.0        1.0
     75%      0.0        1.0
     max      0.0        1.0
    <google.colab._quickchart_helpers.SectionTitle at
    0x7b92df122c80> import numpy as np from google.colab import
    autoviz                  df_8454858346676847654          =
    autoviz.get_df('df_8454858346676847654')

    def value_plot(df, y, sort_ascending=False, figsize=(2, 1)):
      from matplotlib import pyplot as plt if
      sort_ascending:
        df =
      df.sort_values(y).reset_index(drop=True) _, ax
      = plt.subplots(figsize=figsize)
      df[y].plot(kind='line') plt.title(y)
      ax.spines[['top',
      'right',]].set_visible(False) plt.tight_layout()
      return
      autoviz.MplChart.from_current_mpl_state()
```

```
chart = value_plot(df_8454858346676847654, *['close'], **{})
chart import numpy as np from google.colab import autoviz
df_8454858346676847654 = autoviz.get_df('df_8454858346676847654')

def value_plot(df, y, sort_ascending=False, figsize=(2, 1)):
  from matplotlib import pyplot as plt if
  sort_ascending:
    df =
  df.sort_values(y).reset_index(drop=True) _, ax
  = plt.subplots(figsize=figsize)
  df[y].plot(kind='line') plt.title(y)
  ax.spines[['top',
  'right',]].set_visible(False) plt.tight_layout()
  return autoviz.MplChart.from_current_mpl_state()
  chart
  = value_plot(df_8454858346676847654, *['high'],
  **{}) chart import numpy as np from
  google.colab import autoviz
df_8454858346676847654 = autoviz.get_df('df_8454858346676847654')

def value_plot(df, y, sort_ascending=False, figsize=(2, 1)):

  from matplotlib import pyplot as plt if
  sort_ascending:
    df =
  df.sort_values(y).reset_index(drop=True) _, ax
  = plt.subplots(figsize=figsize)
  df[y].plot(kind='line') plt.title(y)
  ax.spines[['top',
  'right',]].set_visible(False) plt.tight_layout()
  return autoviz.MplChart.from_current_mpl_state()

chart = value_plot(df_8454858346676847654, *['low'], **{}) chart
import numpy as np from google.colab import autoviz
df_8454858346676847654 = autoviz.get_df('df_8454858346676847654')

def value_plot(df, y, sort_ascending=False, figsize=(2, 1)):
  from matplotlib import pyplot as plt if
  sort_ascending:
    df =
  df.sort_values(y).reset_index(drop=True) _, ax
  = plt.subplots(figsize=figsize)
  df[y].plot(kind='line') plt.title(y)
  ax.spines[['top',
  'right',]].set_visible(False) plt.tight_layout()
  return  autoviz.MplChart.from_current_mpl_state()
```

```
chart = value_plot(df_8454858346676847654, *['open'], **{}) chart
<google.colab._quickchart_helpers.SectionTitle at  0x7b92dcff1ab0> import
numpy as np from google.colab import autoviz  df_8454858346676847654 =
autoviz.get_df('df_8454858346676847654') def histogram(df, colname,
num_bins=20, figsize=(2, 1)):

  from matplotlib import pyplot as plt _, ax
  = plt.subplots(figsize=figsize) plt.hist(df[colname],
  bins=num_bins, histtype='stepfilled')
  plt.ylabel('count') plt.title(colname) ax.spines[['top',
  'right',]].set_visible(False) plt.tight_layout() return
  autoviz.MplChart.from_current_mpl_state()

chart = histogram(df_8454858346676847654, *['close'],
**{}) chart import numpy as np from  google.colab import autoviz
df_8454858346676847654 = autoviz.get_df('df_8454858346676847654')

def histogram(df, colname, num_bins=20, figsize=(2, 1)):   from
  matplotlib import pyplot as plt _, ax
  = plt.subplots(figsize=figsize) plt.hist(df[colname],
  bins=num_bins, histtype='stepfilled')
  plt.ylabel('count') plt.title(colname) ax.spines[['top',
  'right',]].set_visible(False) plt.tight_layout() return
  autoviz.MplChart.from_current_mpl_state()

chart = histogram(df_8454858346676847654, *['high'], **{}) chart
import numpy as np from google.colab import autoviz
df_8454858346676847654 = autoviz.get_df('df_8454858346676847654')

def histogram(df, colname, num_bins=20, figsize=(2, 1)):
  from matplotlib import pyplot as plt  _,
  ax =  plt.subplots(figsize=figsize)
  plt.hist(df[colname], bins=num_bins,
  histtype='stepfilled') plt.ylabel('count')
  plt.title(colname) ax.spines[['top',
  'right',]].set_visible(False) plt.tight_layout() return
  autoviz.MplChart.from_current_mpl_state()
chart = histogram(df_8454858346676847654, *['low'], **{}) chart
import numpy as np from google.colab import autoviz
df_8454858346676847654 = autoviz.get_df('df_8454858346676847654') def
histogram(df, colname, num_bins=20, figsize=(2, 1)):

  from matplotlib import pyplot as
  plt _, ax = plt.subplots(figsize=figsize)
  plt.hist(df[colname], bins=num_bins, histtype='stepfilled')
  plt.ylabel('count') plt.title(colname) ax.spines[['top',
  'right',]].set_visible(False) plt.tight_layout() return
autoviz.MplChart.from_current_mpl_state() chart
= histogram(df_8454858346676847654,

*['open'], **{}) chart


<google.colab._quickchart_helpers.SectionTitle at
0x7b92dcd69d80> import numpy as np from google.colab import
autoviz                  df_8454858346676847654          =
autoviz.get_df('df_8454858346676847654')

def scatter_plots(df, colname_pairs, scatter_plot_size=2.5, size=8,
  alpha=.6): from matplotlib import pyplot as plt
  plt.figure(figsize=(len(colname_pairs) * scatter_plot_size,
  scatter_plot_size)) for plot_i, (x_colname, y_colname) in
  enumerate(colname_pairs, start=1):
    ax = plt.subplot(1, len(colname_pairs), plot_i)
    ax.scatter(df[x_colname], df[y_colname], s=size, alpha=alpha)
    plt.xlabel(x_colname) plt.ylabel(y_colname)
    ax.spines[['top', 'right',]].set_visible(False)
  plt.tight_layout()                                 return
autoviz.MplChart.from_current_mpl_state()        chart    =
scatter_plots(df_8454858346676847654, *[[['close', 'high'],

['high',␣
 ↪'low'], ['low', 'open'], ['open', 'volume']]],  **{}) chart
```

```
[8]: # summary of data
     df info()
```

```
<class
'pandas.core.frame.DataFrame'>
RangeIndex: 1258 entries, 0 to 1257 Data
columns (total 14 columns):

 # Column      Non-Null Count Dtype
 --- ------   -------------- -----
0 symbol 1258 non-null object 1 date
1258 non-null object
2 close 1258 non-null float64 3 high
1258  non-null  float64  4  low  1258
nonnull float64
```

```
5 open 1258 non-null float64 6 volume 1258
non-null int64   7 adjClose 1258 non-null
float64 8 adjHigh 1258 non-null float64
9 adjLow  1258 non-null float64 10 adjOpen  1258
 non-null float64 11 adjVolume 1258 non-null
 int64

  12   divCash    1258 non-null float64
  13   splitFactor 1258 non- float64 null   dtypes:
 float64(10), int64(2), object(2)  memory usage: 137.7+ KB
```

[9]:
```
# checking null values
df isnull() sum()
```

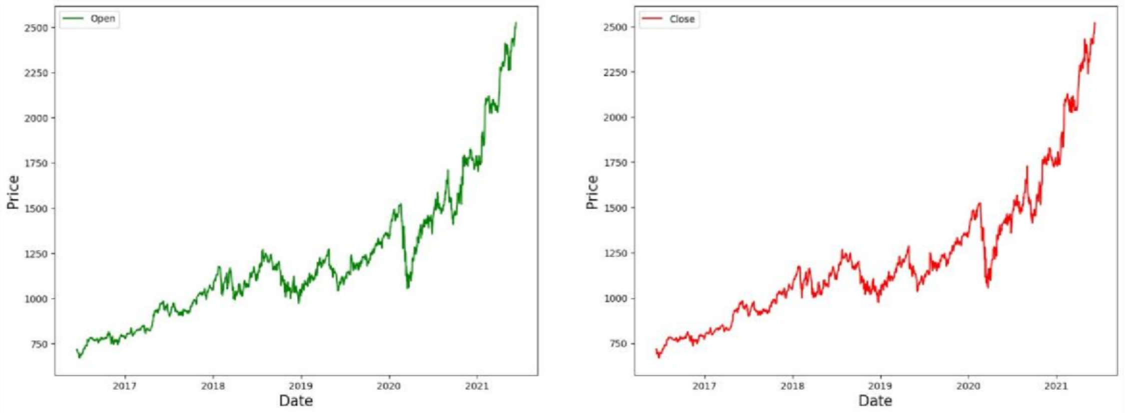
[9]:
```
 symbol       0
date         0
close        0
high         0
low          0
open         0
volume       0
adjClose     0
adjHigh      0
adjLow       0
adjOpen      0
adjVolume     0
divCash      0
splitFactor 0 dtype:
int64
```

[10]:
```
df = df[['date','open','close']] # Extracting required columns
df['date'] = pd.to_datetime(df['date'].apply(lambda x: x.split()[0])) #␣
 ↪converting object dtype of date column to datetime dtype
df.set_index('date',drop=True,inplace=True) # Setting date column
as index df.head(10)
```

[10]:
```
           open close date
2016-06-14 716.48 718.27
2016-06-15 719.00 718.92

2016-06-16 714.91 710.36
2016-06-17 708.65 691.72
2016-06-20 698.77 693.71
2016-06-21 698.40 695.94
2016-06-22 699.06 697.46
2016-06-23 697.45 701.87
2016-06-24 675.17 675.22
```

```
2016-06-27 671.00 668.26
```

[11]:
```
 # plotting open and closing price on date
index fig, ax
=plt.subplots(1,2,figsize=(20,7))
ax[0].plot(df['open'],label='Open',color='
green') ax[0].set_xlabel('Date',size=15)
ax[0].set_ylabel('Price',size=15)
ax[0].legend()

ax[1].plot(df['close'],label='Close',color='red')
 ax[1].set_xlabel('Date',size=15)
ax[1].set_ylabel('Price',size=15)
ax[1].legend()

fig.show()
```



[12]:
```
# normalizing all the values of all columns using MinMaxScaler
MMS   MinMaxScaler()
df[df.columns]   MMS.fit_transform(df)
df.head(10)
```

[12]:
```
                     open      close
 date
2016-06-14 0.024532 0.026984 2016-06-15 0.025891 0.027334
2016-06-16 0.023685 0.022716
2016-06-17 0.020308 0.012658
2016-06-20 0.014979 0.013732
2016-06-21 0.014779 0.014935
2016-06-22 0.015135 0.015755
2016-06-23 0.014267 0.018135
2016-06-24 0.002249 0.003755
2016-06-27 0.000000 0.000000
```

[13]:
```
# splitting the data into training and test set training_size =
round(len(df) * 0.75) # Selecting 75 % for training and 25 %␣
```

```
↪for testing training_size
```

```
[13]: 944
```

```
[14]: train_data   df[:training_size]
      test_data  = df[training_size:]


      train_data.shape, test_data.shape
```

```
[14]: ((944, 2), (314, 2))
```

```
[15]: # Function to create sequence of data for training and testing

      def create_sequence(dataset):
        sequences   []
        labels   []

        start_idx   0

        for stop_idx in range(50 len(dataset)): # Selecting 50 rows at a time
          sequences.append(dataset.iloc[start_idx:stop_idx])
          labels.append(dataset.iloc[stop_idx])
          start_idx += 1
        return (np.array(sequences),np array(labels))
```

```
[16]: train_seq, train_label = create_sequence(train_data)
      test_seq, test_label = create_sequence(test_data)
      train_seq.shape, train_label.shape, test_seq.shape, test_label.shape
```

```
                          [16]: ((894, 50, 2), (894, 2), (264, 50, 2), (264, 2))
```

```
[17]: # imported Sequential from keras.models
      model   Sequential()
      # importing Dense, Dropout, LSTM, Bidirectional from keras.layers
      model.add(LSTM(units=50, return_sequences=True  input_shape = (train_seq.
       ↪shape[1], train_seq.shape[2])))

      model.add(Dropout(0.1))
      model.add(LSTM(units=50))

      model.add(Dense(2))

      model.compile(loss='mean_squared_error , optimizer='adam' ␣
       ↪metrics=['mean_absolute_error ])

      model.summary()
```

```
    Model: "sequential"
_________________________________________________________________
                                                            _____
```

```
     Layer (type)     Output Shape     Param #
============================================================ ====== lstm (LSTM)
(None, 50, 50) 10600
      dropout (Dropout)       (None, 50, 50)        0

      lstm_1 (LSTM)           (None, 50)            20200

      dense (Dense)           (None, 2)             102
     =================================================================
     Total params: 30,902
     Trainable params: 30,902
     Non-trainable params: 0
     _________________________________________________________________
```

```
[18]: # fitting the model by iterating the dataset over 100 times(100 epochs)
      model.fit(train_seq, train_label,

      epochs=100,validation_data=(test_seq,␣ ↪test_label), verbose=1)
```

```
     Epoch 1/100
     28/28 [==============================] - 5s 73ms/step - loss: 0.0070
     mean_absolute_error: 0.0597 - val_loss: 0.0155 - val_mean_absolute_error:
     0.1008  Epoch 2/100
     28/28 [==============================] - 1s 42ms/step - loss: 6.9591e-
     04 mean_absolute_error: 0.0209 - val_loss: 0.0064 -
     val_mean_absolute_error: 0.0646
     Epoch 3/100
```

```
                                                                      -



                                                                      -
28/28 [==============================] 1s 52ms/step 04 -  - loss:
4.4913e mean_absolute_error: 0.0154 - val_loss: 0.0039 -    -
val_mean_absolute_error: 0.0483
Epoch 4/100
28 /28 [==============================] - 1s 49ms/step  - loss:
4.3055e
04 mean_absolute_error: 0.0150 - val_loss: 0.0055 -
val_mean_absolute_error: 0.0597
Epoch 5/100
28/28 [==============================] - 1s 38ms/step - loss: 4.1487e-
04 mean_absolute_error: 0.0150 - val_loss: 0.0040 -
val_mean_absolute_error: 0.0490
Epoch 6/100
28/28 [==============================] - 1s 39ms/step - loss: 4.0929e-
04 mean_absolute_error: 0.0148 - val_loss: 0.0055 -
val_mean_absolute_error: 0.0592
Epoch 7/100
28/28 [==============================] - 1s 39ms/step - loss: 4.1738e-
04 mean_absolute_error: 0.0149 - val_loss: 0.0065 -
val_mean_absolute_error: 0.0658
Epoch 8/100
28/28 [==============================] - 1s 38ms/step - loss: 4.0575e-
04 mean_absolute_error: 0.0148 - val_loss: 0.0031 -
val_mean_absolute_error: 0.0420
Epoch 9/100
28/28 [==============================] - 1s 38ms/step - loss: 3.8307e-
04 mean_absolute_error: 0.0145 - val_loss: 0.0036 -
val_mean_absolute_error: 0.0455
Epoch 10/100  28/28 [==============================] - 1s 39ms/step -
loss: 3.8019e-
04 mean_absolute_error: 0.0143 - val_loss: 0.0044 -
val_mean_absolute_error: 0.0520


                               -                  -
```

```
                                                                     -
Epoch 11/100  28/28 [==============================] - 1s 39ms/step -
loss: 3.7979e-

04 mean_absolute_error: 0.0142 - val_loss: 0.0074 -
val_mean_absolute_error: 0.0723
Epoch 12/100  28/28 [==============================] - 1s 39ms/step -
loss: 4.0588e-
04 mean_absolute_error: 0.0149 - val_loss: 0.0049 -
val_mean_absolute_error: 0.0552

     -   - 1s 53ms/step - loss: 3.6978e-  -   04
mean_absolute_error: 0.0141 val_loss: 0.0036 -
val_mean_absolute_error: 0.0463
Epoch 15/100
28/28 [==============================] - 1s 52ms/step  loss:
3.3517e Epoch 13/100
28/28 [==============================] - 1s 40ms/step loss: 3.9518e
04 mean_absolute_error: 0.0146 val_loss: 0.0027
val_mean_absolute_error: 0.0381
Epoch 14/100
04 mean_absolute_error: 0.0134 - val_loss: 0.0026 -
val_mean_absolute_error: 0.0375
Epoch 16/100  28/28 [==============================] - 1s 38ms/step -
loss: 3.9181e-
04 mean_absolute_error: 0.0144 - val_loss: 0.0043 -
val_mean_absolute_error: 0.0521
Epoch 17/100  28/28 [==============================] - 1s 36ms/step -
loss: 3.3263e-
04 mean_absolute_error: 0.0133 - val_loss: 0.0034 -
val_mean_absolute_error: 0.0451
Epoch 18/100  28/28 [==============================] - 1s 38ms/step -
loss: 3.3538e-
04 mean_absolute_error: 0.0134 - val_loss: 0.0037 -
val_mean_absolute_error: 0.0482
Epoch 19/100  28/28 [==============================] - 1s 38ms/step -
loss: 3.0465e-
04 mean_absolute_error: 0.0127 - val_loss: 0.0023 -
val_mean_absolute_error: 0.0357


                               -                  -
```

```
28/28 [==============================]                               -
Epoch 20/100  28/28 [==============================] - 1s 38ms/step -
loss: 3.1931e-
04 mean_absolute_error: 0.0130 - val_loss: 0.0030 -
val_mean_absolute_error: 0.0422
            -              -



            -              -
Epoch 21/100  28/28 [==============================] - 1s 48ms/step -
loss: 3.0678e-
04 mean_absolute_error: 0.0128 - val_loss: 0.0052 -
val_mean_absolute_error: 0.0599
Epoch 22/100
28/28 [==============================] - 1s 49ms/step - loss: 3.1832e-


      -   - -



04 mean_absolute_error: 0.0133 - val_loss: 0.0052 -
val_mean_absolute_error: 0.0596
Epoch 23/100  28/28 [==============================] - 1s 38ms/step -
loss: 2.9412e-
04 mean_absolute_error: 0.0127 - val_loss: 0.0032 -
val_mean_absolute_error: 0.0444
Epoch 24/100
28/28 [==============================] - 2s 74ms/step loss: 2.7506e
04 mean_absolute_error: 0.0121 val_loss: 0.0033
val_mean_absolute_error: 0.0447
Epoch 25/100
04 mean_absolute_error: 0.0118 - val_loss: 0.0025 -
val_mean_absolute_error: 0.0372
Epoch 27/100  28/28 [==============================] - 1s 38ms/step -
loss: 2.6288e-
04 mean_absolute_error: 0.0121 - val_loss: 0.0018 -
val_mean_absolute_error: 0.0311

                               -                  -
```

```
                                                                      -
Epoch 28/100  28/28 [==============================] - 1s 38ms/step -
loss: 3.0022e-
04 mean_absolute_error: 0.0127 - val_loss: 0.0024 -
val_mean_absolute_error: 0.0363
Epoch 29/100  28/28 [==============================] - 1s 38ms/step -
loss: 2.5981e-

04 mean_absolute_error: 0.0118 - val_loss: 0.0039 -
val_mean_absolute_error: 0.0494
Epoch 30/100  28/28 [==============================] - 1s 38ms/step -
loss: 2.5348e-
04 mean_absolute_error: 0.0118 - val_loss: 0.0029 -
val_mean_absolute_error: 0.0403
Epoch 31/100




                                                       -              -




                                -                  -
```

```
28/28 [==============================]                               -

                                  2s 54ms/step 04 - loss: 2.7607e-  -
mean_absolute_error: 0.0121 - val_loss: 0.0057 -
val_mean_absolute_error: 0.0621
Epoch 26/100
28/28 [==============================] - 1s 39ms/step  loss:
2.6551e
28/28 [==============================] - 1s 39ms/step - loss: 2.5479e-
04 mean_absolute_error: 0.0118 - val_loss: 0.0035 -
val_mean_absolute_error: 0.0465
Epoch 32/100  28/28 [==============================] - 1s 37ms/step -
loss: 2.4600e-
04 mean_absolute_error: 0.0115 - val_loss: 0.0027 -
val_mean_absolute_error: 0.0396
Epoch 33/100  28/28 [==============================] - 1s 37ms/step -
loss: 2.4682e-
04 mean_absolute_error: 0.0117 - val_loss: 0.0034 -
val_mean_absolute_error: 0.0449
Epoch 34/100  28/28 [==============================] - 1s 38ms/step -
loss: 2.4333e-
04 mean_absolute_error: 0.0115 - val_loss: 0.0034 -
val_mean_absolute_error: 0.0453
Epoch 35/100
28/28 [==============================] - 1s 45ms/step loss: 2.2664e
04 mean_absolute_error: 0.0111 val_loss: 0.0043
val_mean_absolute_error: 0.0523
Epoch 36/100
04 mean_absolute_error: 0.0123 - val_loss: 0.0044 -
val_mean_absolute_error: 0.0538
Epoch 38/100  28/28 [==============================] - 1s 37ms/step -
loss: 2.3647e-
04 mean_absolute_error: 0.0113 - val_loss: 0.0026 -
val_mean_absolute_error: 0.0388
Epoch 39/100  28/28 [==============================] - 1s 37ms/step -
loss: 2.3214e-
04 mean_absolute_error: 0.0114 - val_loss: 0.0035 -
val_mean_absolute_error: 0.0457
Epoch 40/100  28/28 [==============================] - 1s 38ms/step -
loss: 2.2272e-

                               -                  -
```

```
                                                                 -
04 mean_absolute_error: 0.0109 - val_loss: 0.0039 -
val_mean_absolute_error: 0.0497
```

```
                         -                -
```

```
28/28 [==============================] -              -              -



                                                      -              -
      -   - 1 s 51ms/step loss: 2.5588e
04 mean_absolute_error: 0.0117 val_loss: 0.0044 -  -
val_mean_absolute_error: 0.0534
Epoch 37/100
28 /28 [==============================] - 1s 46ms/step loss: 2.8117e
Epoch 41/100  28/28 [==============================] - 1s 38ms/step -
loss: 2.3288e-
04 mean_absolute_error: 0.0113 - val_loss: 0.0018 -
val_mean_absolute_error: 0.0310
Epoch 42/100  28/28 [==============================] - 1s 39ms/step -
loss: 2.3720e-
04 mean_absolute_error: 0.0114 - val_loss: 0.0029 -
val_mean_absolute_error: 0.0420
Epoch 43/100  28/28 [==============================] - 1s 38ms/step -
loss: 2.2844e-
04 mean_absolute_error: 0.0111 - val_loss: 0.0044 -
val_mean_absolute_error: 0.0547
Epoch 44/100  28/28 [==============================] - 1s 38ms/step -
loss: 2.2612e-
04 mean_absolute_error: 0.0110 - val_loss: 0.0024 -
val_mean_absolute_error: 0.0371
Epoch 45/100  28/28 [==============================] - 1s 38ms/step -
loss: 2.1131e-
04 mean_absolute_error: 0.0105 - val_loss: 0.0021 -
val_mean_absolute_error: 0.0342
Epoch 46/100
28/28 [==============================] - 1s 40ms/step loss: 2.1178e
04 mean_absolute_error: 0.0105 val_loss: 0.0023
val_mean_absolute_error: 0.0362
Epoch 47/100
                                                      -              -
                                        1             s loss: 2.2767e
50ms/step 04 mean_absolute_error: 0.0110 val_loss:
0.0023 -  - val_mean_absolute_error: 0.0363

                                   -                  -
```

```
28/28 [==============================] -              -              -



                                                     -              -
Epoch 48/100
28 /28 [==============================] - 1s 52ms/step  loss: 2.3243e
04 mean_absolute_error: 0.0113 - val_loss: 0.0040 -
val_mean_absolute_error: 0.0505
Epoch 49/100  28/28 [==============================] - 1s 37ms/step -
loss: 2.1314e-
04 mean_absolute_error: 0.0107 - val_loss: 0.0036 -
val_mean_absolute_error: 0.0467
Epoch 50/100  28/28 [==============================] - 1s 38ms/step -
loss: 1.9676e-
04 mean_absolute_error: 0.0103 - val_loss: 0.0025 -
val_mean_absolute_error: 0.0386
Epoch 51/100  28/28 [==============================] - 1s 38ms/step -
loss: 2.1936e-
04 mean_absolute_error: 0.0109 - val_loss: 0.0024 -
val_mean_absolute_error: 0.0371
Epoch 52/100  28/28 [==============================] - 1s 38ms/step -
loss: 1.9640e-
04 mean_absolute_error: 0.0103 - val_loss: 0.0022 -
val_mean_absolute_error: 0.0345
Epoch 53/100  28/28 [==============================] - 1s 39ms/step -
loss: 1.9537e-
04 mean_absolute_error: 0.0101 - val_loss: 0.0029 -
val_mean_absolute_error: 0.0423
Epoch 54/100  28/28 [==============================] - 1s 38ms/step -
loss: 2.0339e-
04 mean_absolute_error: 0.0103 - val_loss: 0.0024 -
val_mean_absolute_error: 0.0386
Epoch 55/100  28/28 [==============================] - 1s 37ms/step -
loss: 2.0150e-
04 mean_absolute_error: 0.0103 - val_loss: 0.0019 -
val_mean_absolute_error: 0.0319
Epoch 56/100  28/28 [==============================] - 1s 37ms/step -
loss: 1.8074e-

                               -                  -
```

```
28/28 [==============================] -              -              -




                                                      -              -
04 mean_absolute_error: 0.0097 - val_loss: 0.0026 -
val_mean_absolute_error: 0.0403

      -   - 1 s 46ms/step loss: 1.9212e
04 mean_absolute_error: 0.0100 val_loss: 0.0019 -  -
val_mean_absolute_error: 0.0325
Epoch 59/100
28 /28 [==============================] - 2s 56ms/step loss: 1.7550e
Epoch 57/100
28/28 [==============================] - 1s 39ms/step loss: 2.0540e
04 mean_absolute_error: 0.0104 val_loss: 0.0029
val_mean_absolute_error: 0.0435
Epoch 58/100
04 mean_absolute_error: 0.0098 - val_loss: 0.0025 -
val_mean_absolute_error: 0.0388
Epoch 60/100  28/28 [==============================] - 1s 40ms/step -
loss: 1.9490e-
04 mean_absolute_error: 0.0102 - val_loss: 0.0037 -
val_mean_absolute_error: 0.0507
Epoch 61/100  28/28 [==============================] - 1s 38ms/step -
loss: 1.8077e-
04 mean_absolute_error: 0.0097 - val_loss: 0.0024 -
val_mean_absolute_error: 0.0382
Epoch 62/100  28/28 [==============================] - 1s 40ms/step -
loss: 2.0307e-
04 mean_absolute_error: 0.0103 - val_loss: 0.0017 -
val_mean_absolute_error: 0.0306
Epoch 63/100  28/28 [==============================] - 1s 37ms/step -
loss: 1.6272e-
04 mean_absolute_error: 0.0092 - val_loss: 0.0015 -
val_mean_absolute_error: 0.0292
Epoch 64/100  28/28 [==============================] - 1s 37ms/step -
loss: 1.6148e-



                                    -                  -
```

```
28/28 [==============================] -              -              -



                                                      -              -
04 mean_absolute_error: 0.0092 - val_loss: 0.0011 -
val_mean_absolute_error: 0.0243
Epoch 65/100  28/28 [==============================] - 1s 37ms/step -
loss: 1.9973e-
04 mean_absolute_error: 0.0105 - val_loss: 0.0026 -
val_mean_absolute_error: 0.0397
Epoch 66/100
28/28 [==============================] - 1s 37ms/step - loss: 1.6555e-

                                                      -              -
```

```
                               -                  -
```

```
28/28 [==============================] -             -             -



                                                    -              -
                                           1          s loss: 1.5642e
44ms/step 04 mean_absolute_error: 0.0089 val_loss:
0.0020 -  - val_mean_absolute_error: 0.0342
Epoch 70/100
28 /28 [==============================] - 1s 53ms/step  loss: 1.5181e
04 mean_absolute_error: 0.0092 - val_loss: 0.0028 -
val_mean_absolute_error: 0.0431
Epoch 67/100  28/28 [==============================] - 1s 38ms/step - loss:
1.8140e-
04 mean_absolute_error: 0.0098 - val_loss: 0.0011 -
val_mean_absolute_error: 0.0243
Epoch 68/100
28/28 [==============================] - 1s 39ms/step loss: 1.5566e
04 mean_absolute_error: 0.0090 val_loss: 0.0016 val_mean_absolute_error:
0.0297
Epoch 69/100
04 mean_absolute_error: 0.0089 - val_loss: 0.0012 -
val_mean_absolute_error: 0.0250
Epoch 71/100  28/28 [==============================] - 1s 45ms/step - loss:
1.5722e-
04 mean_absolute_error: 0.0092 - val_loss: 0.0012 -
val_mean_absolute_error: 0.0253
Epoch 72/100  28/28 [==============================] - 1s 38ms/step - loss:
1.5028e-
04 mean_absolute_error: 0.0088 - val_loss: 0.0031 -
val_mean_absolute_error: 0.0448
Epoch 73/100  28/28 [==============================] - 1s 38ms/step - loss:
1.5013e-
04 mean_absolute_error: 0.0087 - val_loss: 0.0020 -
val_mean_absolute_error: 0.0336
Epoch 74/100  28/28 [==============================] - 1s 40ms/step - loss:
1.5820e-
04 mean_absolute_error: 0.0090 - val_loss: 0.0016 -
val_mean_absolute_error: 0.0295
Epoch 75/100  28/28 [==============================] - 1s 40ms/step - loss:
1.4808e-
04 mean_absolute_error: 0.0089 - val_loss: 0.0016 -
val_mean_absolute_error: 0.0297
Epoch 76/100  28/28 [==============================] - 1s 38ms/step - loss:
1.4740e-
04 mean_absolute_error: 0.0088 - val_loss: 0.0021 -
val_mean_absolute_error: 0.0354
Epoch 77/100
```

```
28/28 [==============================] -              -              -



                                                      -              -
28/28 [==============================] - 1s 38ms/step - loss: 1.4434e- -




04 mean_absolute_error: 0.0086 - val_loss: 9.5732e-04 -
val_mean_absolute_error:
0.0227
Epoch 78/100  28/28 [==============================] - 1s 38ms/step - loss:
1.5803e-
04 mean_absolute_error: 0.0090 - val_loss: 0.0013 -
val_mean_absolute_error: 0.0262
Epoch 79/100  28/28 [==============================] - 1s 39ms/step - loss:
1.5157e-
04 mean_absolute_error: 0.0088 - val_loss: 0.0014 -
val_mean_absolute_error: 0.0278
Epoch 80/100
```

- - - -

```
                               28/28                                      --
                               [==============================] -
                               -


                                                                           --
                                          1s 42ms/step loss: 1.4757e
04 mean_absolute_error: 0.0088 val_loss: 0.0025 - val_mean_absolute_error:
0.0400
Epoch 81/100
28/28 [==============================] - 1s 51ms/step  loss: 1.4949e
04 mean_absolute_error: 0.0089 - val_loss: 0.0012 -
val_mean_absolute_error: 0.0254
Epoch 82/100  28/28 [==============================] - 1s 51ms/step - loss:
1.3308e-
04 mean_absolute_error: 0.0083 - val_loss: 0.0030 -
val_mean_absolute_error: 0.0434
Epoch 83/100  28/28 [==============================] - 1s 38ms/step - loss:
1.3501e-
04 mean_absolute_error: 0.0082 - val_loss: 0.0019 -
val_mean_absolute_error: 0.0329
Epoch 84/100  28/28 [==============================] - 1s 39ms/step - loss:
1.3702e-
04 mean_absolute_error: 0.0086 - val_loss: 0.0018 -
val_mean_absolute_error: 0.0318
Epoch 85/100  28/28 [==============================] - 1s 38ms/step - loss:
1.3023e-
04 mean_absolute_error: 0.0081 - val_loss: 0.0024 -
val_mean_absolute_error: 0.0382
Epoch 86/100  28/28 [==============================] - 1s 38ms/step - loss:
1.2756e-
04 mean_absolute_error: 0.0080 - val_loss: 0.0025 -
val_mean_absolute_error: 0.0389
Epoch 87/100  28/28 [==============================] - 1s 39ms/step - loss:
1.3654e-
04 mean_absolute_error: 0.0084 - val_loss: 0.0028 -
val_mean_absolute_error: 0.0416
Epoch 88/100  28/28 [==============================] - 1s 38ms/step - loss:
1.4430e-
04 mean_absolute_error: 0.0087 - val_loss: 0.0014 -
val_mean_absolute_error: 0.0268
Epoch 89/100  28/28 [==============================] - 1s 41ms/step - loss:
1.3139e-
04 mean_absolute_error: 0.0083 - val_loss: 0.0016 -
val_mean_absolute_error: 0.0295
28/28 [==============================] -             -              -
```

```
                                                      -              -
Epoch 90/100  28/28 [==============================] - 1s 38ms/step - loss:
1.2766e-
04 mean_absolute_error: 0.0082 - val_loss: 0.0013 -
val_mean_absolute_error: 0.0267 Epoch 91/100
```

```
28/28 [==============================] - 1s 42ms/step - loss: 1.2961e-
04 mean_absolute_error: 0.0082 - val_loss: 0.0014 -
val_mean_absolute_error: 0.0280
Epoch 92/100  28/28 [==============================] - 1s 53ms/step - loss:
1.2139e-
04 mean_absolute_error: 0.0081 - val_loss: 0.0016 -
val_mean_absolute_error: 0.0300
Epoch 93/100  28/28 [==============================] - 1s 50ms/step - loss:
1.2566e-
04 mean_absolute_error: 0.0079 - val_loss: 0.0015 -
val_mean_absolute_error: 0.0289
Epoch 94/100  28/28 [==============================] - 1s 40ms/step - loss:
1.2364e-
04 mean_absolute_error: 0.0082 - val_loss: 0.0016 -
val_mean_absolute_error: 0.0296
Epoch 95/100  28/28 [==============================] - 1s 39ms/step - loss:
1.2415e-
04 mean_absolute_error: 0.0080 - val_loss: 0.0016 -
val_mean_absolute_error: 0.0296
Epoch 96/100  28/28 [==============================] - 1s 38ms/step - loss:
1.1602e-
04 mean_absolute_error: 0.0076 - val_loss: 0.0020 -
val_mean_absolute_error: 0.0339
Epoch 97/100  28/28 [==============================] - 1s 39ms/step - loss:
1.1907e-
04 mean_absolute_error: 0.0078 - val_loss: 0.0018 -
val_mean_absolute_error: 0.0311
Epoch 98/100  28/28 [==============================] - 1s 39ms/step - loss:
1.2545e-
04 mean_absolute_error: 0.0080 - val_loss: 0.0019 -
val_mean_absolute_error: 0.0326
Epoch 99/100  28/28 [==============================] - 1s 38ms/step - loss:
1.2563e-
04 mean_absolute_error: 0.0079 - val_loss: 0.0015 -
val_mean_absolute_error: 0.0290 Epoch 100/100
28/28 [==============================] - 1s 39ms/step - loss: 1.3376e-
04 mean_absolute_error: 0.0084 - val_loss: 0.0028 -
val_mean_absolute_error: 0.0426
```

```
[18]: <keras.callbacks.History at 0x7b92dc653970>
```

```
[19]: # predicting the values after running the model
      test_predicted   model.predict(test_seq)
      test_predicted[:5]
```

```
9/9 [==============================] - 1s 8ms/step
```

```
[19]: array([[0.3925917 , 0.3948203 ],
             [0.39278576, 0.39529413],
             [0.3889445 , 0.39180565],
             [0.3916219 , 0.3940799 ],
             [0.39539546, 0.3975677 ]], dtype=float32)
```

```
[20]: # Inversing normalization/scaling on predicted data
      test_inverse_predicted = MMS.inverse_transform(test_predicted)
      test_inverse_predicted[:5]
```

```
[20]: array([[1398.8336, 1399.9962],
             [1399.1934, 1400.8745],
             [1392.072 , 1394.4092],
             [1397.0356, 1398.624 ],
             [1404.0315, 1405.0881]], dtype=float32)
```

```
[21]: # Merging actual and predicted data for better visualization df_merge
      = pd.concat([df.iloc[264:].copy(), pd.
       ↪DataFrame(test_inverse_predicted,columns=['open_predicted','close_p
                                           redicted'], index=df.iloc[-
                                           264:].index)], axis=1)
```

```
[22]: # Inversing normalization/scaling df_merge[['open','close']] =
      MMS.inverse_transform(df_merge[['open','close']]) df_merge.head()
```

```
[22]:   open close open_predicted close_predicted date
      2020-05-27 1417.25 1417.84 1398.833618   1399.996216
      2020-05-28 1396.86 1416.73 1399.193359   1400.874512
      2020-05-29 1416.94 1428.92 1392.072021   1394.409180
      2020-06-01 1418.39 1431.82 1397.035645   1398.624023
      2020-06-02 1430.55 1439.22 1404.031494   1405.088135
     <google.colab._quickchart_helpers.SectionTitle           at
     0x7b92dcd87d00> import numpy as np from google.colab import
     autoviz                   df_2868927680624221977          =
     autoviz.get_df('df_2868927680624221977')

     def value_plot(df, y, sort_ascending=False, figsize=(2, 1)):
       from matplotlib import pyplot as
       plt if sort_ascending:
         df =
       df.sort_values(y).reset_index(drop=True) _, ax
       = plt.subplots(figsize=figsize)
       df[y].plot(kind='line') plt.title(y)
       ax.spines[['top',
       'right',]].set_visible(False) plt.tight_layout()
       return
       autoviz.MplChart.from_current_mpl_state() chart
       = value_plot(df_2868927680624221977, *['open'],
       **{}) chart import numpy as np from
       google.colab import autoviz
```

```
df_2868927680624221977 = autoviz.get_df('df_2868927680624221977') def
value_plot(df, y, sort_ascending=False, figsize=(2, 1)):
  from matplotlib import pyplot as plt if
  sort_ascending:
    df =
  df.sort_values(y).reset_index(drop=True) _, ax
  = plt.subplots(figsize=figsize)
  df[y].plot(kind='line') plt.title(y)
  ax.spines[['top',
  'right',]].set_visible(False) plt.tight_layout()
  return autoviz.MplChart.from_current_mpl_state()

chart = value_plot(df_2868927680624221977, *['close'], **{})
chart import numpy as np from google.colab import autoviz
df_2868927680624221977 = autoviz.get_df('df_2868927680624221977')

def value_plot(df, y, sort_ascending=False, figsize=(2, 1)):
  from matplotlib import pyplot as plt if
  sort_ascending:
    df =
  df.sort_values(y).reset_index(drop=True) _, ax
  = plt.subplots(figsize=figsize)
  df[y].plot(kind='line') plt.title(y)
  ax.spines[['top',
  'right',]].set_visible(False) plt.tight_layout()
  return autoviz.MplChart.from_current_mpl_state()

chart = value_plot(df_2868927680624221977,
*['open_predicted'], **{}) chart import numpy as np from google.colab
import autoviz  df_2868927680624221977 =
autoviz.get_df('df_2868927680624221977')

def value_plot(df, y, sort_ascending=False, figsize=(2, 1)):
  from matplotlib import pyplot as plt if
  sort_ascending:
    df =
  df.sort_values(y).reset_index(drop=True) _, ax
  = plt.subplots(figsize=figsize)
  df[y].plot(kind='line') plt.title(y)
  ax.spines[['top',
  'right',]].set_visible(False)  plt.tight_layout() return
  autoviz.MplChart.from_current_mpl_state()

chart = value_plot(df_2868927680624221977, *['close_predicted'], **{})
chart
<google.colab._quickchart_helpers.SectionTitle at
```

```
0x7b92dcee9a80> import numpy as np from google.colab import
autoviz                    df_2868927680624221977          =
autoviz.get_df('df_2868927680624221977')

def histogram(df, colname, num_bins=20, figsize=(2, 1)):   from
  matplotlib import pyplot as plt _, ax
  = plt.subplots(figsize=figsize) plt.hist(df[colname],
  bins=num_bins, histtype='stepfilled')
  plt.ylabel('count') plt.title(colname) ax.spines[['top',
  'right',]].set_visible(False) plt.tight_layout() return
  autoviz.MplChart.from_current_mpl_state()

chart = histogram(df_2868927680624221977, *['open'], **{}) chart
import numpy as np from google.colab import autoviz
df_2868927680624221977 = autoviz.get_df('df_2868927680624221977')

def histogram(df, colname, num_bins=20, figsize=(2, 1)):   from
  matplotlib import pyplot as plt _, ax
  = plt.subplots(figsize=figsize) plt.hist(df[colname],
  bins=num_bins, histtype='stepfilled')
  plt.ylabel('count') plt.title(colname) ax.spines[['top',
  'right',]].set_visible(False) plt.tight_layout() return
  autoviz.MplChart.from_current_mpl_state()

chart = histogram(df_2868927680624221977, *['close'], **{}) chart
import numpy as np from google.colab import autoviz
df_2868927680624221977 = autoviz.get_df('df_2868927680624221977')

def histogram(df, colname, num_bins=20, figsize=(2, 1)):
  from matplotlib import pyplot as plt
  _, ax =
  plt.subplots(figsize=figsize)
  plt.hist(df[colname], bins=num_bins,
  histtype='stepfilled')
  plt.ylabel('count')
  plt.title(colname) ax.spines[['top',
  'right',]].set_visible(False) plt.tight_layout() return
  autoviz.MplChart.from_current_mpl_state()
chart = histogram(df_2868927680624221977,
*['open_predicted'], **{}) chart import numpy as np from google.colab
import autoviz  df_2868927680624221977 =
autoviz.get_df('df_2868927680624221977')
def histogram(df, colname, num_bins=20, figsize=(2, 1)):   from
  matplotlib import pyplot as plt _, ax
  = plt.subplots(figsize=figsize) plt.hist(df[colname],
  bins=num_bins, histtype='stepfilled')
  plt.ylabel('count') plt.title(colname) ax.spines[['top',
  'right',]].set_visible(False) plt.tight_layout() return
  autoviz.MplChart.from_current_mpl_state()
```

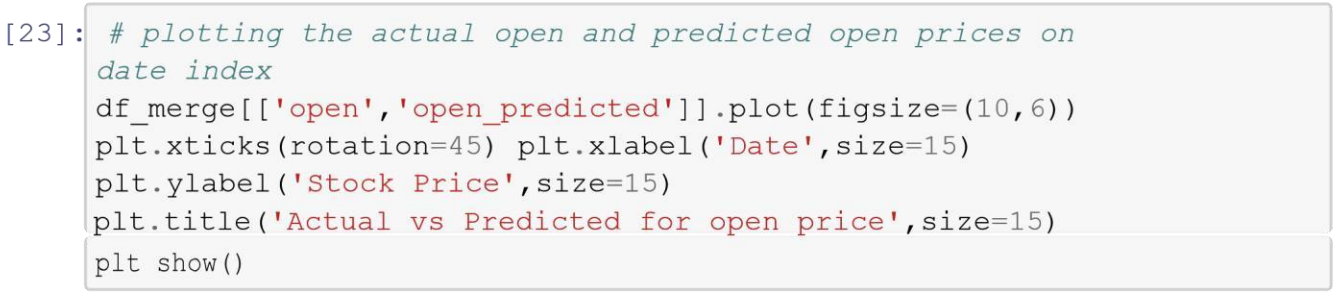
```
chart = histogram(df_2868927680624221977, *['close_predicted'], **{}) chart
```

```
<google.colab._quickchart_helpers.SectionTitle           at
0x7b92dceb1240> import numpy as np from google.colab import
autoviz                    df_2868927680624221977          =
autoviz.get_df('df_2868927680624221977')
```

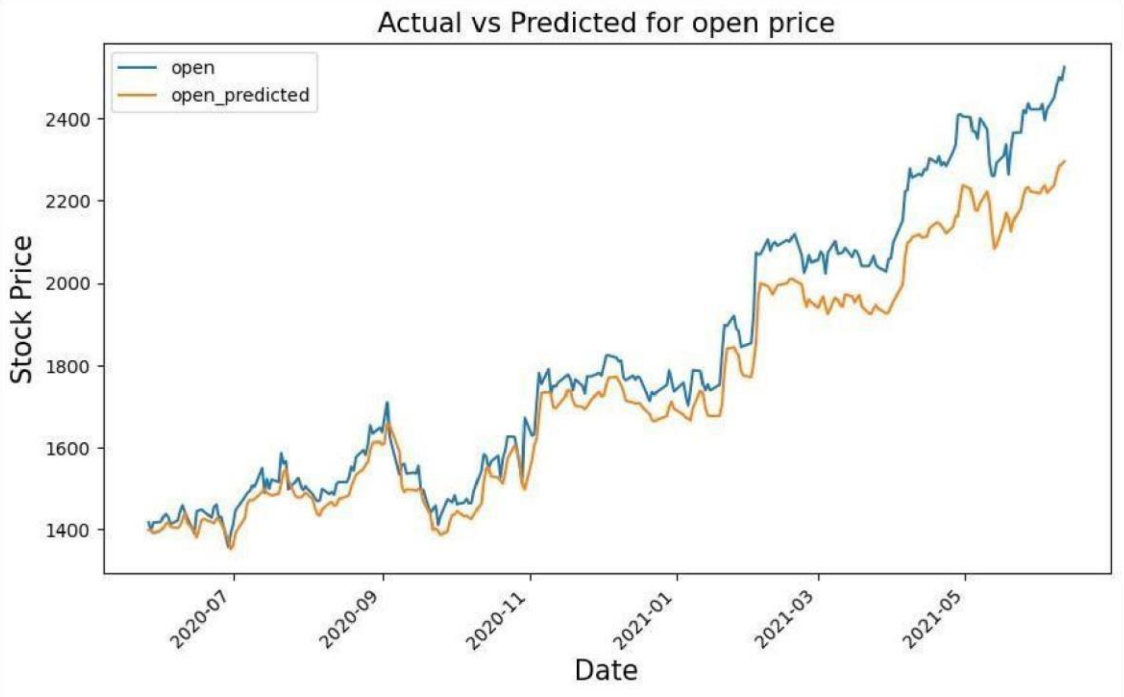
```
def scatter_plots(df, colname_pairs, scatter_plot_size=2.5, size=8,
  alpha=.6): from matplotlib import pyplot as plt
  plt.figure(figsize=(len(colname_pairs) * scatter_plot_size,
  scatter_plot_size)) for plot_i, (x_colname, y_colname) in
  enumerate(colname_pairs, start=1):
    ax = plt.subplot(1, len(colname_pairs), plot_i)
    ax.scatter(df[x_colname], df[y_colname], s=size, alpha=alpha)
    plt.xlabel(x_colname) plt.ylabel(y_colname)  ax.spines[['top',
    'right',]].set_visible(False)
  plt.tight_layout()                                  return
```

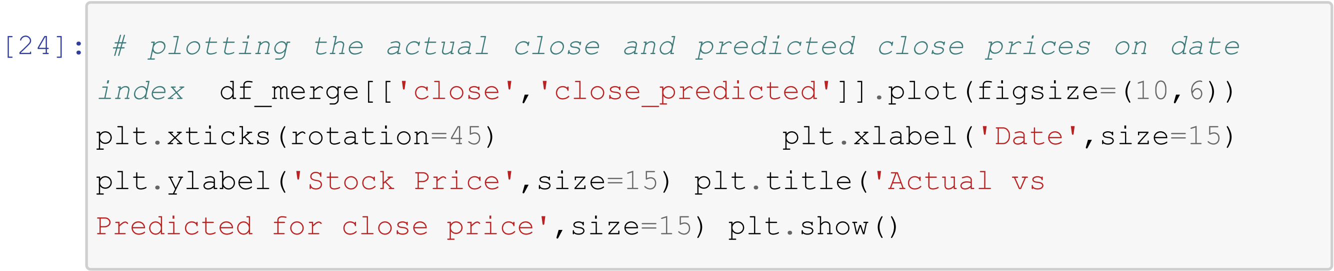
```
autoviz.MplChart.from_current_mpl_state()        chart    =
scatter_plots(df_2868927680624221977, *[[['open', 'close'],
```

```
['close',␣
 ↪'open_predicted'], ['open_predicted', 'close_predicted']]],
**{}) chart
```

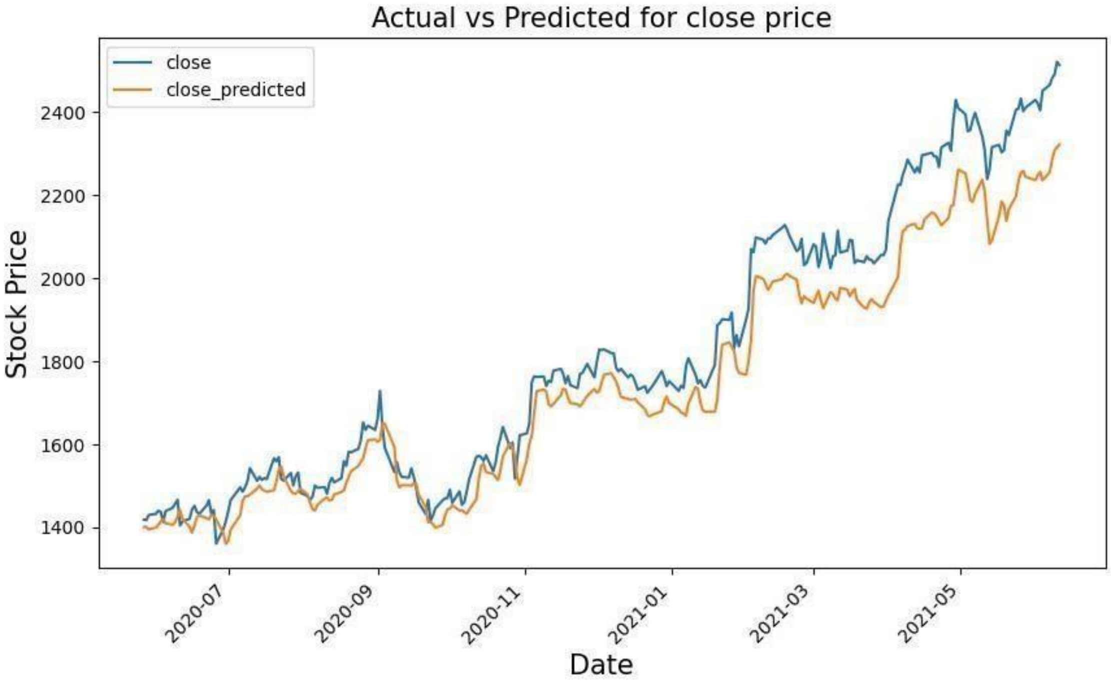


```
[23]: # plotting the actual open and predicted open prices on
date index
df_merge[['open','open_predicted']].plot(figsize=(10,6))
plt.xticks(rotation=45) plt.xlabel('Date',size=15)
plt.ylabel('Stock Price',size=15)
plt.title('Actual vs Predicted for open price',size=15)
plt show()
```





```
[24]: # plotting the actual close and predicted close prices on date
index  df_merge[['close','close_predicted']].plot(figsize=(10,6))
plt.xticks(rotation=45)                   plt.xlabel('Date',size=15)
plt.ylabel('Stock Price',size=15) plt.title('Actual vs
Predicted for close price',size=15) plt.show()
```



```
[25]: # Creating a dataframe and adding 10 days to existing index

      df_merge = df_merge.append(pd.DataFrame(columns=df_merge.columns,
      index=pd.date_range(start=df_merge. ↪index[-1], periods=11, freq='D',
      closed='right'))) df_merge['2021-06-09':'2021-06-16']
```

```
[25]: open close open_predicted close_predicted 2021-06-09 2499.50 2491.40
     2283.043457 2308.479004

      2021-06-10 2494.01 2521.60   2288.935547   2315.539062
      2021-06-11 2524.92 2513.93   2295.734131   2322.352783
        2021-06-12  NaN  NaN              NaN            NaN
        2021-06-13  NaN  NaN              NaN            NaN
        2021-06-14  NaN  NaN              NaN            NaN
        2021-06-15  NaN  NaN              NaN            NaN
        2021-06-16  NaN  NaN              NaN            NaN
     <google.colab._quickchart_helpers.SectionTitle at
     0x7b92dcb7da50> import numpy as np from google.colab import
     autoviz                        df_2077258851996054484          =
     autoviz.get_df('df_2077258851996054484')

     def value_plot(df, y, sort_ascending=False, figsize=(2, 1)):
       from matplotlib import pyplot as plt  if
       sort_ascending:
         df =
       df.sort_values(y).reset_index(drop=True) _, ax
       = plt.subplots(figsize=figsize)
       df[y].plot(kind='line') plt.title(y)
       ax.spines[['top',
       'right',]].set_visible(False) plt.tight_layout()
       return autoviz.MplChart.from_current_mpl_state()

     chart = value_plot(df_2077258851996054484, *['open'], **{}) chart
     import numpy as np from google.colab import autoviz
     df_2077258851996054484 = autoviz.get_df('df_2077258851996054484')

     def value_plot(df, y, sort_ascending=False, figsize=(2, 1)):
       from matplotlib import pyplot as plt if
       sort_ascending:
         df =
       df.sort_values(y).reset_index(drop=True) _, ax
       = plt.subplots(figsize=figsize)
       df[y].plot(kind='line') plt.title(y)
       ax.spines[['top',
       'right',]].set_visible(False) plt.tight_layout()
       return autoviz.MplChart.from_current_mpl_state()

     chart = value_plot(df_2077258851996054484, *['close'], **{})
     chart import numpy as np from google.colab import autoviz
     df_2077258851996054484 = autoviz.get_df('df_2077258851996054484')

     def value_plot(df, y, sort_ascending=False, figsize=(2, 1)):
       from matplotlib import pyplot as plt if
       sort_ascending:
         df =
       df.sort_values(y).reset_index(drop=True) _, ax
       = plt.subplots(figsize=figsize)
       df[y].plot(kind='line') plt.title(y)
       ax.spines[['top',
       'right',]].set_visible(False) plt.tight_layout()   return
       autoviz.MplChart.from_current_mpl_state()

     chart = value_plot(df_2077258851996054484,
     *['open_predicted'], **{}) chart import numpy as np  from
     google.colab import autoviz df_2077258851996054484 =
     autoviz.get_df('df_2077258851996054484')   def
     value_plot(df, y, sort_ascending=False, figsize=(2, 1)):
       from matplotlib import pyplot as plt if
       sort_ascending:
         df =
       df.sort_values(y).reset_index(drop=True) _, ax
       = plt.subplots(figsize=figsize)
       df[y].plot(kind='line') plt.title(y)
       ax.spines[['top',
       'right',]].set_visible(False) plt.tight_layout()
       return autoviz.MplChart.from_current_mpl_state()

     chart = value_plot(df_2077258851996054484, *['close_predicted'], **{})
     chart
     <google.colab._quickchart_helpers.SectionTitle           at
     0x7b92ca5342b0> import numpy as np from google.colab import
     autoviz                   df_2077258851996054484          =
     autoviz.get_df('df_2077258851996054484')

     def histogram(df, colname, num_bins=20, figsize=(2, 1)):   from
       matplotlib import pyplot as plt _, ax
       = plt.subplots(figsize=figsize) plt.hist(df[colname],
       bins=num_bins, histtype='stepfilled')
       plt.ylabel('count') plt.title(colname) ax.spines[['top',
       'right',]].set_visible(False) plt.tight_layout() return
       autoviz.MplChart.from_current_mpl_state()

     chart = histogram(df_2077258851996054484, *['open'], **{}) chart
     import numpy as np from google.colab import autoviz
     df_2077258851996054484 = autoviz.get_df('df_2077258851996054484')

     def histogram(df, colname, num_bins=20, figsize=(2, 1)):   from
       matplotlib import pyplot as plt _, ax
       = plt.subplots(figsize=figsize) plt.hist(df[colname],
       bins=num_bins, histtype='stepfilled')
       plt.ylabel('count') plt.title(colname) ax.spines[['top',
       'right',]].set_visible(False) plt.tight_layout()  return
       autoviz.MplChart.from_current_mpl_state()
     chart = histogram(df_2077258851996054484, *['close'], **{})
     chart  import  numpy  as  np  from  google.colab  import  autoviz
     df_2077258851996054484                                   =
     autoviz.get_df('df_2077258851996054484')  def histogram(df,
     colname, num_bins=20, figsize=(2, 1)):
       from matplotlib import pyplot as plt _, ax
       = plt.subplots(figsize=figsize) plt.hist(df[colname],
       bins=num_bins, histtype='stepfilled') plt.ylabel('count')
       plt.title(colname) ax.spines[['top',
       'right',]].set_visible(False) plt.tight_layout() return
       autoviz.MplChart.from_current_mpl_state()

     chart = histogram(df_2077258851996054484,
     *['open_predicted'], **{}) chart import numpy as np from google.colab
     import autoviz  df_2077258851996054484 =
     autoviz.get_df('df_2077258851996054484')

     def histogram(df, colname, num_bins=20, figsize=(2, 1)):   from
       matplotlib import pyplot as plt _, ax
       = plt.subplots(figsize=figsize) plt.hist(df[colname],
       bins=num_bins, histtype='stepfilled')
       plt.ylabel('count') plt.title(colname) ax.spines[['top',
       'right',]].set_visible(False) plt.tight_layout() return
       autoviz.MplChart.from_current_mpl_state()

     chart = histogram(df_2077258851996054484, *['close_predicted'], **{}) chart
```

```
<google.colab._quickchart_helpers.SectionTitle           at
0x7b92ca303520> import numpy as np from google.colab import
autoviz                    df_2077258851996054484          =
autoviz.get_df('df_2077258851996054484')

def scatter_plots(df, colname_pairs, scatter_plot_size=2.5, size=8,
  alpha=.6): from matplotlib import pyplot as plt
  plt.figure(figsize=(len(colname_pairs) * scatter_plot_size,
  scatter_plot_size)) for plot_i, (x_colname, y_colname) in
  enumerate(colname_pairs, start=1):
    ax = plt.subplot(1, len(colname_pairs), plot_i)
    ax.scatter(df[x_colname], df[y_colname], s=size, alpha=alpha)
    plt.xlabel(x_colname) plt.ylabel(y_colname)   ax.spines[['top',
    'right',]].set_visible(False)
  plt.tight_layout()                                  return
autoviz.MplChart.from_current_mpl_state()        chart    =
scatter_plots(df_2077258851996054484, *[[['open', 'close'],

['close',␣
 ↪'open_predicted'], ['open_predicted', 'close_predicted']]],  **{})
chart
```

```
[26]: # creating a DataFrame and filling values of open and close column
       upcoming_prediction  =   pd  . DataFrame(columns  =  [  'open'  ,  'close'
[27]:   curr_seq  =    test_seq[-   1  :]

       for   i  in    range  ( - 10,   0  ):
         up_pred   =   model  . predict(curr_seq)
         upcoming_prediction    .   iloc[i]      =     up_pred
         curr_seq    =     np   .  append(curr_seq[  0  ][1   :]
         ,up_pred,axis =0)
```

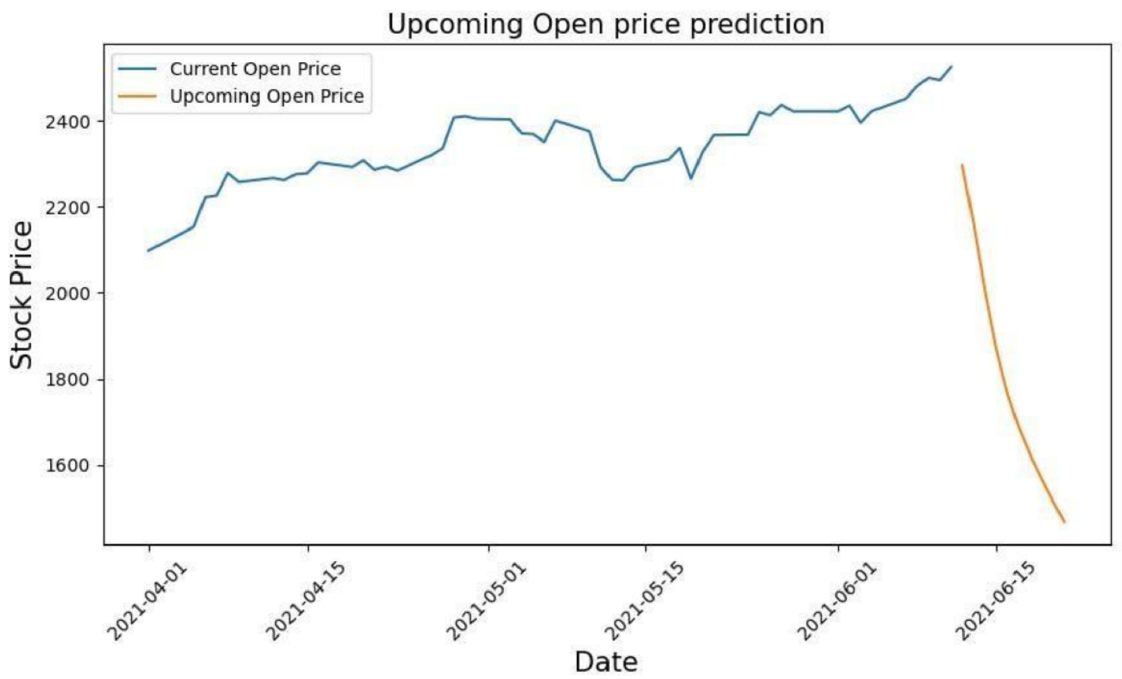
```
] ,index = df_merge .
 ↪ index)  upcoming_prediction . index = p d .
to_datetime(upcoming_prediction . inde x)
```

```
curr_seq =   curr_seq . reshape(test_seq[ -
  1:].shape)

1/1 [==============================] - 0s 26ms/step
1/1 [==============================] - 0s 20ms/step
1/1 [==============================] - 0s 17ms/step
1/1 [==============================] - 0s 22ms/step
1/1 [==============================] - 0s 46ms/step
1/1 [==============================] - 0s 30ms/step
1/1 [==============================] - 0s 29ms/step
1/1 [==============================] - 0s 37ms/step
1/1 [==============================] - 0s 31ms/step
1/1 [==============================] - 0s 50ms/step
```

```
[28]: # inversing Normalization/scaling
      upcoming_prediction[['open','close']] = MMS.
       ↪inverse_transform(upcoming_prediction[['open','close']])
```

```
[29]: # plotting Upcoming Open price on date index
      fig,ax=plt.subplots(figsize=(10,5))
```

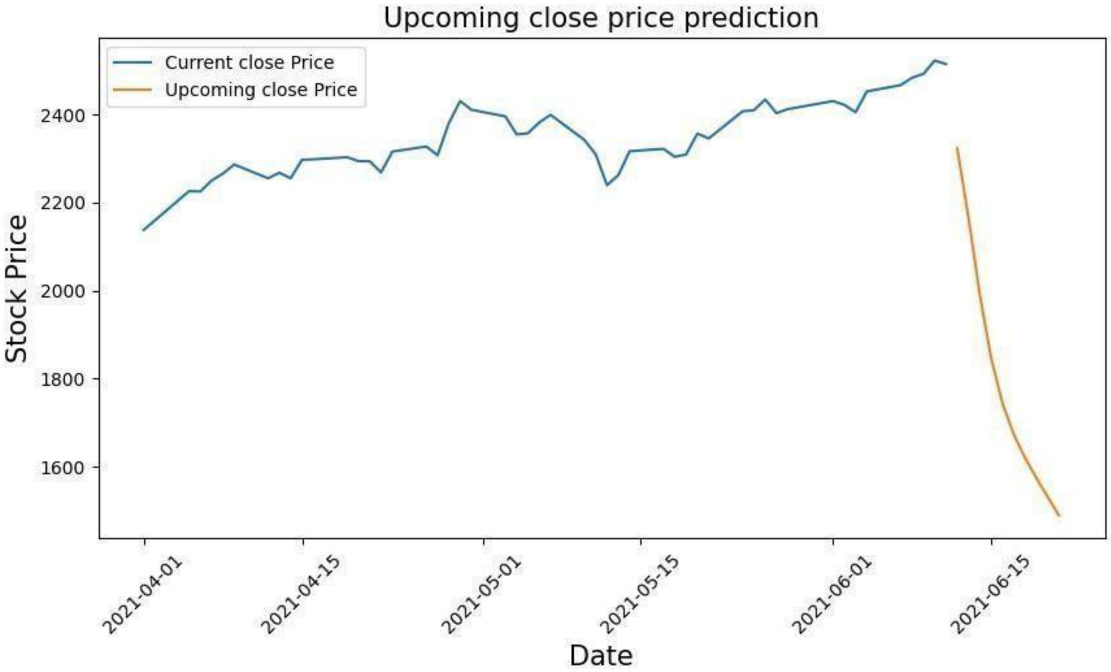
```
ax.plot(df_merge.loc['2021-04-01':,'open'],label='Current Open
Price') ax.plot(upcoming_prediction.loc['2021-04-
01':,'open'],label='Upcoming Open␣
 ↪Price')
plt.setp(ax.xaxis.get_majorticklabels(),
rotation=45) ax.set_xlabel('Date',size=15)
ax.set_ylabel('Stock Price',size=15)
ax.set title('Upcoming Open price prediction',size=15)
ax legend()
fig show()
```



[30]: *# plotting Upcoming Close price on date index*

```
01':,'close'],label='Current close Price')
ax.plot(upcoming_prediction.loc['2021-04-
01':,'close'],label='Upcoming close␣
 ↪Price') plt.setp(ax.xaxis.get_majorticklabels(),
rotation=45) ax.set_xlabel('Date',size=15)
ax.set_ylabel('Stock Price',size=15)
```

```
fig,ax=plt.subplots(figsize=(10,5)) ax.plot(df_merge.loc['2021-04-
ax.set_title('Upcoming close price prediction',size=15) ax.legend()
fig.show()
```



```
[ ]:
```