

A Project Phase-I Report
on
”Prediction Of Market Trends”

Submitted to the
Savitribai Phule Pune University
In partial fulfillment for the award of the Degree of
Bachelor of Engineering
in
Information Technology

by
Mayank Kumar 4435
Payal 4442
R Sankalp Shukla 4446
Shikha Jha 4457

Under the guidance of
Mr.Gajanan Walunjkar



Department of Information Technology

Army Institute of Technology
Dighi Hills, Pune-Alandi Road,
Pune 411015.
2021-2022



CERTIFICATE

This is to certify that the project based seminar report entitled "**Prediction Of Market Trends**" being submitted by **Mayank Kumar, Payal, R Sankalp Shukla, Shikha Jha** is a record of bonafide work carried out by them under the supervision and guidance of **Mr. Gajanan Walunjkar** in partial fulfillment of the requirement for **BE (Information Technology Engineering) - 2015 Course** of Savitribai Phule Pune University, Pune in the academic year 2021-2022.

Date: 23/11/2021

Place: Pune

Mr. Gajanan Walunjkar
Seminar Guide

Dr Sangeeta Jadhav
Head of the Department

Dr. B. P. Patil
Principal

This Project Based Seminar report has been examined by us as per the Savitribai Phule Pune University, Pune requirements at Army Institute of Technology, Pune-411015 on

Internal Examiner

External Examiner



ACKNOWLEDGMENT

We are highly indebted to my guide **Mr.Gajanan Walunekar** for his guidance and constant supervision as well as for providing necessary information regarding the seminar report and also for her support in completing the seminar report. We would like to express our special gratitude and thanks to Seminar Coordinator Prof. Rupali Bagate for giving us such attention and time.

This acknowledgment would be incomplete without expressing my thanks to Prof. Sangeeta Jadhav, Head of the Department (Information Technology) for her support during the work.

We would like to extend my heartfelt gratitude to my Principal, Dr.B. P. Patil who provided a lot of valuable support, mostly being behind the veils of college bureaucracy.

we would also like to express my gratitude towards my parents and friends for their kind co-operation and encouragement which help us in completion of this report. Our thanks and appreciations also go to my colleague in developing the seminar report and people who have willingly helped me out with their abilities.

(Mayank Kumar) (Payal) (R Sankalp Shukla) (Shikha Jha)

Abstract

Forecasting about Indian market has always been interesting and topic of discussion among analyst and researchers. With the arrival of machine learning and artificial intelligence the race is now becoming the competition with best algorithms to be used and give investors more profit. In past years prediction was only based on experience and daily headlines of business newspapers but now it depends on various international, national and political economic factors and the sentiments and reaction of people over the issues. With the growing power of social media, the game in market over this also changed now with the help of sentiment analysis over social media we can determine the mood of investors over the news. In the present scenarios you can divide two categories for the prediction strategies one is the time series analysis of stocks and the second is artificial intelligence property over the market. AI property contains multi-layer perception, support vector machine, naive Bayes network, back propagation, convolutions neural network, single-layer LSTM, recurrent neural network etc during this we have a tendency to come with plan of combination of each. Within the paper we have conjointly covers the assorted challenges that are encountered while building prediction models. This whole module focuses on use of statistical analysis and conjointly development of the sentimental analysis and to get better results. The LSTM has the advantage of analyzing relationship between time series knowledge through memory functions. The performance of the system is improved by combine efforts of time-series and sentiments with the LSTM prediction model..

Contents

Certificate	ii
Acknowledgment	iii
Abstract	iv
Chapter Contents	vii
List of Figures	viii
List of Tables	ix

Contents

1	INTRODUCTION TO PREDICTION OF MARKET TRENDS	1
1.1	INTRODUCTION	1
1.1.1	Introduction	1
1.1.2	Motivation behind project topic	2
1.1.3	Aim of the work	2
1.1.4	Scope of the work	2
2	LITERATURE SURVEY	3
2.0.1	Terms of Stock Market	4
2.0.2	Market Analysis	5
3	PROBLEM STATEMENT	6
4	PROJECT REQUIREMENT SPECIFICATION	7
4.1	Web Technologies	7
4.2	Libraries/APIs	7
4.3	Machine Learning Model	8
5	SYSTEMS PROPOSED ARCHITECTURE	9
6	HIGH LEVEL DESIGN	10
6.1	Use Case Diagram	10
6.2	Class Diagram	11
6.3	Activity Diagram	12
7	Methodology	13
7.0.1	Overview	13
7.0.2	Statical Method	14
7.0.3	Sentimental Method	14
7.0.4	Long Short term memory	15
8	SYSTEM IMPLEMENTATION AND CODE	17

9	GUI/WORKING MODULES	19
10	Other Aspect of Stock Market	21
10.1	Stock's Trade Volume	21
10.1.1	How It Works	21
10.1.2	Why It Matters	21
10.1.3	The Bottom Line	22
11	CONCLUSION	23

List of Figures

5.1	System Architecture Diagram	9
6.1	Use Case Diagram	10
6.2	Class Diagram	11
6.3	Activity Diagram	12
7.1	Method Diagram	13
7.2	Method Diagram	15
7.3	Method Diagram	16
8.1	Code Snippet 1	17
8.2	Code Snippet 2	18
9.1	UI Snippet 1	19
9.2	UI Snippet 2	20
9.3	UI Snippet 3	20

Chapter 1

INTRODUCTION TO PREDICTION OF MARKET TRENDS

1.1 INTRODUCTION

1.1.1 Introduction

Stock market has provided a platform for investors to deploy their resources in Indian industries in exchange of their equities. Indian equity market development got pace in the initial phase of liberalization. Volatility is one of the characteristic factors in stock market which makes it speculative and provided a room for predicting its future trend. And volatility itself is influenced by trading volume and new information or sentiments regarding that stock. volatility is a key parameter used in many financial applications so, it is important to estimate volatility in stock market. The most important role of any investor in stock market is to analyze its movement and to make an precise prediction to have profit on his investment. The amount of people which invest over stocks increased, especially after the start of bull market and loss of jobs in covid 19. Even the single investors are important part to the development of Indian markets. With the ease of investing through brokers apps and good internet facilities both the things have changed unexpectedly investing and expressing thoughts which affects the stocks. Therefore, we are using digital data and news feed (as they are constant source) of any major indexes like NIFTY50, SENSEX, etc. to construct the outcome model and test the co-relation between media attention(sentiments) and trading volume in predicting their trends.

1.1.2 Motivation behind project topic

The main motive for developing our software is to tackle the problem of common investor which don't understand the technicality of market. The increasing availability of stock markets digital records (i.e., prices and trading volumes) has motivated and directed more research efforts towards automated trading. An automated model with reasonable accuracy is far better than human trading as it eliminates the human emotion from the game, which is the biggest reason of losses in stock market. In this project we will try to merge some factors, which influence the stock market, and predict the future trend for the market with better accuracy than the individual strategy.

1.1.3 Aim of the work

1. To ease the investment in SENSEX .
2. To eliminate the need of reading long and boring stock market newspapers and article
3. Common people with little knowledge of market can understand and invest in market.

1.1.4 Scope of the work

In this project we will try to merge some factors, which influence the stock market, and predict the future trend for the market with better accuracy than the individual strategy. In this project, we tried to cover volume/momentum and sentiments, as are key features to predict the trend of the market. In the future scope, we will try to identify more features that influence the market, to integrate in with our model to increase its accuracy.

Chapter 2

LITERATURE SURVEY

Abdulrahman A. Ahmed, Ayman Ghoneim, Mohamed Saleh.[1] in the paper "Research on the Interactive Effect of Media Attention and Trading Volume on Stock Return". Stocks in a state of high volume in general have gathered more investors will attract more investors to join and further increase the stock price.

Guangyu Ding, Liangxi Qin.[2] in the paper "Study on the prediction of stock price based on the associated network model of LSTM" used A multi-value associated network model of LSTM-based deep-recurrent neural network is proposed to predict multiple prices of a stock simultaneously.

Calvin Frans Mariel, W., Mariyah, S., Pramana[3] in the paper "Sentiment analysis: a comparison of deep learning neural network algorithm with SVM and naïve Bayes for Indonesian text" presents an approach to extract features by using comparisons between different classification models.

Stephanie Stoll et al.[4] in the paper "A Comparative Study on Machine Learning Algorithms for the Control of a Wall Following Robot" A perfect solution using a DT model was proposed for the simplified dataset which achieves a mean accuracy of 100 percent.

Shibl, M., Ismail, L., Massoud, A. (2020).[5] in the paper, "Machine Learning-Based Management of Electric Vehicles Charging: Towards Highly-Dispersed Fast Chargers" Seven different ML classifiers (NB, KNN, SVM, DT, RF, DNN, and LSTM) were used in order to provide the best possible results and choose the best model. The leading ML model that provided the best results, which were significant, is LSTM.

Calvin Frans Mariel, W., Mariyah, Pramana.[6] in the paper "Sentiment analysis: a comparison of deep learning neural network algorithm with SVM and Naïve Bayes for Indonesian text", proposed an approach Based on this research, it can be concluded that the combination of Deep Learning Neural Network algorithm with bigram technique is very suitable for conducting sentiment analysis for Indonesian text data.

Abdulrahman Radaideh, Fikri Dweiri, Mohammad Obaidat.[7] in the paper "A Novel Approach to Predict the Real Time Sentimental Analysis by Naive Bayes RNN Algorithm during the Covid Pandemic in UAE" proposed 1) Naïve Bayes more accurate than RNN 2) Maximum number of positive responses compared to negative and neutral response from total tweets. 3) The sentimental analysis successfully performed for the real time scenario. 4) Produce better accuracy and performance than earliest real time analysis.

Andrew Pulver, Siwei Lyu .[8] in the paper "LSTM with Working Memory" proposed LSTM and introduced a modified LSTM architecture that outperforms LSTM in several cases using few additional parameters.

Predicting how the stock market will perform is one of the most difficult things to do. There are so many factors involved in the prediction – physical factors vs. physiological, rational and irrational behaviour, etc. All these aspects combine to make share prices volatile and very difficult to predict with a high degree of accuracy.

Can we use machine learning as a game changer in this domain? Using features like the latest announcements about an organization, their quarterly revenue results, etc., machine learning techniques have the potential to unearth patterns and insights we didn't see before, and these can be used to make unerringly accurate predictions.

2.0.1 Terms of Stock Market

- **Buy** To take a position by buying shares of a company
- **Sell** To sell the shares you currently own.
- **Bid** When a trader in the market makes an offer to buy shares..
- **Ask** When a trader offers their shares for sale at a certain price..
- **Bull Market** A market condition where stock prices are continually rising.
- **Bear Market** Bear markets are times where the outlook appears bad for a company, an industry, or the overall economy. Traders and in-

vestors are less willing to buy stocks, and many are looking to sell their stocks. This causes prices to fall..

- **Limit Order** A type of stock market order that provides instruction to only execute at a certain price, or one that is more profitable.
- **Market Order** A type of stock market order that provides instruction to buy or sell as quickly as possible, at whatever price is currently available

2.0.2 Market Analysis

To understand algorithmic trading, it is useful to consider the different types of trading, explore how a trade is executed in an exchange, and review the objectives and challenges.

Trade execution Dealers generally execute their orders through a shared centralized order book that lists the buy and sell orders for a specific security ranked by price and order arrival time (generally on a first-in, first-out basis). This centralized order-driven trading system continuously tries to match buy and sell orders.

Pretrade analysis In an algorithmic trading system generally involves both analyzing financial data or news with the aim of forecasting future price movement or volatility and generating trading signals when a trading opportunity occurs. Broadly, the three categories of techniques used to perform this include fundamental analysis, technical analysis, and quantitative analysis

1) **Fundamental analysis** It involves a detailed study of related information that might affect asset prices with the aim of determining the asset's fair value or potential future price movement.

2) **Technical analysis** It aims to predict future price movements based on asset price history and, sometimes, related trading information such as trade volume. By assuming that the market's price reflects all relevant information, technical analysis seeks to identify and exploit price movement patterns rather than examine the underlying factors affecting asset prices.

3) **Quantitative analysis** It treats asset prices as random and uses mathematical and statistical analysis to find a suitable model for describing this randomness. This type of analysis has dominated the financial industry in recent decades, forming a solid foundation for portfolio theory, derivatives pricing, and risk management.

Chapter 3

PROBLEM STATEMENT

Stock market trading is a complex process where traders aim to maximize their expected return while minimizing associated risks. With the increasing availability of digital historical records, using automated agents for stock market trading becomes of a significant interest. Different machine learning algorithms are used to circumvents the problem of defining explicit targets and tackles problems which require sequential decisions. The prediction of mood/trend of stock markets is a vital problem, where a trader wants to make a position with predefined amount of shares over a fixed time horizon in the predicted trend.

Chapter 4

PROJECT REQUIREMENT SPECIFICATION

4.1 Web Technologies

The technologies we are going to use to build the user interface and to connect our models are as follows:

- HTML, CSS, Bootstrap
- JavaScript

4.2 Libraries/APIs

Some resources are going to be used to manipulate the data input.

- tweepy and twitter api
- keras
- Jupyter notebook
- Moneycontrol.com
- Sensex api
- Timeseries Api

4.3 Machine Learning Model

Machine learning models will be used to extract the computed results. Some of the models used in this project are as follows:

- LSTM

Chapter 5

SYSTEMS PROPOSED ARCHITECTURE

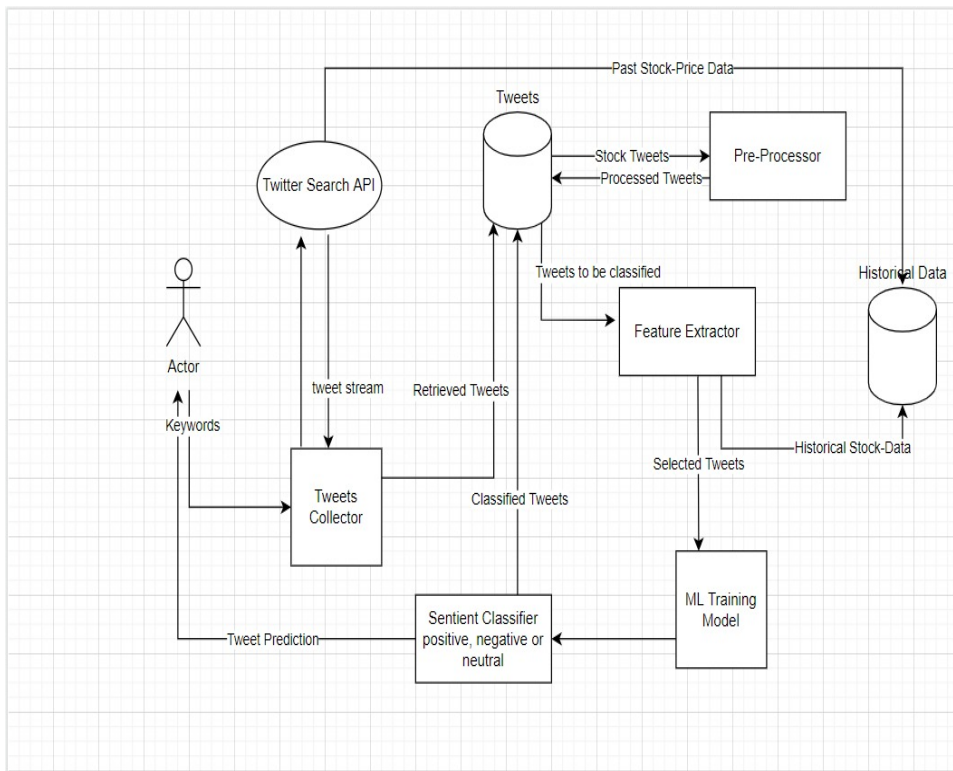


Figure 5.1: System Architecture Diagram

Chapter 6

HIGH LEVEL DESIGN

6.1 Use Case Diagram

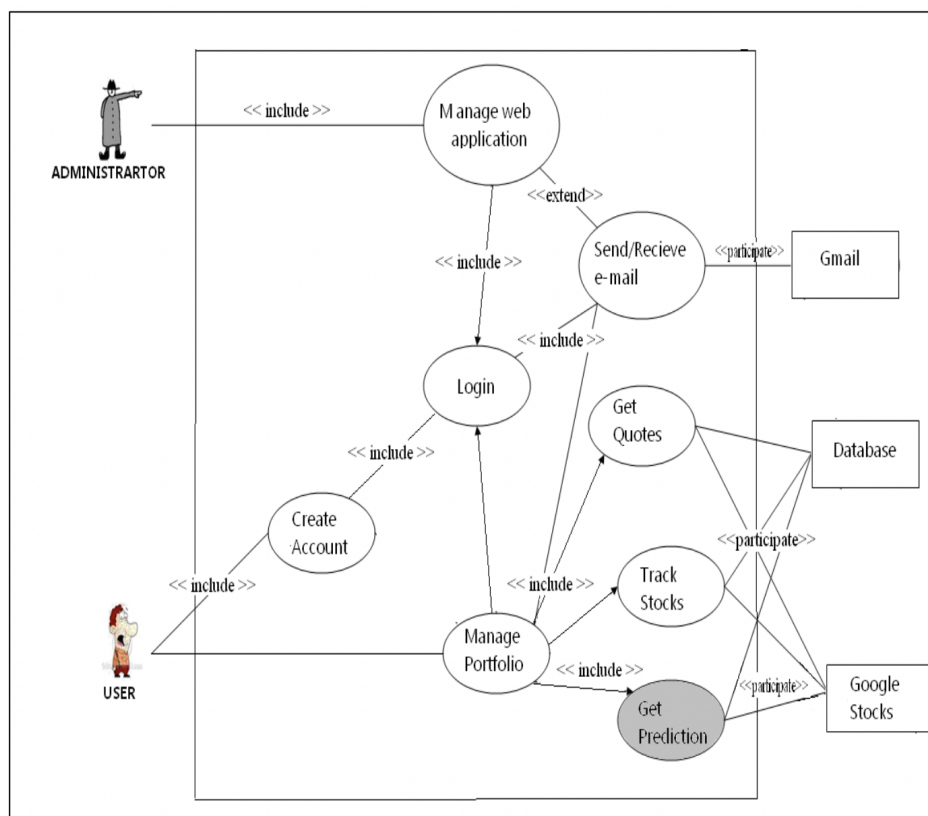


Figure 6.1: Use Case Diagram

6.2 Class Diagram

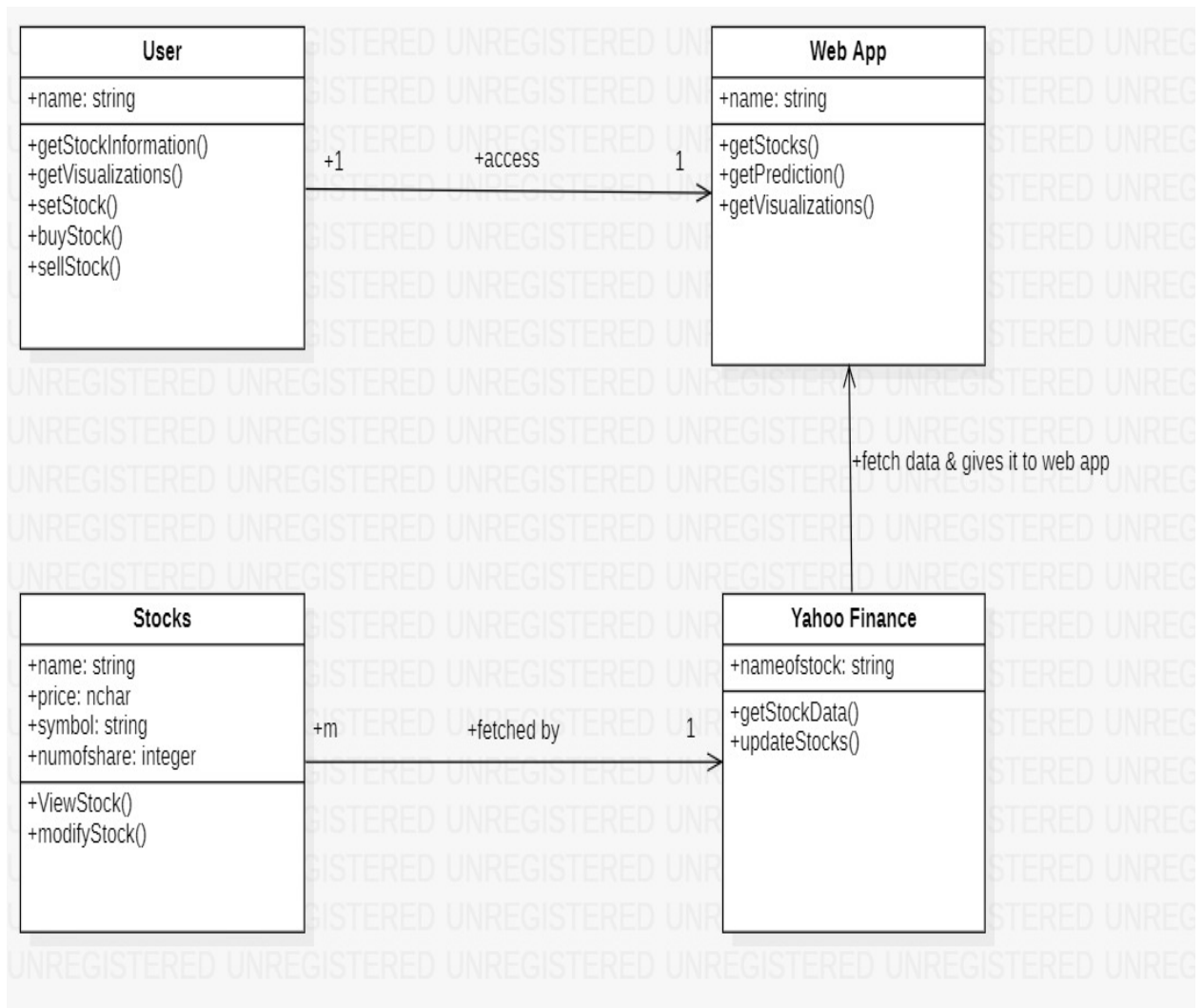


Figure 6.2: Class Diagram

6.3 Activity Diagram

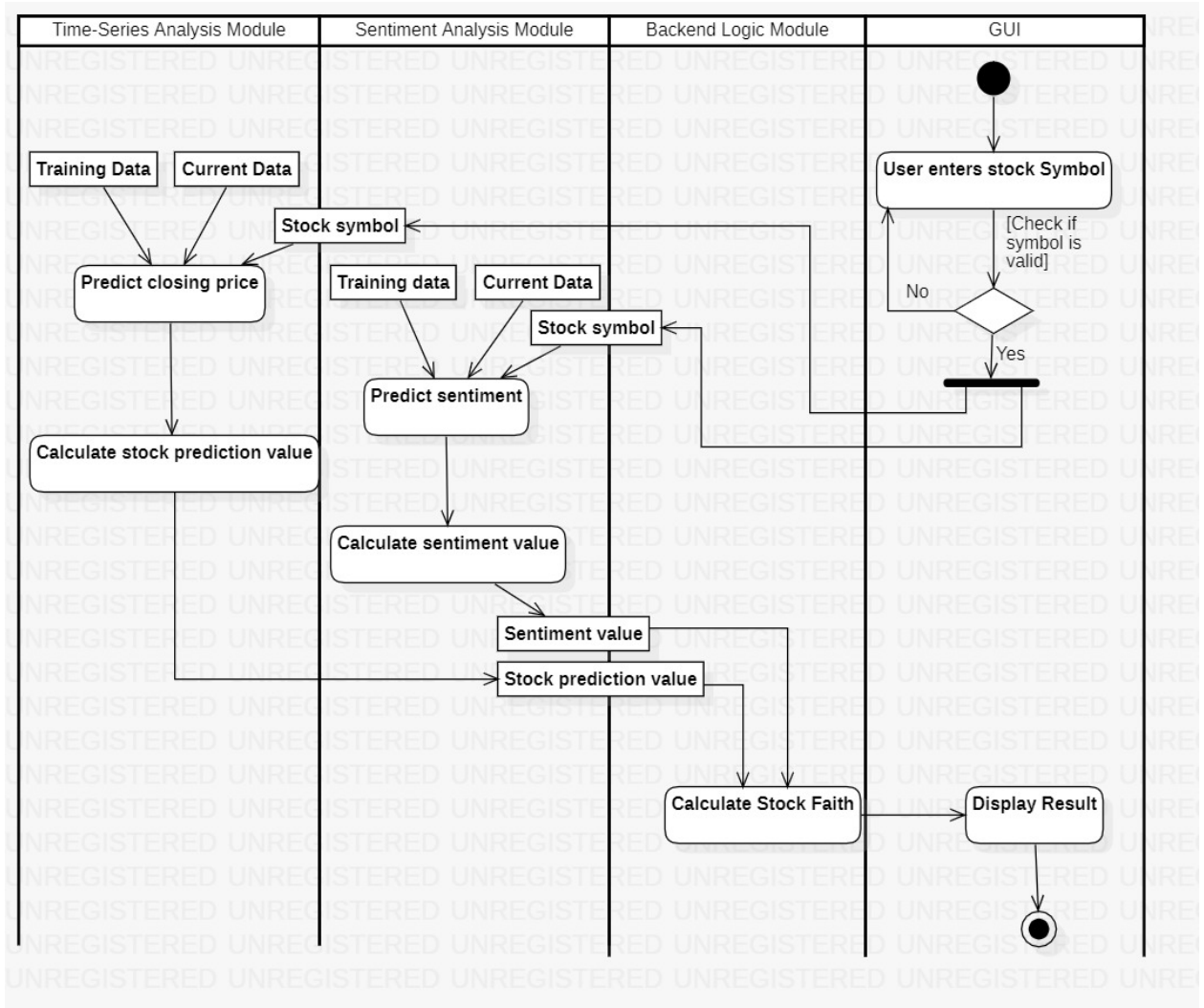


Figure 6.3: Activity Diagram

Chapter 7

Methodology

7.0.1 Overview

The way we are approaching toward the problem it reduces the chance of error because we are covering both the aspects of the share market

1. Statical Method
2. Sentimental Method

Methodology

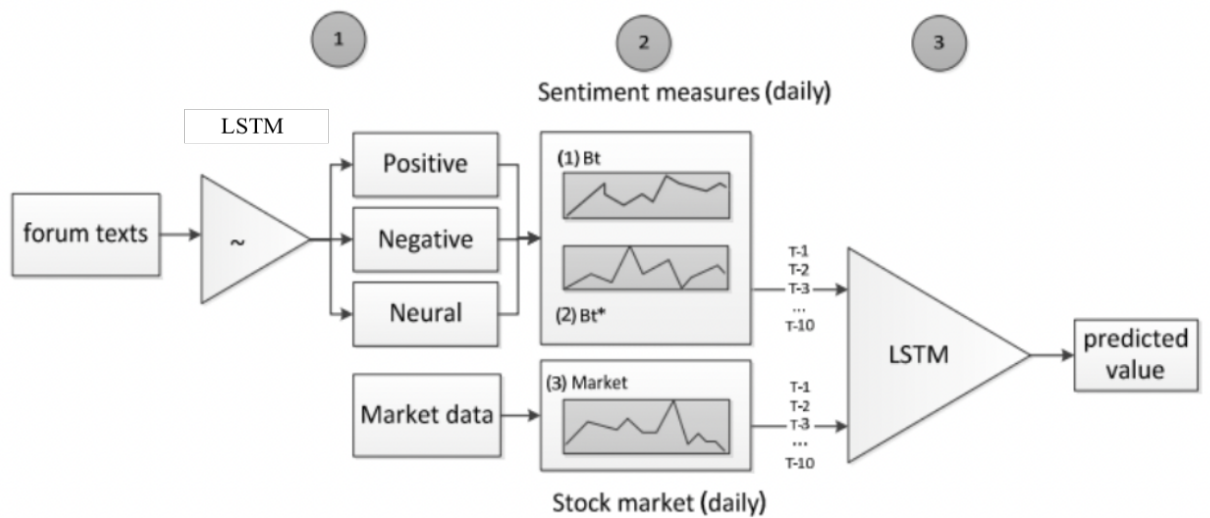


Figure 7.1: Method Diagram

Sentiment analysis or opinion mining makes use of text mining, natural language processing (NLP), in order to identify and extract the subjective content by analysing user's opinion, evaluation, sentiments, attitudes and emotions. The prediction of mood/trend of stock markets is a vital problem, where a trader wants to make a position with predefined amount of shares over a fixed time horizon in the predicted trend.

7.0.2 Statical Method

Most of the existing machine learning model (ML) input as samples/examples however there is no time involved in the context. The time-series method made up models can predict future pricing or determined value. Time-series are always used to predict for non-stationary knowledge these are like mean and variance are not constant over time however instead, these metrics vary over time. And these autos generated computer files (input for model) are known as time-series data. Some useful examples of it are temperature values over the crop and stock price of industry associated, worth of house over time period, price of gold with time series etc. Input can be an information that is observed with reference to-time.

7.0.3 Sentimental Method

Sentiment and Market:

Social media networks like Twitter, Instagram and Facebook etc. are growing their scope day by day. It is used by each and every category of people regardless of caste, sex, gender to put their opinions over any topic don't matter whether its international, national or political or launch of business products. This information is very much useful to know the sentiment of people and it can be used to make policies, planning's and processes for the development of product or company. Here comes the role of sentiment analysis which is used to extract such opinions and classify them into majorly three types which are as follows - positive, negative and neutral. Although we can define it in many ways it is basically capturing of perspective or views of individual or organization from any platform available (for now only web). There are some serious challenges also associated with it because human are not very straightforward.

Comparison between Models:

Accuracy of various classifier area unit taken as a basis for recommending the algorithm. An analysis was created on a news data set to spot pretend news

accurately. The precisions, accuracy and f1 score are often computed with the assistance of confusion matrices. one confusion matrix was created for every model. The values shown area unit the averaged values over ordered trial.

Table 2: Results of Algorithm

Model	Accuracy
Naïve Bayes	71.84%
Support Vector Machine	87.37%
LSTM	94.27%
Keras Based Neural Network	90.62%

Figure 7.2: Method Diagram

7.0.4 Long Short term memory

LSTM is a class of recurrent neural network. So before we can jump to LSTM, it is essential to understand neural networks and recurrent neural networks.

Neural Network

An artificial neural network is a layered structure of connected neurons, inspired by biological neural networks. It is not one algorithm but combinations of various algorithms which allows us to do complex operations on data. Recurrent Neural Networks: It is a class of neural networks tailored to deal with temporal data. The neurons of RNN have a cell state/memory, and input is processed according to this internal state, which is achieved with the help of loops with in the neural network. There are recurring module(s) of âtanhâ layers in RNNs that allow them to retain information. However, not for a long time, which is why we need LSTM models.

LSTM:

It is special kind of recurrent neural network that is capable of learning long term dependencies in data. This is achieved because the recurring module of the model has a combination of four layers interacting with each other.

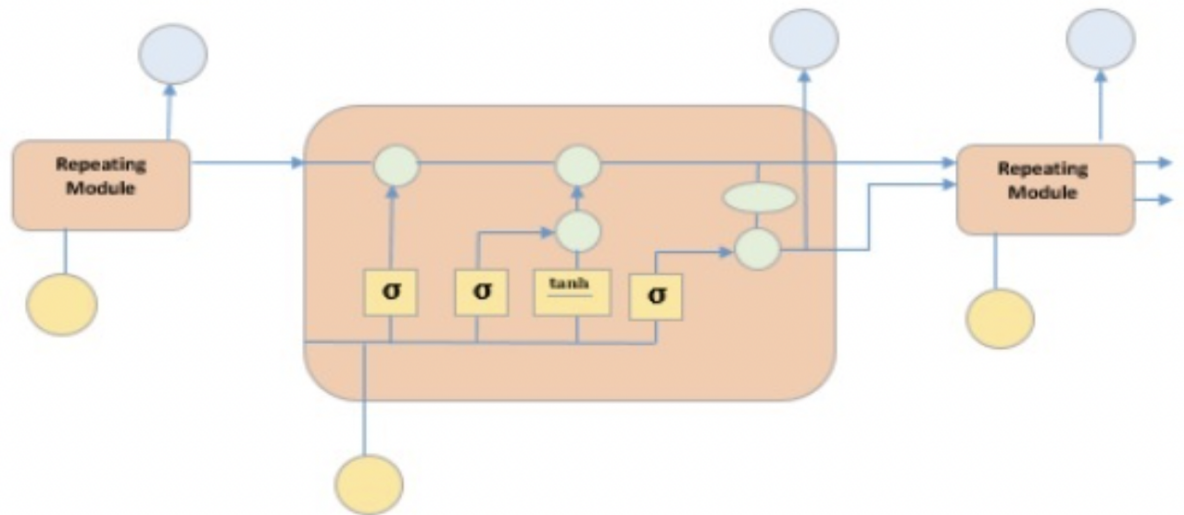


Figure 7.3: Method Diagram

Chapter 8

SYSTEM IMPLEMENTATION AND CODE

```
# Getting the predicted stock price of 2017
dataset_train = df.iloc[:800, 1:2]
dataset_test = df.iloc[800:, 1:2]
dataset_total = pd.concat((dataset_train, dataset_test), axis = 0)
inputs = dataset_total[len(dataset_total) - len(dataset_test) - 60:].values
inputs = inputs.reshape(-1,1)
inputs = sc.transform(inputs)
X_test = []
for i in range(60, 519):
    X_test.append(inputs[i-60:i, 0])
X_test = np.array(X_test)
X_test = np.reshape(X_test, (X_test.shape[0], X_test.shape[1], 1))
print(X_test.shape)
```

(459, 60, 1)

```
predicted_stock_price = model.predict(X_test)
predicted_stock_price = sc.inverse_transform(predicted_stock_price)
```

Figure 8.1: Code Snippet 1

```
model = Sequential()
#Adding the first LSTM layer and some Dropout regularisation
model.add(LSTM(units = 50, return_sequences = True, input_shape = (X_train.shape[1], 1)))
model.add(Dropout(0.2))
# Adding a second LSTM layer and some Dropout regularisation
model.add(LSTM(units = 50, return_sequences = True))
model.add(Dropout(0.2))
# Adding a third LSTM layer and some Dropout regularisation
model.add(LSTM(units = 50, return_sequences = True))
model.add(Dropout(0.2))
# Adding a fourth LSTM layer and some Dropout regularisation
model.add(LSTM(units = 50))
model.add(Dropout(0.2))
# Adding the output layer
model.add(Dense(units = 1))

# Compiling the RNN
model.compile(optimizer = 'adam', loss = 'mean_squared_error')

# Fitting the RNN to the Training set
model.fit(X_train, y_train, epochs = 100, batch_size = 32)
```

Figure 8.2: Code Snippet 2

Chapter 9

GUI/WORKING MODULES

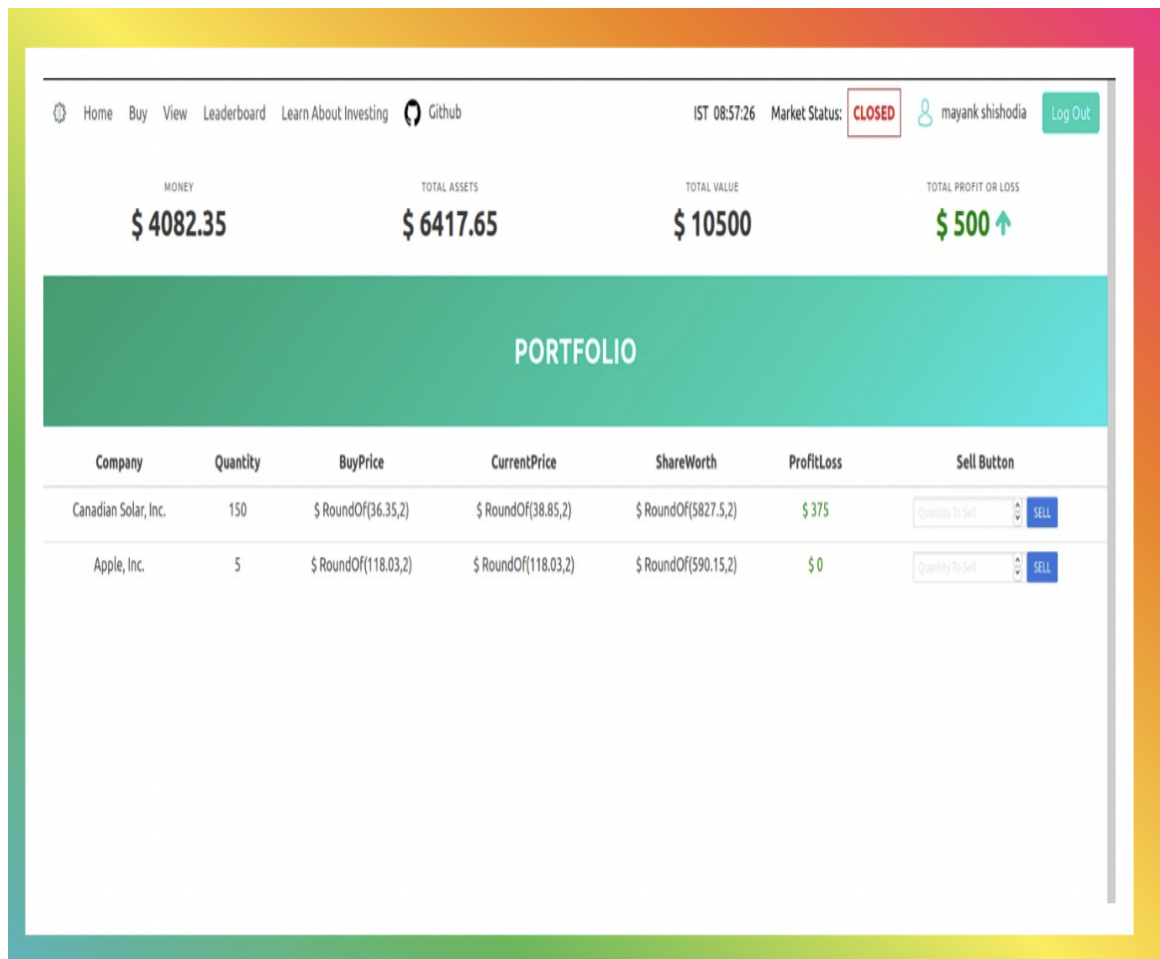


Figure 9.1: UI Snippet 1

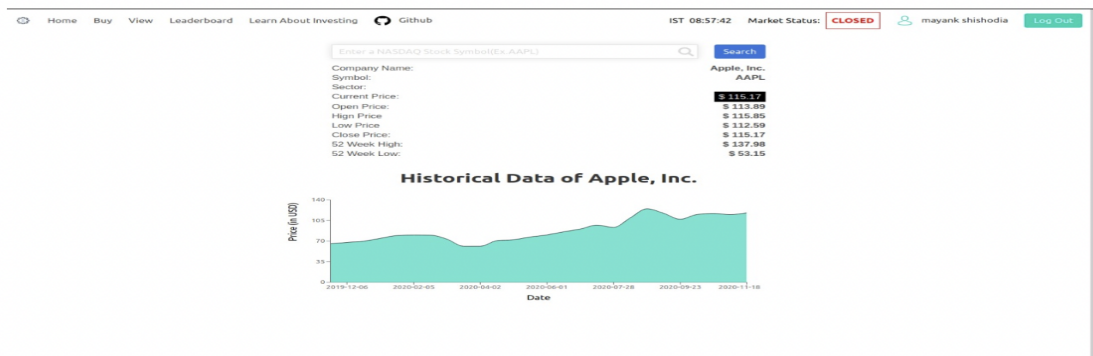


Figure 9.2: UI Snippet 2

UI Snippet 3 displays a leaderboard table. The top navigation bar is identical to the previous snippet, but the time is now IST 08:58:00. The market status remains CLOSED, and the user is still logged in as mayank shishodia.

LEADERBOARD		
Sr. No	Name of the User	Total Profit
1	MAYANK SHISHODIA	\$ 500.00
2	R. SANKALP SHUKLA	\$ 300.50
3	PAYAL	\$ -100.98
4	SHIKHA JHA	\$ -1943.89

Figure 9.3: UI Snippet 3

Chapter 10

Other Aspect of Stock Market

10.1 Stock's Trade Volume

If you ever look at the volume leaders for the trading day, you will almost always find Bank of America Corporation (BAC). On April 2, 2020, trading volume for BAC totaled 83,961,297. General Electric Company (GE) was even higher at 99,556,805. Those are big numbers, but where do they come from, and what do they mean? The first part of the question can be answered with ease: market exchanges. The second part requires a little more detail. While volume is only one tool of many, it adds value to your investment decision.

10.1.1 How It Works

Calculating volume is simply the total amount of shares traded for the day, which includes both buy and sell orders. You can determine the daily trading volume on your own—all transactions are publicly available—by calculating the total amount of shares traded. However, it's much easier to look at the daily trading volume on any stock chart. Time is money, after all, and it would be wise to save time. Daily trading volume shouldn't be confused with dollar volume, which is a stock's share price times its daily volume.

10.1.2 Why It Matters

If you see a stock that's appreciating on high volume, it's more likely to be a sustainable move. If you see a stock that's appreciating on low volume, it could be a dead cat bounce. Logically, when more money is moving a stock price, it means there is more demand for that stock.

If a small amount of money is moving the stock price, the odds of that move being sustainable are lower. Also, be careful of low-volume (illiquid) stocks, where you could end up trapped in a pump and dump scheme. Even if you were trying to play the artificial move, you might not be able to find a seller if the volume is low and you'd be locked into a losing trade.

There is one exception for buying low-volume stocks, which is when you have done your due diligence and concluded that you have found a good company that has yet to be discovered. In this scenario, you would have gotten in ahead of the curve. When volume increases, you will have the potential for a multi-bagger, which is every investor's dream scenario.

Another reason to steer clear of most low-volume stocks is the bid-ask spread. With illiquid stocks, the bid-ask spread is going to be wide, which can be costly. A high-volume stock, such as the aforementioned BAC, often has a tight bid-ask spread of a penny, which should do you minimal to no harm.

When you look at daily trading volume, don't just look at the trading volume for that particular day. This could be a small-cap stock that popped or dropped on news. In most cases, this won't be sustainable. Instead, look at the three-month average daily trading volume, which will give you a much better idea of whether the stock offers liquidity. If you're on the hunt for high-volume stocks, then you might want to begin with the New York Stock Exchange (NYSE) or Nasdaq. These exchanges have stricter requirements than other exchanges, which is positive because it keeps the riff-raff out of play.

10.1.3 The Bottom Line

Calculating volume is easy. Understanding what volume means is more important. While this should never be the only factor when weighing an investment or trading decision, it should always play a role, as it can impact your investments and trading strategy. Speech recognition will revolutionize the way people interacted with Smart devices will, ultimately, differentiate the upcoming technologies. Many areas can benefit from this technology. Speech Recognition can be used for intuitive operation of computer-based systems in daily life. This technology will spawn revolutionary changes in the modern world and become a pivot technology. Within five years, speech recognition technology will become so pervasive in our daily lives that service environments lacking this technology will be considered inferior.

Chapter 11

CONCLUSION

Use of recently introduced machine learning techniques in the prediction of stocks have yielded promising results and thereby marked the use of them in profitable exchange schemes. It has led to the conclusion that it is possible to predict stock market with more accuracy and efficiency using machine learning techniques. In the future, the stock market prediction system can be further improved by utilizing a much bigger data set than the one being utilized currently. This would help to increase the accuracy of our prediction models. And considering the fact that both the aspects are covered and the technology stack used is best method to use .

The final set of conclusions was also apparent after reflection. Financial investment theory needs to be a stronger driver underlying the ML systemsâ inputs, algorithms, and performance measures. If this is not the case then results may just be random and not have any practical use. Too many studies use techniques without consideration of the vast amount of financial theory that has been developed over the past centuries. Reporting failures where techniques do not improve predictive performance would also be informative. At this point this rarely occurs so it is impossible to find patterns where there is a mismatch between a particular stock market prediction problem and a machine learning technique.

Bibliography

- [1] Yadav, S. (2017). Stock Market Volatility-A Study of Indian Stock market. *Global Journal for Research Analysis*, 6(4), 629-632.
- [2] Pierrot, R., Liu, H. (2008, October). The Influence of Volume and Volatility on Predicting Shanghai Stock Exchange Trends. In *2008 Fifth International Conference on Fuzzy Systems and Knowledge Discovery* (Vol. 1, pp. 470-474). IEEE.
- [3] Li, G., Xiao, M., Guo, Y. (2019, October). Application of Deep Learning in Stock Market Valuation Index Forecasting. In *2019 IEEE 10th International Conference on Software Engineering and Service Science (ICSESS)* (pp. 551-554). IEEE.
- [4] Sismanoglu, G., Onde, M. A., Kocer, F., Sahingoz, O. K. (2019, April). Deep learning based forecasting in stock market with big data analytics. In *2019 Scientific Meeting on Electrical-Electronics Biomedical Engineering and Computer Science (EBBT)* (pp. 1-4). IEEE.
- [5] Feng, L., Yi-jun, L., Xian-wei, L. (2013, July). Research on the interactive effect of media attention and trading volume on stock return. In *2013 International Conference on Management Science and Engineering 20th Annual Conference Proceedings* (pp. 1734-1738). IEEE.
- [6] Tijare, Poonam. (2019). A Study on Fake News Detection Using Naïve Bayes, SVM, Neural Networks and LSTM.
- [7] Hammad, I., El-Sankary, K., Gu, J. (2019, December). A Comparative Study on Machine Learning Algorithms for the Control of a Wall Following Robot. In *2019 IEEE International Conference on Robotics and Biomimetics (ROBIO)* (pp. 2995-3000). IEEE.
- [8] Calvin Frans Mariel, W., Mariyah, S., Pramana, S. (2018, March). Sentiment analysis: a comparison of deep learning neural network algorithm

- with SVM and naDve Bayes for Indonesian text. In Journal E of Physics Conference Series (Vol. 971, No. 1, p. 012049).
- [9] Zhang, X., Liu, L., Xiao, L., Ji, J. (2020). Comparison of Machine Learning Algorithms for Predicting Crime Hotspots. *IEEE Access*, 8, 181302-181310.
 - [10] Kotsiantis, S. B., Zaharakis, I. D., Pintelas, P. E. (2006). Machine learning: a review of classification and combining techniques. *Artificial Intelligence Review*, 26(3), 159-190.
 - [11] Mohan, S., Mullapudi, S., Sammeta, S., Vijayvergia, P., Anastasiu, D. C. (2019, April). Stock price prediction using news sentiment analysis. In 2019 IEEE Fifth International Conference on Big Data Computing Service and Applications (BigDataService). IEEE.
 - [12] Khatri, S. K., Srivastava, A. (2016, September). Using sentimental analysis in prediction of stock market investment. In 2016 5th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions)(ICRITO). IEEE.
 - [13] Reddy, N. N., Naresh, E. (2020, July). Predicting Stock Price Using Sentimental Analysis Through Twitter Data. In 2020 IEEE International Conference on Electronics, Computing and Communication Technologies (CONECCT). IEEE.
 - [14] Angur M. Jarman, Samiul Arshad, Nashid Alam and Mohammed J.Islam, "An automated Bengali sign language recognition based on fingertip finder Algorithm", *International journal of Electronics Informatics*, 2015.B.Srivastava, R., Agarwal, S., Garg, D., Patni, J. C. (2016, October). Capital market forecasting by using sentimental analysis. In 2016 2nd International Conference on Next Generation Computing Technologies (NGCT). IEEE.
 - [15] Reddy, V. K. S. (2018). Stock market prediction using machine learning. *International Research Journal of Engineering and Technology (IRJET)*.