chaitanya-data science intern task 1

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)
```

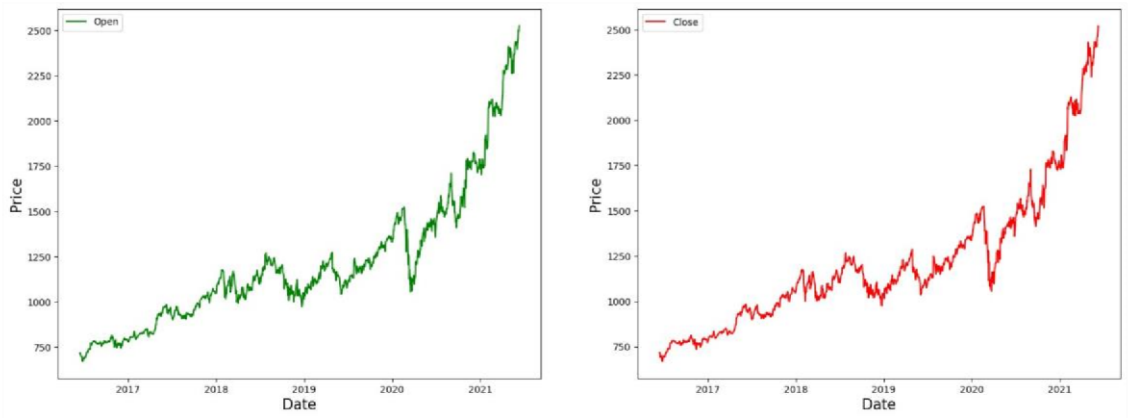
[10]:
```
            open close date
2016-06-14 716.48 718.27
2016-06-15 719.00 718.92
2016-06-16 714.91 710.36
2016-06-17 708.65 691.72
2016-06-20 698.77 693.71
2016-06-21 698.40 695.94
2016-06-22 699.06 697.46
2016-06-23 697.45 701.87
```

```
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
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

- -

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




                                                    -              -
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


                                -              -
```

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


                                                      -              -
                                                      -              -
                                        1          s   loss: 2.2767e
50ms/step  04  mean_absolute_error:  0.0110  val_loss:
0.0023 -  - val_mean_absolute_error: 0.0363
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-


                                  -                -
```

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


                                                      -              -
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-
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

                                -                -
```

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


                                                                    -              -
Epoch 64/100  28/28 [==============================] - 1s 37ms/step -
loss: 1.6148e-
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')
```

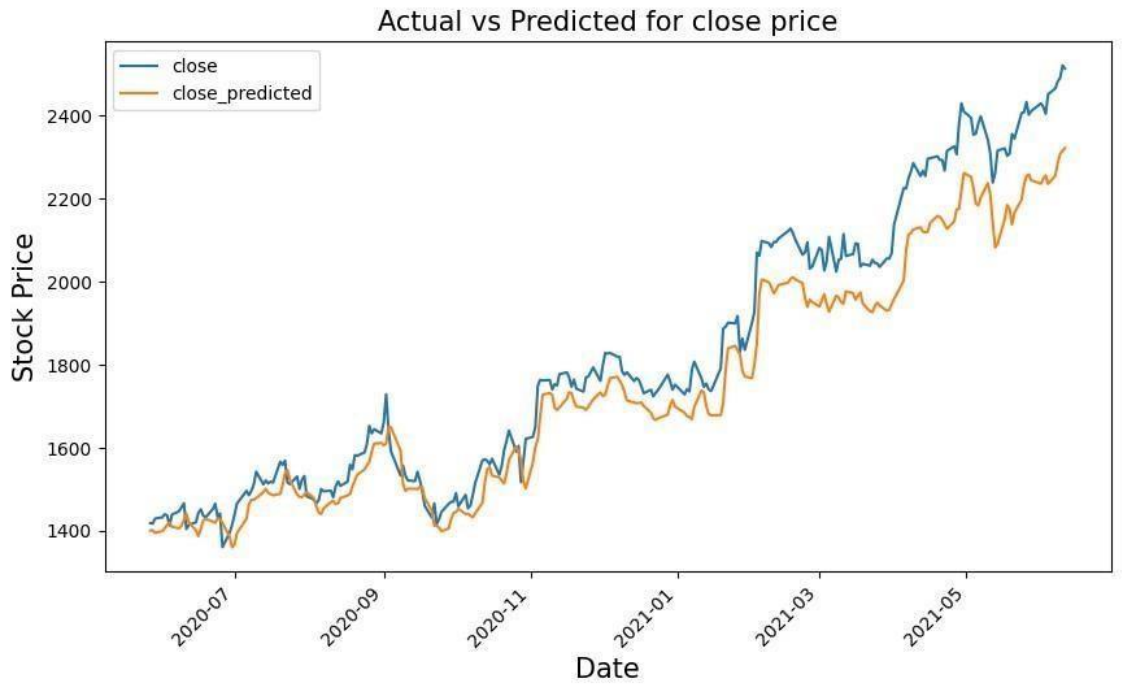
```
def scatter_plots(df, colname_pairs, scatter_plot_size=2.5, size=8,
  alpha=.6): from matplotlib import pyplot as plt
  plt.figure(figsize=(len(colname_pairs) * scatter_plot_size,
  scatter_plot_size)) for plot_i, (x_colname, y_colname) in
  enumerate(colname_pairs, start=1):
    ax = plt.subplot(1, 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'
] ,index = df_merge .
 ↪ index)  upcoming_prediction . index = p d .
to_datetime(upcoming_prediction . inde x)
```

[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)
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
```

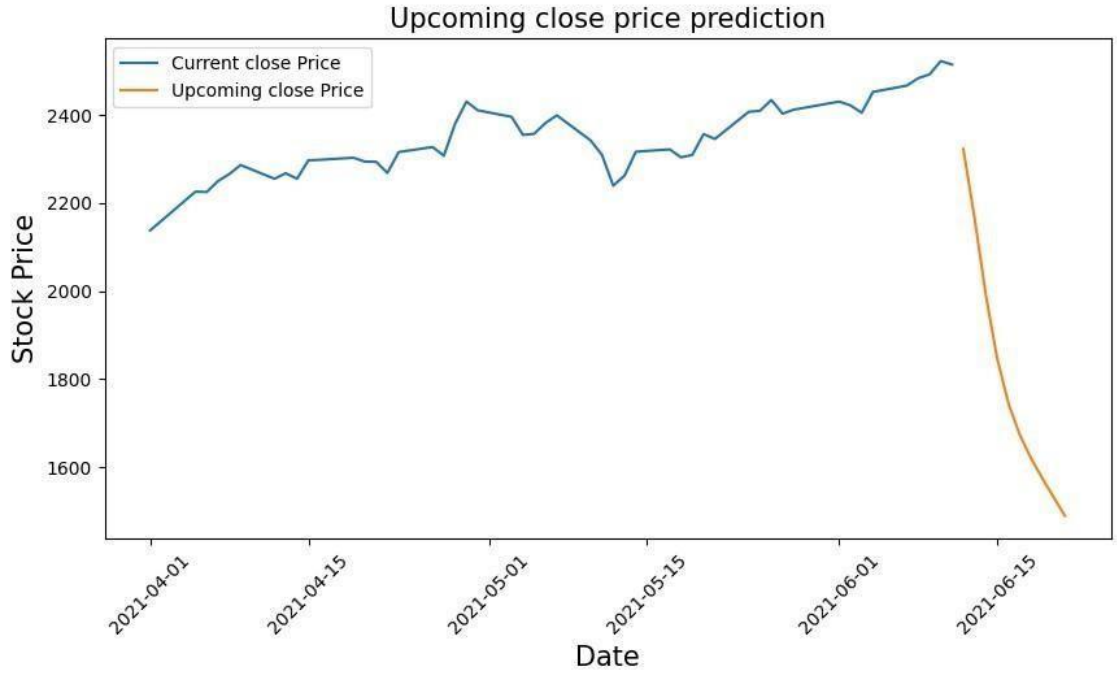
[28]:
```
# inversing Normalization/scaling
upcoming_prediction[['open','close']] = MMS.
    ↪inverse_transform(upcoming_prediction[['open','close']])
```

[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()
```



[ ]: