Skills: Programming - Introduction Level

Python Project
H$G-Elite-Trading-Program

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Spring 21

May 30, 2021

Contents

1 Program Description

Following program enables the user to analyze any stock from Yahoo Finance and provides its current market condition. Key functions are the visualization of candlesticks, the traded volume, and the inspection of various technical aspects such as Bollinger Bands and Short Moving Averages 20 Days and 50 Days.

Furthermore, does the program train an ARIMA ML-Model based on the stock data passed as input by the user and provides a next day forecast of the stocks future price. The forecast of future stock prices is limited to one day, as a longer forecast would reduce the model‘s accuracy. These features enable the user to analyze the past and the future of the stock holds, which can be beneficial for investment decisions.

To test and use the program the user has to open the distributed file (H$G-Elite-Trading-Project.ipynb) in a jupyter notebook and use Python3. The program starts, after all cells have been run step by step.

2 Code Implementation

2.1 DataFrame

Developing a class Dataframe to build a Pandas Dataframe around the scraped data regarding the stocks passed as input from the user. The script uses Yahoo Finance as the source of information. The information once scraped from yahoo is then turned into a DF which is further utilized for training, analysis, and testing purposes.

```
        #Class has following attributes:

                #stock_name : Name of stock asset
                #start_date : Initial date of record
                #end_date : Last date of record

        #Class has following functionalities:
                #construct_df : returns the constructed DF
```

```
# Importing libraries
import json
import pandas as pd
from pprint import pprint
import pandas_datareader.data as pdr
import datetime as dt
import numpy as np
import plotly.offline as py
from sklearn.model_selection import train_test_split


class Dataframe:
	# Class Initialisation
	def __init__(self,stock_name,start_date,end_date):
		self.stock_name=stock_name # Initialising the attributes
		self.start_date=start_date
		self.end_date=end_date

	# Class function
	def contruct_df(self):
		df = pdr.DataReader(self.stock_name,'yahoo',start,end)
		return df
```

2.2 Graphs

```
Developing a class plots to be used to plot various Graphs based on the DF which
will be useful for analyzing the underlying asset and predict what its future
might hold. This class produces graphs for sole purpose of analysis.


#Class has following attributes :
	#df : Dataframe being used for drawing graphs.


#Class has following functionalities:
	#candle_stick : Produces a candle stick graph

	#volume_chart : Produces a line chart showing volume of underlying asset.

	#sma : Produces SMA chart for 20 Days,50 Days

	#bollinger_bands : Produces the Bollinger Bands graph of the asset
```

```
import plotly.offline as py
import plotly.graph_objs as go
import matplotlib.pyplot as plot
import plotly.express as px


class plots:
	def __init__(self,df): # Class Initialisation
		self.df=df

	def candle_stick(self):
		py.init_notebook_mode(connected=True)#To ensure to see the graph


	#Preparing data for graph
	data = [go.Candlestick(x=self.df.index,
	                          open=self.df.Open,
	                          high=self.df.High,
	                          low=self.df.Low,
	                          close=self.df.Close)]

	# Fixing the Layout
	layout=go.Layout(title=f'{stock_name.upper()} Candlestick withRangeSlider',
	                 xaxis={'rangeslider':{'visible':True}})
```

```
        # Plotting the figure
        fig = go.Figure(data=data,layout=layout)
        fig.update_layout(
        title = f'The Candlestick graph for {stock_name}',
        xaxis_title = 'Date',
        yaxis_title = 'Price',
        xaxis_rangeslider_visible = True)
        fig.update_yaxes(tickprefix='$')
        py.iplot(fig,filename='f{stock_name.upper()}_candlestick')
        xaxis = {'rangeselector':{'buttons':[{'count':1,
                                        'label':'1m',
                                        'step':'month',
                                        'stepmode':'backward'}]}}


def volume_chart(self):
        fig = px.line(df,y="Volume", title=f'Trade Volume of{stock_name.upper()}')
        fig.show()



def sma(self):
        py.init_notebook_mode(connected=True)
        fig = go.Figure(
        data = [
                go.Candlestick(x=self.df.index,
                                open=self.df.Open,
                                high=self.df.High,
                                low=self.df.Low,
                                close=self.df.Close),

                go.Scatter(

                        x = self.df.index,
                        y = self.df.Close.rolling(window=20).mean(),
                        mode = 'lines',
                        name = '20SMA',
                        line = {'color': '#ff006a'}

                ),
                go.Scatter(

                        x = self.df.index,
                        y = self.df.Close.rolling(window=50).mean(),
                        mode = 'lines',
                        name = '50SMA',
                        line = {'color': '#1900ff'}
                )
        ])
```

```
        # Setting up the titles on X,Y and Main
        xn = 'Date'
        fig.update_layout(
        title = f'The SMA graph for {stock_name}',
        xaxis_title = xn,
        yaxis_title = 'Price',
        xaxis_rangeslider_visible = True)
        fig.update_yaxes(tickprefix='$')

        fig.show()

def bollinger_bands(self):
        # Preparing Mean of Close column in DF
        self.df['MA20'] = self.df.Close.rolling(window=20).mean()

        #Preparing Standard deviationg of Close column in DF
        self.df['20dSTD'] = self.df.Close.rolling(window=20).std()$

        #Calculating upper Bollinger Band
        self.df['Upper'] = self.df['MA20'] + (self.df['20dSTD'] * 2)

        #Calculating lower Bolling Band
        self.df['Lower'] = self.df['MA20'] - (self.df['20dSTD'] * 2)

        #Plotting only the calculated Columns
        self.df[['Close','MA20','Upper','Lower']].plot(figsize=(10,4))

        # Setting up the graph
        plot.title(stock_name + ' Bollinger Bands')
        plot.grid(True)
        plot.axis('tight')
        plot.ylabel('Price')
        plot.show()
```

2.3 ARIMA ML-Model For Price Forecast

The AutoRegressive Integrated Moving Average (ARIMA) is used herefor time series price forecasting. The model takes historical data and forecasts the open price of the future.#The forecast is set for the next trading day, a longer forecast would reduce the accuracy of the model.

Train-Test-Split ratio | Train:Test = 80:20

A nonseasonal ARIMA model is classified as an "ARIMA(p,d,q)" model, where: p is the number of autoregressive terms, d is the number of nonseasonal differences needed for stationarity, and q is the number of lagged forecast errors in the prediction equation.

```
        The models :
                        #p : 5
                        #d : 1
                        #q : 0


Why using ARIMA ?
ARIMA is much faster than for example the LSTM model and accuracy is much higher
and does not need a static data for building and training.
```

```
# Importing important Libraries
import numpy as np
import pandas as pd
import os
from subprocess import check_output
import seaborn as sns
import matplotlib.pyplot as plt
import warnings
from pandas.plotting import lag_plot
from pandas import datetime
from statsmodels.tsa.arima_model import ARIMA
from sklearn.metrics import mean_squared_error


def AI(stock_name,df):


        #Splitting the DF into train and test
        train_data, test_data = df[0:int(len(df)*0.8)],df[int(len(df)*0.8):]


        # Function for data reshaping
        def smape_kun(y_true, y_pred):
                return np.mean((np.abs(y_pred - y_true) * 200/ (np.abs(y_pred)+
        np.abs(y_true))))


        #This function is used to format data into correct form for the Model
        def inverse_difference(history, yhat, interval=1):
            return yhat + history[-interval]


        train_ar = train_data['Open'].values # Creating Train Array
        test_ar = test_data['Open'].values # Creating Test Array
        history = [x for x in train_ar] # Historical Close prices
        predictions = list() # Initialising the Predictions list


        # Processing each of the test data
```

```
for t in range(len(test_ar)):
        model = ARIMA(history, order=(5,1,0))
        model_fit = model.fit(disp=0)
        output = model_fit.forecast() # Forecasting the future
        yhat = output[0] # Yielding the correct data
        predictions.append(yhat) # Appending to the predictions
        obs = test_ar[t]
        history.append(obs)


# Plotting the predictions and actual data for expressing Model Accuracy
plt.figure(figsize=(12,7))
plt.plot(df['Open'], 'green', color='blue', label='Training Data')
plt.plot(test_data.index, predictions, color='green', marker='o',
           linestyle='dashed', label='Price Forecast')
plt.plot(test_data.index, test_data['Open'],color='red',label='Actual
           Price')
plt.title(f'{stock_name} Price Forecast')
plt.xlabel('Dates')
plt.ylabel('Close')

try:
        plt.xticks(np.arange(0,1857, 300), df['Date'][0:1857:300])
except:
        pass
plt.legend()
plt.show()

print(f'Price forecast next trading day : ${round(predictions[1][0],2)}')
print('AWARE! THIS IS NOT A STOCK RECOMMENDATION OR FINANCIAL ADVISE PLEASE
        TAKE FINANCIAL DECISION APPROPRIATELY')
```

2.4 User Interface

```
# Implementiung the User Input
stock_name=str(input('Welcome to H$G-Elite-Trading\nEnter a stock you
                     would like to analyze : '))
start = '2010/01/01'
end = dt.date.today()
print(f'Analysis for {stock_name.upper()}\nFrom : {start} To : {end}\n ')

#Passing input variables into Dataframe Class
dfr=Dataframe(stock_name,start,end) # Creating Class object
df=dfr.contruct_df() # Calling Class function
plt_gr=plots(df)
print('Please select a option')
```

```
while True:
        x=int(input('1.Show Candlestick\n2.Show Volume Traded\n3.Show SMA20 and
                    SMA50\n4.Show Bollinger Bands\n5.Show Price forecast next
                    trading day\n6.Exit\nYour Input : '))
        if x==1:
                print('Use the Range Slider to analyze a specific period')
                plt_gr.candle_stick()
        elif x==2:
                plt_gr.volume_chart()
        elif x==3:
                print('Use the Range Slider to analyze a specific period')
                plt_gr.sma()
        elif x==4:
                plt_gr.bollinger_bands()
        elif x==5:
                print('Calculating price, please wait.....')
                AI(stock_name,df)
        elif x==6:
                print('Thank you and Goodbye :-)')
                break
        else:
                print('Invalid Input')
```

3 Use Case: Tesla Stock TSLA

```
Welcome to H$G-Elite-Trading
Enter a stock you would like to analyze : TSLA ---> User Input
```

Output:

```
Analysis for TSLA
From : 2010/01/01 To : 2021/05/30

Please select a option
1.Show Candlestick
2.Show Volume Traded
3.Show SMA20 and SMA50
4.Show Bollinger Bands
5.Show Price forecast next trading day
6.Exit
Your Input : 1
```

Output:

Use the Range Slider to analyze a specific trading period

```
Click on a candlestick to inspect the open/high/low/close price of a
specific trading day
```

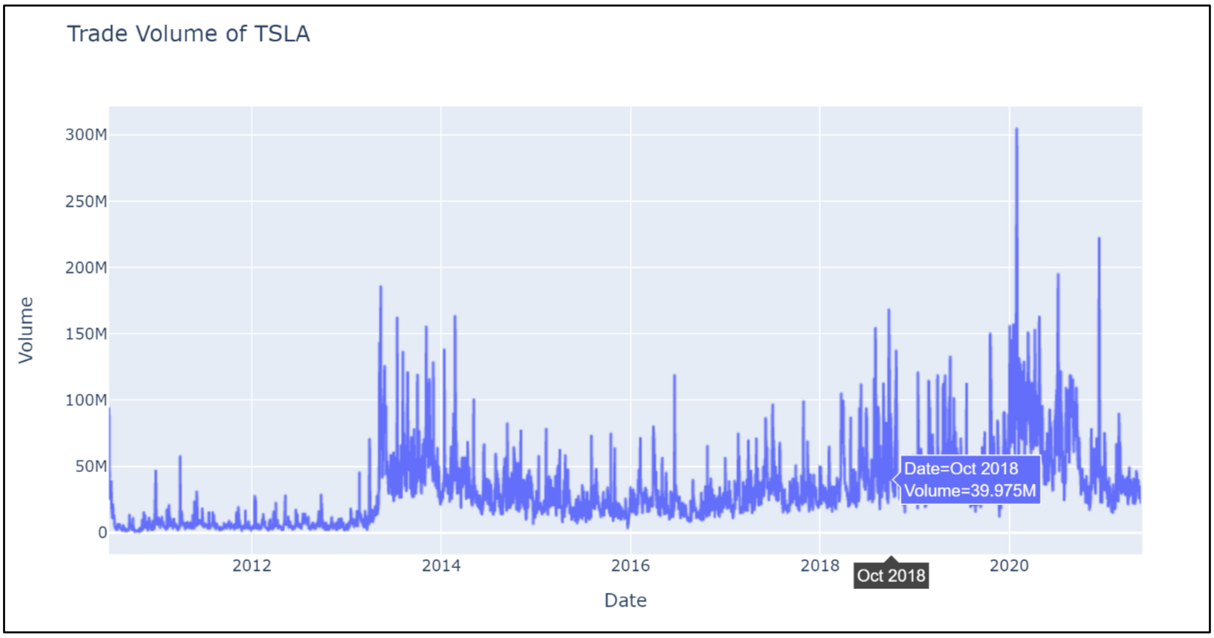

```
-----------------------------------------------------------------------

Please select a option

1.Show Candlestick
```
2.Show Volume Traded
```
3.Show SMA20 and SMA50
4.Show Bollinger Bands
5.Show Price forecast next trading day
6.Exit

Your Input : 2
```

Output:

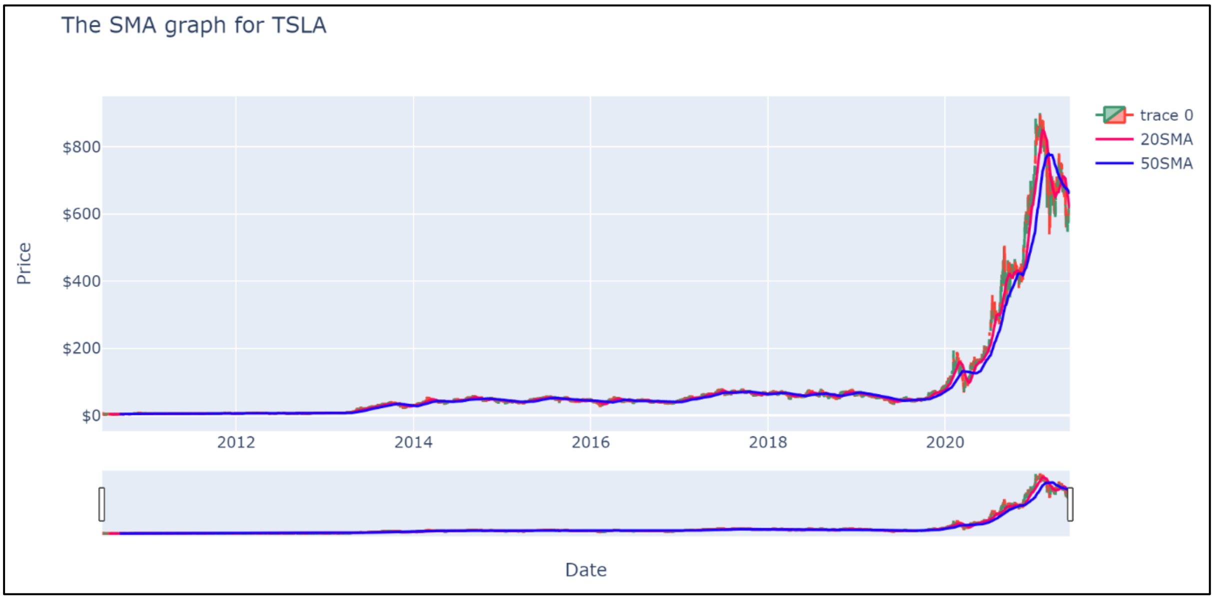


```
Please select a option

1.Show Candlestick
2.Show Volume Traded
3.Show SMA20 and SMA50
4.Show Bollinger Bands
5.Show Price forecast next trading day
6.Exit

Your Input : 3
```

Output:



Use the Range Slider to analyze a specific period

```
Click on a specific day to inspect the SMA 20 and SMA 50
```

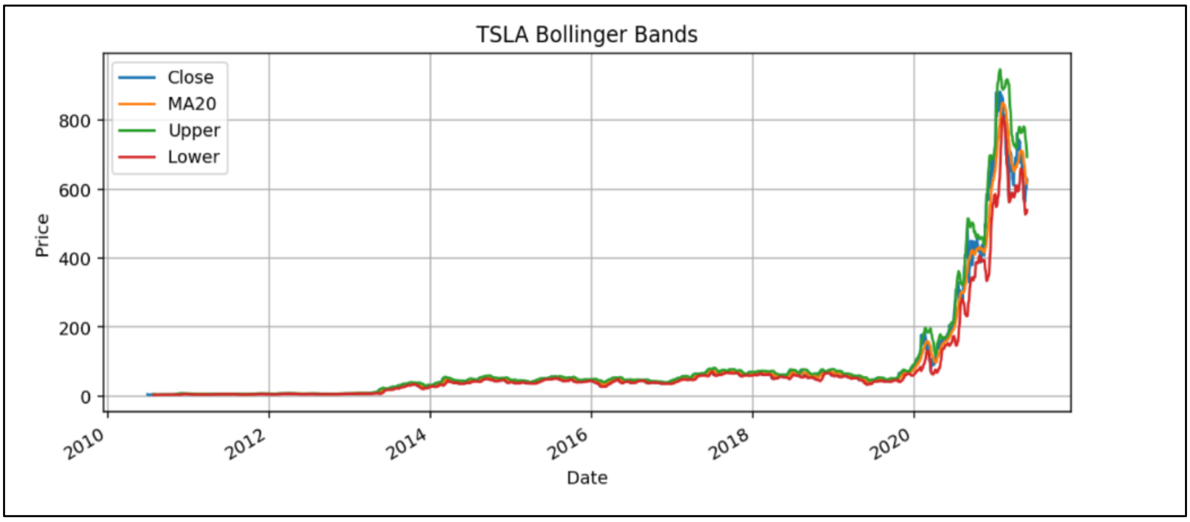

```
----------------------------------------------------------------

Please select a option

1.Show Candlestick
2.Show Volume Traded
3.Show SMA20 and SMA50
4.Show Bollinger Bands
5.Show Price forecast next trading day
6.Exit

Your Input : 4
```

Output:

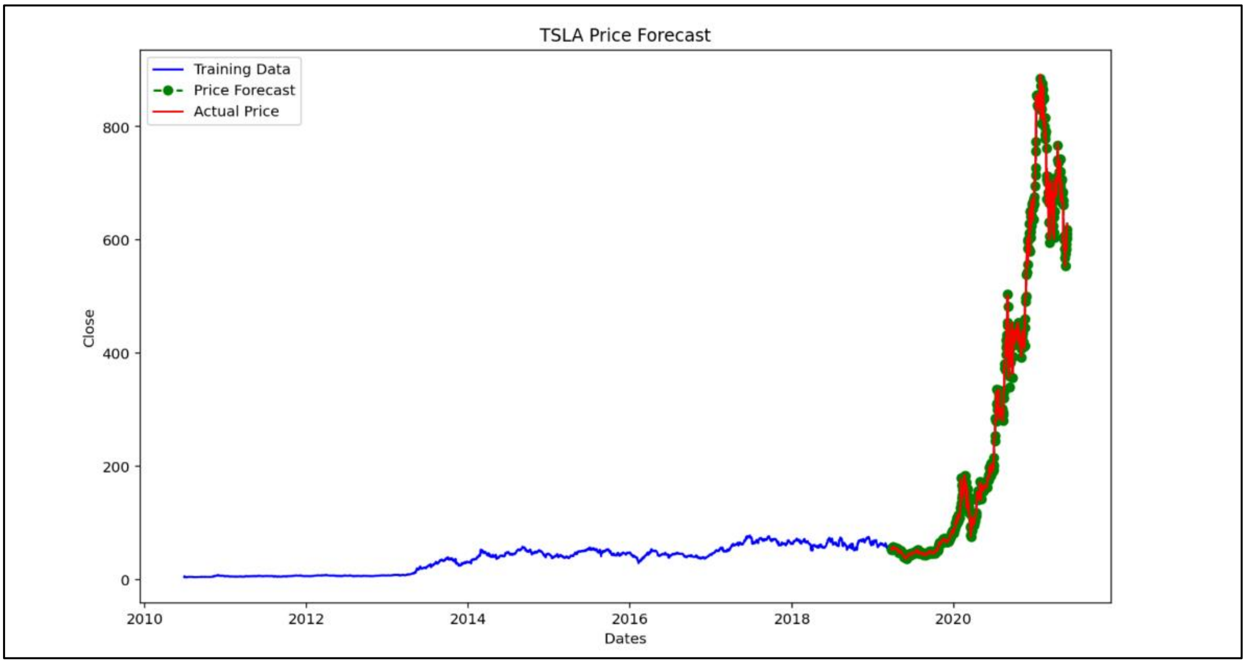


```
Please select a option

1.Show Candlestick
2.Show Volume Traded
3.Show SMA20 and SMA50
4.Show Bollinger Bands
```
5.Show Price forecast next trading day
```
6.Exit

Your Input : 5

Calculating price, please wait.....
```



Price forecast next trading day : **$618.21**

AWARE! THIS IS NOT A STOCK RECOMMENDATION OR FINANCIAL ADVISE PLEASE TAKE FINANCIAL DECISION APPROPRIATELY

```
Please select a option

1.Show Candlestick
2.Show Volume Traded
3.Show SMA20 and SMA50
4.Show Bollinger Bands
5.Show Price forecast next trading day
```
6.Exit
```
Your Input : 6

Thank you and Goodbye :-)
```