

## **Project Report (BT-3025)**

### **AUTOMATED PORTFOLIO TRACKER**

**Through python**

*Submitted in partial fulfillment of the  
requirement for the award of the degree of*

## **Bachelors of Technology (Computer Science)**



(Established under Galgotias University Uttar Pradesh Act No. 14 of 2011)

**Under The Supervision of**

**Mr. SHUBHAM KUMAR**

S.No	Enrollment Number	Admission Number	Student Name	Degree / Branch	Sem
1.	19021180040	19SCSE1180044	HARSH KUMAR DWIVEDI	B-Tech / CSE	V
2.	19021180041	19SCSE1180045	GAURAV KUMAR SINGH	B-Tech / CSE	V

**SCHOOL OF COMPUTING SCIENCE AND ENGINEERING DEPARTMENT  
OF COMPUTER SCIENCE AND ENGINEERING GALGOTIAS UNIVERSITY,  
GREATER NOIDA ,INDIA**



**SCHOOL OF COMPUTING SCIENCE AND  
ENGINEERING  
GALGOTIAS UNIVERSITY, GREATER NOIDA**

**CANDIDATE'S DECLARATION**

We hereby certify that the work which is being presented in the project, entitled “**AUTOMATED PORTFOLIO TRACKER USING PYTHON**” in partial fulfillment of the requirements for the award of the **BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE AND ENGINEERING** submitted in the School of Computing Science and Engineering of Galgotias University, Greater Noida, is an original work carried out during the period of **JULY-2021 to DECEMBER-2021**, under the supervision of **Mr. Shubham Kumar Associate Professor, Department of Computer Science and Engineering** of School of Computing Science and Engineering , Galgotias University, Greater Noida

The matter presented in the thesis/project/dissertation has not been submitted by us for the award of any other degree of this or any other places.

19SCSE1180044 – HARSH KR. DWIVEDI

19SCSE1180045 – GAURAV KR SINGH

**This is to certify that the above statement made by the candidates is correct to the best of my knowledge.**

Supervisor

(Mr. Shubham kumar Associate Professor)

## **ABSTRACT**

The Financial market has grabbed a lot of attention in recent year, people around the globe look upto these markets as sources of their passive income. The subtle growth has gained trust of all sectors of individuals. India has market an all-time high for new members and Demat accounts created this year. India's Investment accounted for 28.7 % of its Nominal GDP in Jun 2021, compared with a ratio of 34.3 % in the previous quarter, Also the immense growth and volatility of crypto currencies in the global market has allured people towards the financial market. Both students and working class people have started investing in stocks and crypto currencies even without its proper knowledge an risk management strategies. India ranks 6th biggest stock market in the world in the year 2021. Also the immense growth and volatility of crypto currencies in the global market has allured people towards the financial market. There are several brokerage apps for stocks and crypto respectively. Here we are going to create a system which can keep the accounts of our stocks and crypto at a single place which were purchased or traded on different sites and apps. This system will represent the total profit loss ratio ,determined SL , graphical diagram of price action for each product with its comparison from the time of purchase to the current value. With the use of web scraping in python which provides many third party libraries for browser automation , here we are going to use SELENIUM library which is incredibly fast compared to others. This automated portfolio system will be helpful for people who have several holdings in different brokerage applications or securities to track their portfolio's progress at a single stop.

# Table of Contents

<b>Title</b>	<b>Page No.</b>
<b>Candidates Declaration</b>	<b>I</b>
<b>Abstract</b>	<b>II</b>
<b>Table of content</b>	<b>III</b>
<b>List of figures</b>	<b>IV</b>
<b>CHAPTER 1</b>	<b>V</b>
<b>INTRODUCTION</b>	
<b>1.1DISADVANTAGES OF CURRENT SYSTEM</b>	<b>VIII</b>
<b>1.2 FORMULATION OF PROBLEM</b>	<b>IX</b>
<b>1.3 REQUIREMENTS</b>	<b>X</b>
<b>CHAPTER 2</b>	<b>XI</b>
<b>LITERATURE SURVEY</b>	<b>XII</b>
<b>2.1 INTRODUCTION</b>	
<b>2.2 PREVIOUS METHODS</b>	
<b>2.3WORKING OF PROJECT</b>	<b>XIII</b>
<b>CODE</b>	
<b>OUTPUT</b>	
<b>FLOW CHART</b>	
<b>CONCLUSION</b>	<b>XXV</b>
<b>REFERENCES</b>	<b>XXVI</b>

## LIST OF FIGURES

<b>1</b>	<b>WEBCRAPPING</b>	<b>7</b>
<b>2</b>	<b>USER GROWW REPRESENTATION</b>	<b>9</b>
<b>3</b>	<b>SELENIUM WEBDRIVER ARCHITECTURE</b>	<b>10</b>
<b>4</b>	<b>INITAIL EXCELSHEET</b>	<b>11-12</b>
<b>5</b>	<b>FINAL EXCEL SHEET/OUTPUT</b>	<b>13-15</b>
<b>6</b>	<b>FLOW CHART</b>	<b>16</b>

# CHAPTER-1

## INTRODUCTION

Looking on the immense growth of interest and craze in people's mind about the financial market has brought us to create a useful tool, easy to use and compatible for every new comer in this market sector. The colossal gains and growth in crypto currencies and compounding stocks have grabbed people's attention. The financial market has become a source of passive income for both working class and students.

Individuals around the globe have started to recognize the power of Simple investment plans, Mutual funds, Crypto currencies and stocks. Though people need to invest not just money but also their time to master the knowledge before entering into the market, also following a proper risk management system is important. There are a lot of different sites, apps and broker houses from where these assets could be bought and held. The crypto market, stock market are a part of financial market but are totally different sectors. Suppose a person holds both crypto and stocks to track his daily momentum/growth he needs to visit different sites/apps for crypto and stocks also sometimes a person has multiple Demat accounts for same market which makes his daily analysis a difficult job. Here the Automated portfolio manager would consist of both crypto and stocks (also SIPs/Mutual funds/commodity holdings) holdings record and would display real time price at a single spot. This would help a person to look up to all his investments in the financial market on single screen. For those who are not completely indulge into the financial market as their main source of

income, i.e working people and students who cannot invest their whole day time looking after the charts and prices , this tool would help us track down and manage their assets with proper risk management system. The user has to enter/update the details of his trade once after every transaction such as asset buying price and quantity with stop-loss ratio and later whenever they need to check upto the current market price and their investment return they are just one click away to an exact P&L representation.

The tool is constructed in python with the selenium library , the user would have to create a replica of their portfolio on an excel sheet, Fetch the current share price of multiple companies using Python web scraping. This project describes a Python code, which fetches the current stock price for multiple listed companies. This script first reads the excel sheet to get the list of all companies for which CMP (Current Market Price) has to be calculated and then fire up the browser to open a website which has this information. The automation script enters the name of each stock, one by one, in the search bar which in turn load the page with particular information, from which the CMP is scraped and stored. This continues until the lists items from the excel sheet get over. Parallely, scripts also keep on calculating the total profit/loss for each share by comparing it against the Invested price and number of shares. In the end, profit and (or) loss is calculated for each share and the information is written back to the excel sheet. Excel sheet does further calculation to build up the bar graph for representing the data in the best possible way. Selenium is an open-source and a portable automated software testing tool for testing web applications. It has capabilities to operate across different browsers and operating systems. Selenium is not just a single tool but a set of tools that helps testers to automate web-based applications more efficiently.



This automated portfolio system will be helpful for people who have several holdings in different brokerage applications or securities to track their portfolio's progress at a single stop. In the end, profit and (or) loss is calculated for each share and the information is written back to the excel sheet. Excel sheet does further calculation to build up the bar graph for representing the data in the best possible way. The fetching of information from the internet is done through web scrapping.

When the python code is compiled and the tool is initiated it reads the name of the stocks given by the user inside the code , the current market price is tracked by the tool through money control website this website consists of all price related information of the stock asset, with the company's PE ratio, cash flow, revenue generated per year and other fundamental and technical analysis results and scenarios, after elicitation of the stock prices from the website the tool would now read the excel sheet and perform the analytical results in the excel sheet which are updating the profit or loss of the user and their position ratio .



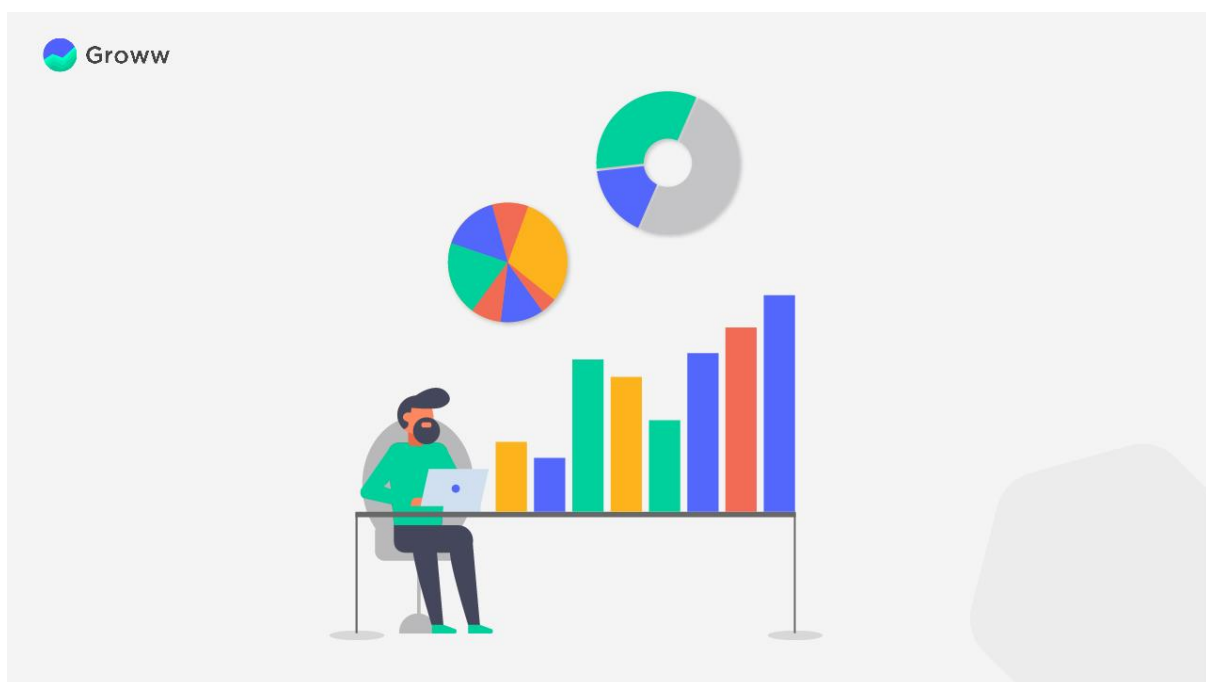
## **I.I Disadvantages of current system**

Currently no such systems exists which displays all holdings from different applications or demat accounts on a single screen. If the user is stuck in such situation where he has bought shares of apple from foreign stock exchange through Capital brokerage application, shares of yes bank and IRCTC from National stock exchange through Kite zerodha brokerage application and a crypto currency from Binance or Delta exchange he or she may face a few problems

- Stuck in late entry or exit because he has to open up each application and look on to the chart of each asset respectively which would obviously consume more time
- Misses a trend reversal or confirmation , as the user has to follow up through multiple sites and screens for technical analysis this can be a hectic process which would lead to poor technical analysis
- Highly time consuming and this can bring a user into a negative portfolio

## I.II Formulation of Problem

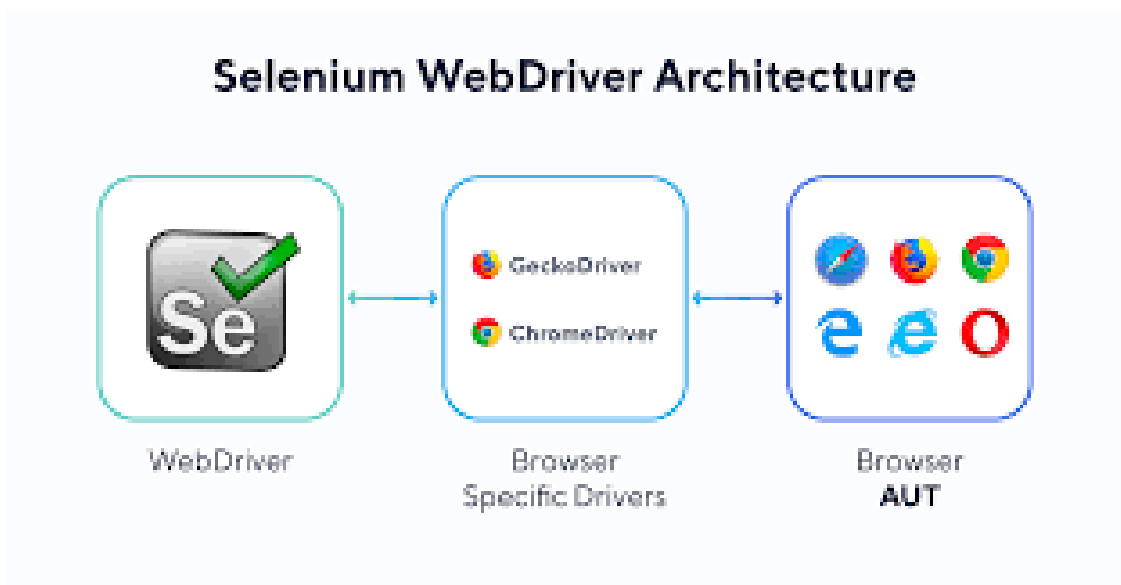
The automated portfolio tracker would help the user to access their multiple diversified positions on a single spot, it is a fast and time-efficient way to track down the current market price of stocks and running profit and loss for the user. The user gets quickly updated about his holdings in a single click and the invested amount and current returns are represented to the user in an easy to understand graphical representations, these small changes would help the user to prevent big losses and mark great entry and exit which would initiate a trade with great profit potentials.



# I.III Required tools/technology

The requirement of tools is quite straightforward. we just need a laptop installed with latest version of selenium webdriver, python and a Microsoft excel sheet  
Python (version>3.0)

- SELENIUM
- Webdriver
- Pandas
- Numpy
- Pathlib



## **Chapter-2**

### **LITERATURE SURVEY**

#### **2.1 INTRODUCTION**

"What other people think" has always been an important piece of information for most of us during the decision-making process. The Internet and the Web have now (among other things) made it possible to find out about the opinions and experiences of those in the vast pool of people that are neither our personal acquaintances nor well-known professional critics — that is, people we have never heard of. And conversely, more and more people are making their opinions available to strangers via the Internet. The interest that individual users show in online opinions about products and services, and the potential influence such opinions wield, is something that is driving force for this area of interest. And there are many challenges involved in this process which needs to be walked all over in order to attain proper outcomes out of them. In this survey we analysed basic methodology that usually happens in this process and measures that are to be taken to overcome the challenges being faced.

#### **2.2 EXISTING METHODS**

##### **2.2.1 Stock Market Prediction Using Machine Learning**

The research work done by V Kranthi Sai Reddy Student, ECM,

Sreenidhi Institute of Science and Technology, Hyderabad, India. In the finance world stock trading is one of the most important activities. Stock market prediction is an act of trying to determine the future value of a stock or other financial instrument traded on a financial exchange. This paper explains the prediction of a stock using Machine Learning. The technical and fundamental or the time series analysis is used by the most of the stockbrokers while making the stock predictions. The programming language used to predict the stock market using machine learning is Python. In this paper we propose a Machine Learning (ML) approach that will be trained from the available stocks data and gain intelligence and then uses the acquired knowledge for an accurate prediction. In this context this study uses a machine learning technique called Support Vector Machine (SVM) to predict stock prices for the large and small capitalizations and in the three different markets, employing prices with both daily and up-to-the-minute frequencies.

### **2.2.2 Forecasting the Stock Market Index Using Artificial Intelligence Techniques**

The research work done by Lufuno Ronald Marwala A dissertation submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Science in Engineering. The weak form of Efficient Market hypothesis (EMH) states that it is impossible to forecast the future price of an asset based on the

information contained in the historical prices of an asset. This means that the market behaves as a random walk and as a result makes forecasting impossible. Furthermore, financial forecasting is a difficult task due to the intrinsic complexity of the financial system. The objective of this work was to use artificial intelligence (AI) techniques to model and predict the future price of a stock market index. Three artificial intelligence techniques, namely, neural networks (NN), support vector machines and neuro-fuzzy systems are implemented in forecasting the future price of a stock market index based on its historical price information. Artificial intelligence techniques have the ability to take into consideration financial system complexities and they are used as financial time series forecasting tools. Two techniques are used to benchmark the AI techniques, namely, Autoregressive Moving Average (ARMA) which is linear modelling technique and random walk (RW) technique. The experimentation was performed on data obtained from the Johannesburg Stock Exchange. The data used was a series of past closing prices of the All Share Index. The results showed that the three techniques have the ability to predict the future price of the Index with an acceptable accuracy. All three artificial intelligence techniques outperformed the linear model. However, the random walk method out performed all the other techniques. These techniques show an ability to predict the future price however, because of the transaction costs of trading in the market, it is not possible to show that the three techniques can disprove the weak form of market

efficiency. The results show that the ranking of performances support vector machines, neuro-fuzzy systems, multilayer perceptron neural networks is dependent on the accuracy measure used.

## **AUTOMATED PORTFOLIO TRACKER**

Our project does not leads to predict the price of a stock which is basically impossible , our project is just a helping tool for people who are already in the financial market working up on them as their source for passive income these people have jobs and business to handle and work on and cannot invest all of their times watching the market growth and debt , this tool would be a one place stop for them to track down all their investments. This project is simply build up in python using selenium web driver third part library to gain information from the internet and an excel sheet to represent those data

### **2.3 WORKING OF PROJECT**

The project is based on web scrapping which means gaining information from the web and implementing it in the result of the code. Our tools works with selenium which provides web scrapping in python.

Firstly we create an excel sheet with stocks name and price at which they were bought , the quantity of each holdings and the total amount invested, a code in python is written to read the respective excel sheet

and search the web for the current market price of the stocks listed in the excel sheet one by one. Python create a complete structured data set with all the information provided about the user's portfolio and this portfolio is represented in the excel sheet

## **CODE:**

```
from selenium import webdriver

from selenium.webdriver.common.keys import Keys

import time

import openpyxl

from pathlib import Path

wait_imp = 10

excel_path =
Path(r"D:\Learning\Practice\Selenium\Stock\stocks_data.xlsx")

wb = openpyxl.load_workbook(excel_path)

ws = wb["CMP"]

# Read company name from excelsheet

print ("Step 1 --> Reading Excel-sheet, Please wait....")
```



```
s_row = 4
```

```
c_list = []
```

```
avg_val = []
```

```
qnty_list = []
```

```
while ws.cell(row = s_row, column= 2).value != None:
```

```
    c_name = ws.cell(row = s_row, column= 2).value
```

```
    val_1 = ws.cell(row = s_row, column= 4).value
```

```
    qnty = ws.cell(row = s_row, column= 5).value
```

```
    c_list.append(c_name)
```

```
    avg_val.append(val_1)
```

```
    qnty_list.append(qnty)
```

```
    s_row += 1
```

```
print ("Company name available in Database")
```

```
[print('  ->',name) for name in c_list]
```

```
time.sleep(2)
```

```
print ('\n')
```

```
# create a webdriver object for chrome-option and configure
```

```

CO = webdriver.ChromeOptions()

CO.add_experimental_option('useAutomationExtension', False)

CO.add_argument('--ignore-certificate-errors')

CO.add_argument('--start-maximized')

wd =
webdriver.Chrome(r'D:\Learning\Practice\Selenium\chromedriver.exe
',options=CO)

print ("Step 2 --> Opening Finance website\n")

wd.implicitly_wait(wait_imp)

wd.get("https://www.moneycontrol.com")

time.sleep(5)

print
("*****")
*****")

print ("          Getting Live Stock Value !! Please wait ...\n")

for i in range(len(c_list)):

```

```

src = wd.find_element_by_id ("search_str")

src.send_keys(c_list[i])

src.send_keys(Keys.RETURN)

wd.implicitly_wait(wait_imp)

s_v =
wd.find_element_by_xpath("//*[ @id='div_nse_livebox_wrap']/div[1]/
div[1]/div/div[2]/span[1]")

ws.cell(row=4+i, column= 3, value = s_v.text)

diff = (avg_val[i] - float(s_v.text))* qty_list[i]

per_diff = (diff/(avg_val[i]*qty_list[i]))*100

print ("{:>23} -> CMP {:<7} Current P/L->[{:>8.2f}] %P/L ->
{:>6.2f}%".format(c_list[i],s_v.text, diff, per_diff))

print ('\n')

print ("Step 3 --> Writing Latest Price into Excel-sheet ....\n")

time.sleep(1)

wb.save(excel_path)

```

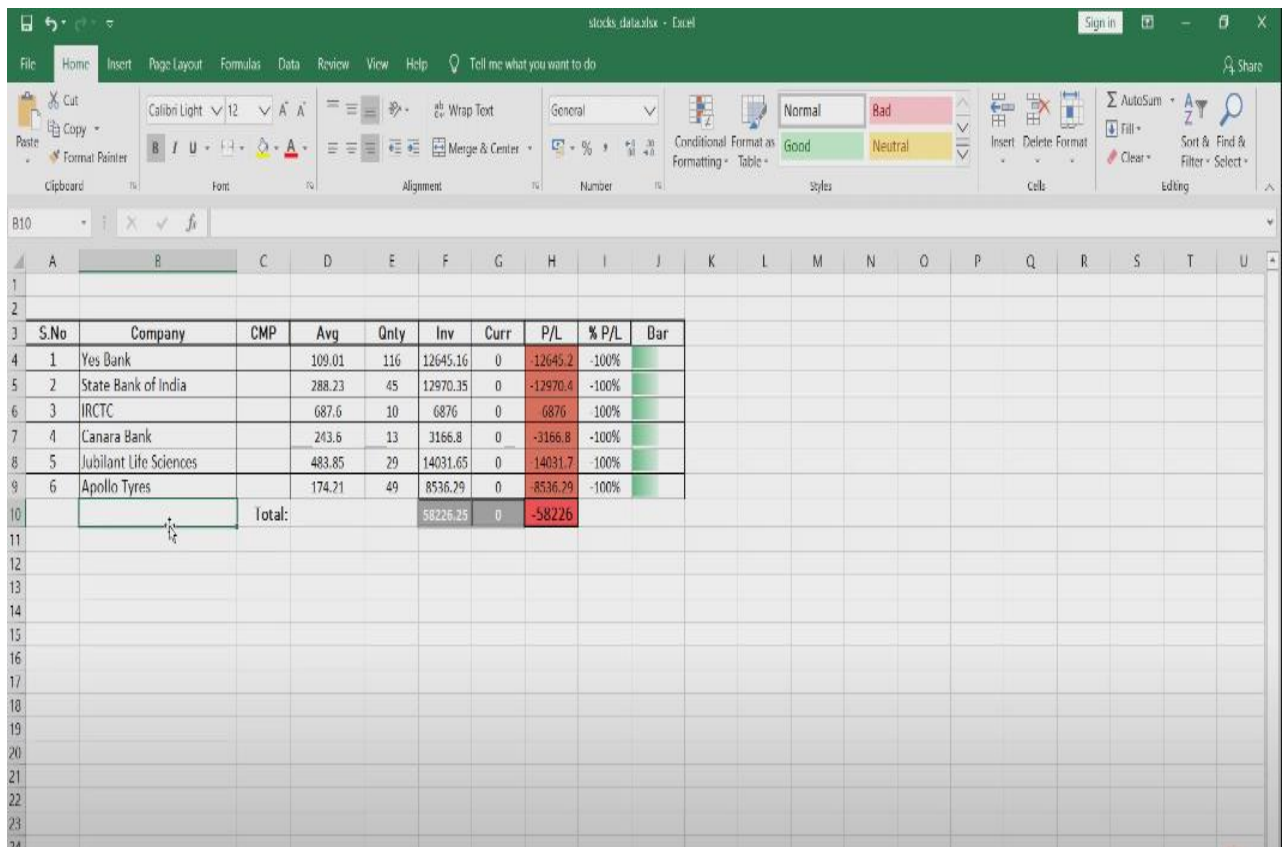
```
print ("Step 4 --> Successfully Written \n")
```

```
print ("Step 5 --> Closing browser !\n")
```

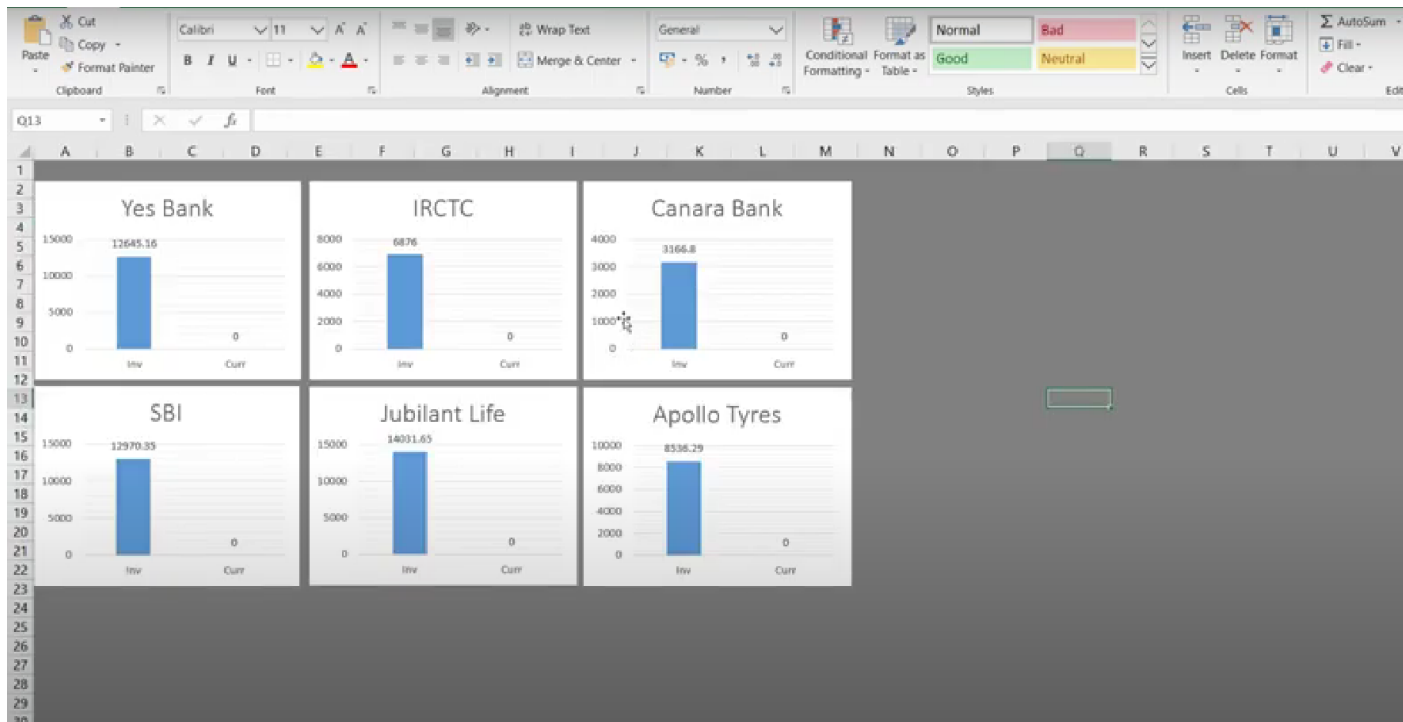
```
print (" ----- FINISHED !! -----")
```

```
time.sleep(1)
```

```
wd.close()
```



S.No	Company	CMP	Avg	Qty	Inv	Curr	P/L	% P/L	Bar
1	Yes Bank		109.01	116	12645.16	0	12645.2	-100%	█
2	State Bank of India		288.23	45	12970.35	0	-12970.4	-100%	█
3	IRCTC		687.6	10	6876	0	6876	-100%	█
4	Canara Bank		243.6	13	3166.8	0	-3166.8	-100%	█
5	Jubilant Life Sciences		483.85	29	14031.65	0	14031.7	-100%	█
6	Apollo Tyres		174.21	49	8536.29	0	8536.29	-100%	█
		Total:			58226.25	0	-58226		



## OUTPUT/REPRESENTATION ON THE EXCEL SHEET:

- Python gaining the required information from the web

```
C:\Python374\python.exe
Step 1 --> Reading Excel-sheet, Please wait...
Company name available in Database
-> Yes Bank
-> State Bank of India
-> IRCTC
-> Canara Bank
-> Jubilant Life Sciences
-> Apollo Tyres

DevTools listening on ws://127.0.0.1:50219/devtools/browser/54b73493-3453-4741-8edc-430a6d1e3a6c
Step 2 --> Opening Finance website
```

The screenshot shows a Chrome browser window with the Moneycontrol website. The browser's address bar shows 'Jubilant Life'. A terminal window is overlaid on the bottom right of the browser, displaying the following text:

```
C:\Python374\python.exe
Step 1 --> Reading Excel-sheet, Please wait...
Company name available in Database
-> Yes Bank
-> State Bank of India
-> IRCTC
-> Canara Bank
-> Jubilant Life Sciences
-> Apollo Tyres

DevTools listening on ws://127.0.0.1:50219/devtools/browser/54b73493-3453-4741-8edc-430a6d1e3a6c
Step 2 --> Opening Finance website

Getting Live Stock Value !! Please wait ...

Yes Bank -> CMP: 45.85 Current P/L-> [ 7326.56] SP/L -> 57.04%
State Bank of India -> CMP: 289.85 Current P/L-> [ 3527.18] SP/L -> 27.15%
IRCTC -> CMP: 951.00 Current P/L-> [ -2634.00] SP/L -> -18.31%
Canara Bank -> CMP: 96.25 Current P/L-> [ 1915.55] SP/L -> 68.45%
```

The Moneycontrol website shows a search for 'Jubilant Life' and a list of companies with their stock prices and P/L ratios. The Canara Bank page is visible at the bottom of the browser window.

```

-> Canara Bank
-> Jubilant Life Sciences
-> Apollo Tyres

DevTools listening on ws://127.0.0.1:50219/devtools/browser/54b73493-3453-4741-8edc-430a6d1e3a6c
Step 2 --> Opening Finance website

*****
Getting Live Stock Value !! Please wait ...

Yes Bank -> CMP 45.85 Current P/L->[ 7326.56] %P/L -> 57.94%
State Bank of India -> CMP 209.85 Current P/L->[ 3527.10] %P/L -> 27.19%
IRCTC -> CMP 951.00 Current P/L->[-2634.00] %P/L -> -38.31%
Canara Bank -> CMP 96.25 Current P/L->[ 1915.55] %P/L -> 60.49%
Jubilant Life Sciences -> CMP 280.20 Current P/L->[ 5905.85] %P/L -> 42.09%
Apollo Tyres -> CMP 88.85 Current P/L->[ 4182.64] %P/L -> 49.00%

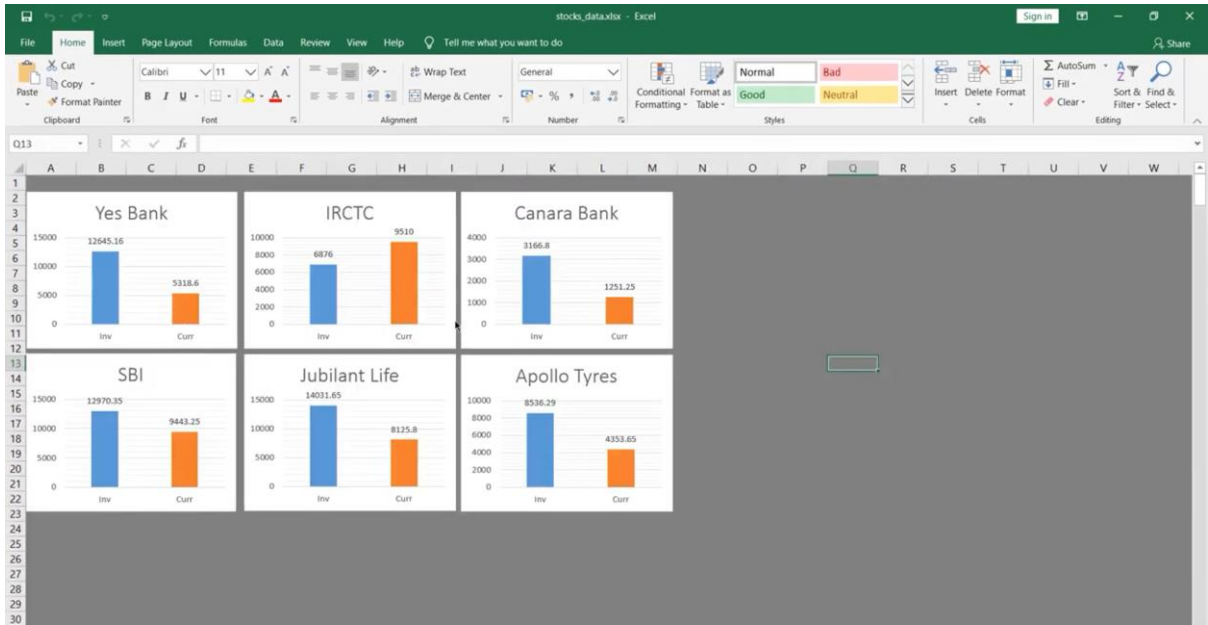
Step 3 --> Writing Latest Price into Excel-sheet ...
Step 4 --> Successfully Written
Step 5 --> Closing browser !

----- FINISHED !! -----

```

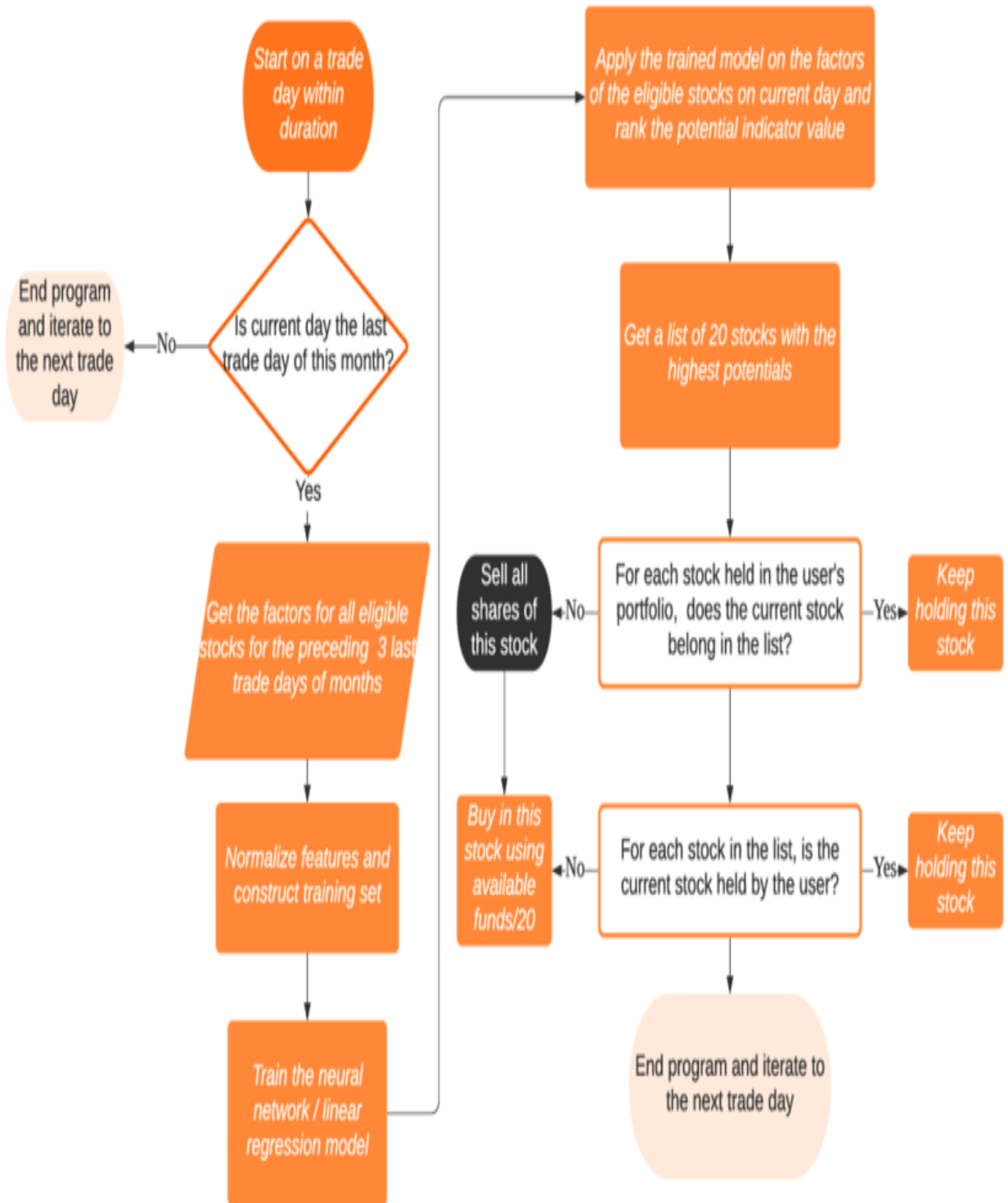
## EXCEL SHEET

S.No	Company	CMP	Avg	Qty	Inv	Curr	P/L	% P/L	Bar
1	Yes Bank	45.85	109.01	116	12645.16	5318.6	-7326.56	-58%	
2	State Bank of India	209.85	288.23	45	12970.35	9443.25	-3527.1	-27%	
3	IRCTC	951.00	687.6	10	6876	9510	2634	38%	
4	Canara Bank	96.25	243.6	13	3166.8	1251.25	-1915.55	-60%	
5	Jubilant Life Sciences	280.20	483.85	29	14031.65	8125.8	-5905.85	-42%	
6	Apollo Tyres	88.85	174.21	49	8536.29	4353.65	-4182.64	-49%	
<b>Total:</b>					<b>58226.25</b>	<b>38002.55</b>	<b>-20224</b>		





# System Flow Diagram



# CONCLUSION

The main objective of this project was to build up a tool which would be beneficial for people according to such times, Indians have now been showing great interests in the financial markets from last few years , over 2.4crore new investment and trading accounts were created last year. Working people and even students have started investing small fraction of their savings or incomes into the financial markets and its not like everyone knows well about the stock market but all have a rough and a long short idea on how it works , nether do they have time to get into leaving all their work behind, this tool will save up a lot of their time and even money if used efficiently Though people need to invest not just money but also their time to master the knowledge before entering into the market, also following a proper risk management system is important. There are a lot of different sites , apps and broker houses form where these asstes could be bought and held. The crypto market , stock market are a part of financial market but are totally different sectors . Suppose a person holds both crypto and stocks to track his daily momentum/growth he needs to visit different sites/apps for crypto and stocks also sometimes a person has multiple Demat accounts for same market which makes his daily analysis a difficult job. Here the Automated portfolio manager would consist of both crypto and stocks (also SIPs/Mutual funds/commodity holdings) holdings record and would display real time price at a single spot. This would help a person to look upto all his investments in the

financial market on single screen. For those who are not completely indulge into the financial market as their main source of income, i.e working people and students who cannot invest their whole day time looking after the charts and prices , this tool would help us track down and manage their assets with proper risk management system.

## REFERENCES

[1] Stock Price Prediction Using LSTM on Indian Share Market by Achyut Ghosh, Soumik Bose<sup>1</sup>, GiridharMaji, Narayan C. Debnath, Soumya Sen

[2] S. Selvin, R. Vinayakumar, E. A. Gopalkrishnan, V. K. Menon and K. P. Soman - Stock price prediction using LSTM, RNN and CNN-sliding window model - 2017.

[3] Murtaza Roondiwala, Harshal Patel, Shraddha Varma, “Predicting Stock Prices Using LSTM” in Undergraduate Engineering Students, Department of Information Technology, Mumbai University, 2015.

[4] Xiongwen Pang, Yanqiang Zhou, Pan Wang, Weiwei Lin, “An innovative neural network approach for stock market prediction”, 2018

[5] Ishita Parmar, Navanshu Agarwal, Sheirsh Saxena, Ridam Arora, Shikhin Gupta, Himanshu Dhiman, Lokesh Chouhan Department of Computer Science and Engineering National Institute of Technology,

Hamirpur – 177005, INDIA - Stock Market Prediction Using Machine Learning.

[6] Pranav Bhat Electronics and Telecommunication Department, Maharashtra Institute of Technology, Pune. Savitribai Phule Pune University - A Machine Learning Model for Stock Market Prediction.

[7] Anurag Sinha Department of computer science, Student, Amity University Jharkhand Ranchi, Jharkhand (India), 834001 - Stock Market Prediction Using Machine Learning.

[8] V Kranthi Sai Reddy Student, ECM, Sreenidhi Institute of Science and Technology, Hyderabad,

[9] Asset Durmagambetov currently works at the mathematics, CNTFI- 'The Riemann Hypothesis Millennium Prize Problems' - stock market predictions.

[10] Mariam Moukalled Wassim El-Hajj Mohamad Jaber Computer Science Department American University of Beirut - Automated Stock Price Prediction Using Machine Learning.

[11] Manh Ha Duong Boriss Siliverstovs June 2006 - The Stock Market and Investment.

[12] Dharmaraja Selvamuthu, Vineet Kumar and Abhishek Mishra

Department of Mathematics, Indian Institute of Technology Delhi,  
Hauz Khas, New Delhi 110016, India - Indian stock market prediction  
using artificial neural networks on tick data.

[13] Lufuno Ronald Marwala A dissertation submitted to the Faculty  
of Engineering and the Built Environment, University of the  
Witwatersrand, Johannesburg, in fulfilment of the requirements for  
the degree of Master of Science in Engineering - Forecasting the  
Stock Market Index Using Artificial Intelligence Techniques.

[14] Xiao Ding, Kuo Liao, Ting Liu, Zhongyang Li, Junwen Duan  
Research Centre for Social Computing and Information Retrieval  
Harbin Institute of Technology, China - Event Representation  
Learning Enhanced with External Common-sense Knowledge.

[15] Huicheng Liu Department of Electrical and Computer  
Engineering Queen's University, Canada - Leveraging Financial  
News for Stock Trend Prediction with Attention-Based Recurrent  
Neural Network.

[16] Hyeong Kyu Choi, B.A Student Dept. of Business  
Administration Korea University Seoul, Korea = Stock Price  
Correlation Coefficient Prediction with ARIMA-LSTM Hybrid  
Model.

