DASHBOARD FOR STOCK MARKET USING SENTIMENT ANALYSIS

Mini Project submitted in partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

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DECLARATION

We hereby declare that the project report entitled "**DASHBOARD FOR STOCK MARKET ANALYSIS USING SENTIMENT ANALYSIS**" is an original work done in the Department of Computer Science and Engineering, GITAM Institute of Technology, GITAM (Deemed to be University) submitted in partial fulfillment of the requirements for the award of the degree of B.Tech. in Computer Science and Engineering. The work has not been submitted to any other college or university for the award of any degree or diploma.

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Sincerely,

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ABSTRACT

The stock market is the aggregation of buyers and sellers of stocks, representing ownership claims on businesses. It is one of the most considerable opportunities for investment by companies and investors. Accurate stock market prediction is of great interest to investors; however, stock markets are driven by volatile factors such as microblogs and news that make it hard to predict stock market index based on historical data. Stock markets can be predicted using machine learning algorithms on information contained in social media and financial news. Financial data can change investors' behaviour. A dashboard is a one-stop solution to get a complete analysis of the share market. It is a dashboard where we get different graphs that explain various aspects of the share market. Here, we are using social media data, Yahoo Finance stock data, and Financial news data as input, and we are applying data preprocessing techniques and machine learning techniques. Random forest classifier is the consistent and highest accuracy of 75-76%.

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1. INTRODUCTION

Share market is the aggregation of buyers and sellers of shares. It includes *securities* listed on a public stock exchange and stock that is only traded privately, such as shares of private companies that are sold to investors through equity crowdfunding platforms. In simple words, we can say that we are giving our money to a company to do business and share profit based on the given amount. It is a golden opportunity to get profits just by investing without doing any work. Investment is often made via stock brokerages and electronic trading platforms. Investment is usually made with a strategy in mind based on the current situation of market conditions.

Fig.1. Share market trends

Share market allows businesses to be publicly traded and raise additional financial capital for expansion by selling shares of ownership of the company in a public market. The liquidity that an exchange affords the investors enables their holders to quickly and easily sell securities. This will provide a win-win situation for both the parties i.e.., investor and company.

Let us consider person A to understand the whole scenario, and A buys shares of B company 100 shares for RS 100/unit. Similarly, many other people bought shares. Company B got colossal capital to invest in their business. As B company gets profit, the share price goes high. When the price is Rs 1000/unit, A sells all his shares. He ends up with a gain of RS 90000.

The stock market plays a vital role in aiding companies to raise capital for expansion and growth. Through IPOs, companies issue stocks to the public and receive funds that are used for various purposes. The company gets listed on the stock exchange after IPO, which provides an opportunity to even a common man to invest in the company. The visibility of the company increases as well.

You can be a trader or investor in the stock market. Traders hold stocks for a short period, whereas investors hold stocks for a longer duration. As per your financial needs, you can choose the investment product.

The investors in the company can use this investment to fulfil their life goals. It's one of the powerful platforms for investment as it provides liquidity. For instance, you can buy or sell stock anytime based on the need. That is, financial assets can be converted to cash anytime. It offers ample opportunities for wealth creation.

You know well that you can earn money by investing in stocks. The following are the ways through which your money grows.

- 1. Dividends
- 2. Capital Growth
- 3. Buyback

1. Dividends:

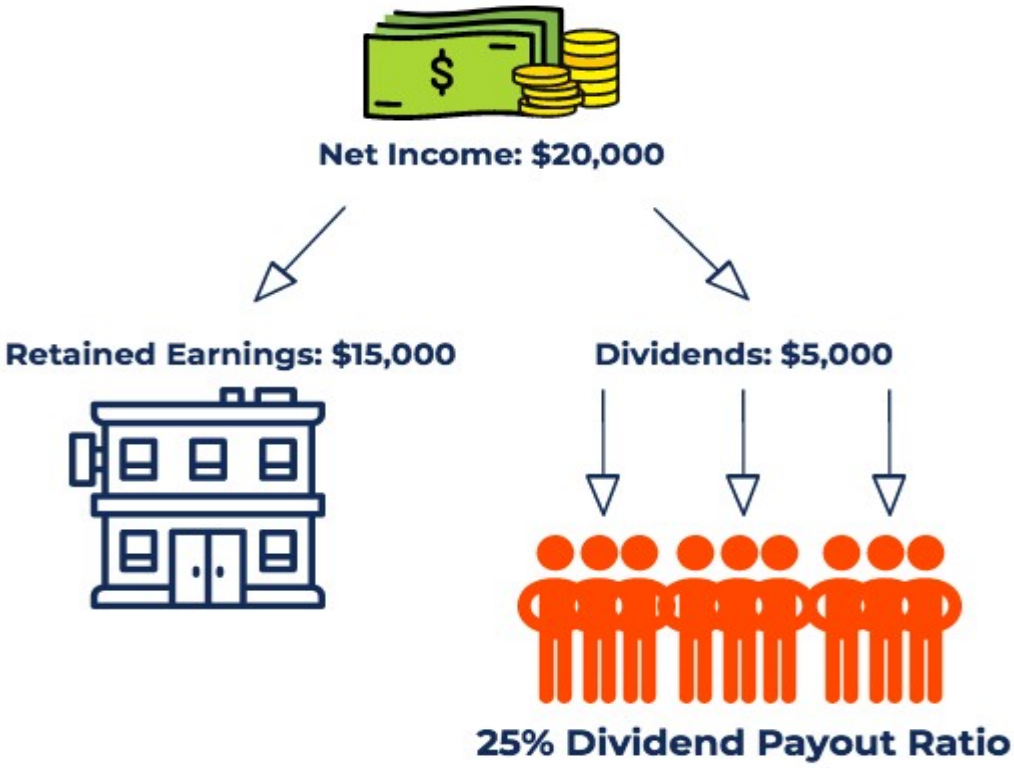


Fig.2. Dividends

1. These are the profits the company earns, and it is distributed as cash among the shareholders.
2. It is distributed according to the number of stocks you own.

2. Capital Growth:

Investment in equities/ stocks leads to capital appreciation. The longer is the duration of investment, the higher the returns. Investment in inventories is associated with risks as well. Your risk appetite is based on your age, dependants and need. If you are young and don't have any dependants, you can invest more in equities to get more yield. But if you have dependants and commitments, you can allocate more money to bonds and less to equity.

3. Buyback:

Fig. 3. Buyback

The company buys back its stock from the investors by paying a higher value than the market value. It buys back stocks when it has a huge cash pile or to consolidate its ownership.

We have many other options like Fixed deposits, Mutual funds, etc. More than any other option, this can give you more benefits. The **benefits of the stock market are**: -

- **Higher Liquidity**: High liquidity means that a company can quickly meet its short-term debts.
- **Versatility**: The stock market offers different financial instruments, such as stocks, bonds, mutual funds, and derivatives. This provides investors with a wide choice of products in which to invest their monies. In addition to providing investment choices, this flexibility helps mitigate the risks inherent to stock investing by enabling diversification of investment portfolios.
- **Higher Returns in Shorter Periods of Time**: More profit in short duration.
- **Acquire Ownership and Right to Vote**: Even if an investor acquires a single stock in a company, he receives a portion of its ownership. In turn, this ownership provides investors with the right to vote and contribute to the business's strategic movement. Although this may seem like an exaggeration, it is accurate. There are several instances when shareholders have prevented company management by making unreasonable decisions that are detrimental to their interests.
- **Regulatory Environment and Framework**: When investors invest in financial products on the stock market**,** their interests are well-protected by a regulatory framework. This significantly helps in reducing risks due to the fraudulent activities of companies.
- **Convenience**: Technical development has influenced every aspect of modern living. The stock exchanges are also using various technological advancements to provide greater comfort to the investors. The trades are all executed on an electronic platform to ensure investors' best investment opportunities in an open environment.

Everything in this world has both **advantages and disadvantages**. The stock market also has some disadvantages. They are: -

1. **Increased chances of volatilities:**

Considering that markets are volatile and ever-dynamic, investing in stocks involves their wagers. Stock prices spike and plummet multiple times within a single day. These fluctuations are mostly unforeseeable that can, in the process, pose risks to investments. Moreover, while chances of a large failure are not familiar, it can take years for the market to recover from the brunt of a crash. It is very tough to predict.

Fig.4. Depiction of the volatile nature of the stock market

2. **Brokerage can eat into profit margins:**

Every time an investor decides to buy or sell stocks, he/she will have to shell out a certain proportion as brokerage fees to the broker. This, in turn, can jeopardize profitability.

Fig. 5. Top stock broker companies in India

Stock Market Participants:

Along with long-term investors and short-term traders, there are many different types of players associated with the stock market. Each has a unique role, but many parts are intertwined and depend on each other to make the market run effectively.

- **Stockbrokers**, also known as registered representatives in the U.S., are licensed professionals who buy and sell securities on behalf of investors. The brokers act as intermediaries between the stock exchanges

and the investors by buying and selling stocks on the investors' behalf. An account with a retail broker is needed to gain access to the markets.

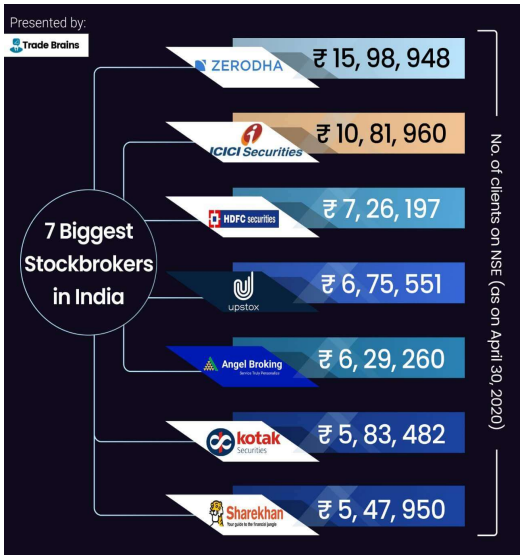


Fig. 6. Biggest stockbrokers in India

- **Portfolio managers** are professionals who invest portfolios, or collections of securities, for clients. These managers get recommendations from analysts and make the buy or sell decisions for the portfolio. Mutual fund companies, hedge funds, and pension plans use portfolio managers to make decisions and set the investment strategies for the money they hold.

Fig. 7. Portfolio Management Services

- **Investment bankers** represent companies in various capacities, such as private companies that want to go public via an IPO or companies involved in pending mergers and acquisitions. They take care of the listing process in compliance with the regulatory requirements of the stock market.

Fig. 8. Investment Banking in India

- **Custodian** and depot service providers, which are institutions holding customers' securities for safekeeping to minimize the risk of their theft or loss, also operate in sync with the exchange to transfer stocks to/from the respective accounts of transacting parties based on trading on the stock market.
- **Market maker**: A market maker is a broker-dealer who facilitates the trading of stocks by posting bid and ask prices and maintaining an inventory of stocks. He ensures sufficient liquidity in the market for a particular (set of) stock(s) and profits from the difference between the bid and the asking price he quotes.

Success Stories: -

- **Rakesh Jhunjhunwala– Successful Stock Market Investor**

Fig. 9. Rakesh Jhunjhunwala

Popularly known as Warren Buffet of the Indian stock market, Rakesh Jhunjhunwala entered the Indian market in 1985. He inherited the interest in stock trading from his father, talked with his friends, and Rakesh used to listen to them keenly. He joined the Chartered Accountancy course to acquire a professional degree

and completed in 1985. After that, he joined the Stock Market and started trading. His first most significant hit was 5000 stocks of Tata Tea, which he got for Rs 43 and sold for Rs143 in just three months. This gave him Rs. 5 Lakh, which was a big deal at that time. His next big bet was Sesa Goa. He purchased 4 lakh stocks and accumulated considerable profits in it. Many stocks made large sums of money for him like Lupin, Crisil etc.

Today his portfolio is worth over Rs. 20,000 crores / 3.2 Bn Dollars consists of Titan, Lupin and CRISIL as top holdings now. He is a renowned trader and investor of the Indian stock market and called Indian Warren Buffet.

- **Porinju Veliyath – a Mid class Family member, turned to CEO of Equity Intelligence**

Fig. 10. Porinju Veliyath

Porinju Veliyath was born in the year 1962 in a lower-middle-class family in Kochi. His early life was full of struggles. He joined various jobs along with studies to support his family. He went to Mumbai in 1990 in search of a job. He was appointed as a floor trader at Kotak Securities there. The Stock Market was a new field for him. Within a short period, he learned the in and out of the stock market and became an expert trader. He worked for four years there and gained a lot of knowledge. In 1994, he joined Parag Parikh Securities as a Research Analyst and fund manager. In 1999, he returned to Kochi and decided to make money from the stock market. He made his first significant investment in 'Geojit Financial Services.' The stock was trading at a low value at that time. Proving everybody wrong, this investment gave him manifold returns. In 2002, he started his portfolio management service (PMS) firm in the name of 'Equity Intelligence.' Today, he is one of the most well-known investors and fund-manager of recent times. Equity Intelligence stock picks like Emkay Global Financial Services and BCL Industries has raised by 200% in their stock prices and IZMO and Vista Pharma raised by 100% at their stock prices.

- **Vijay Kedia – From the family of stock brokers now turned to be successful investor**

Born in the family of stock-brokers, Vijay Kedia started his career in stock market in 1978 not because of choice but of compulsion as his father died. So, to earn the bread-butter for his family, he joined the family business of trading and stock-broking. Initially, he was not doing well. But, he did not lose hope and read about the stories of successful investors. He decided to switch in investing. He started learning about the fundamentals of companies. He owned Rs 35,000 at that time and by his own study, he invested the entire amount in a stock named Punjab Tractor. In 3 years, the stock multiplied 6 times and his Rs 35,000 grew into Rs. 2.1 Lakhs. Thereafter, he invested in ACC at the rate of Rs. 300. After a year, the stock multiplied 10 times and moved to Rs. 3,000 in second year. He continued to make successful investments in various stocks to create a wealth of 500 crores. His biggest success mantra is 'knowledge to find out quality stocks which one can acquire only by reading. If one doesn't have reading habits, he can't be a good investor.'

Vijay Kedia is betting now on Everest Industries and Vaibhav Global as multibagger stocks for 2018.

2. LITERATURE REVIEW

On 31 August 1957, the BSE became the first stock exchange recognized by the Indian Government under the Securities Contracts Regulation Act. Construction of the present building, the Phiroze Jeejeebhoy Towers at Dalal Street, Fort area, began in the late 1970s and was completed and occupied by the BSE in 1980.

Later on, NSE was incorporated in 1992. It was recognized as a stock exchange by SEBI in April 1993 and commenced operations in 1994 with the wholesale debt market launch, followed shortly after by the launch of the cash market segment.

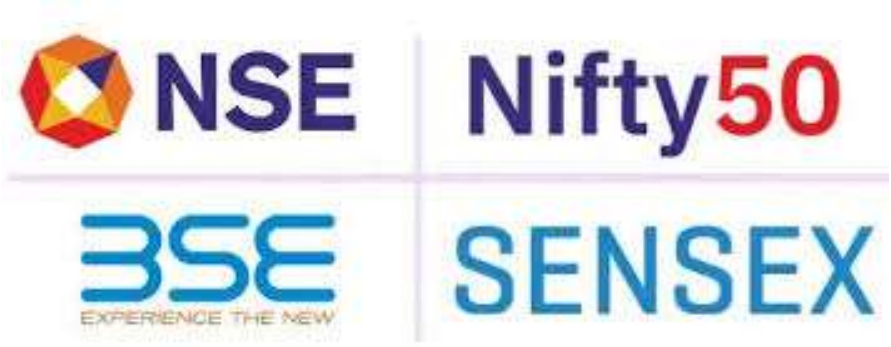


Fig. 11. Stock Exchange

In the initial days, people didn't understand the concept of the stock market. After many years, people understood the stock market as gambling, and they started investing without thinking. Some people got profits, and some lost money completely.

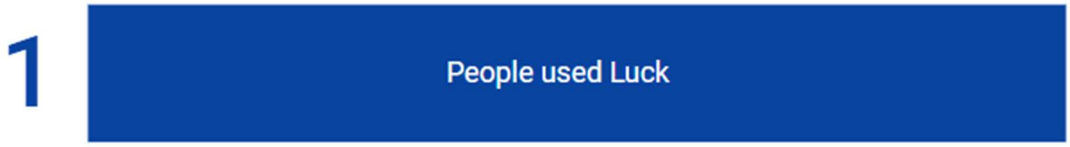
The education rate went high year by year, and people started analyzing the market. They used newspapers and their intelligence. Huge profits and losses are seen as it was very tough to understand the whole situation.

Brokerages and the internet came into the pictures. They tried to help a lot. In many situations, they solved the problem, but they failed in many cases. Many websites tried to solve, which helped a lot of questions.

Presently, the world is running with AI. That has entered to solve the problem. The research is still going on.

STEPWISE TRANSFORMATION:

1. People used Luck
2. People believed in newspapers
3. People believed in agencies
4. People believed in the technology



Initially, when there was no information source to understand and analyze stock trends, people highly relied on their gut or intuition. People take stock associated decisions hoping to gain profits. Most people try to analyze the general directions and decide based on that. They do not necessarily have the knowledge and information to understand the trends differently before they act on it.

Fig. 12. No Newspapers

Unlike now, people did not have any source of information like the newspapers, social media, or search engines like now to gain knowledge about different companies and the stock trends, and that was a significant shortcoming. People believed in whatever they heard from other people and based their decisions on how much they trust the source they've listened to the information from. Individual investors' decision-making is usually based on their age, education, income, investment portfolio, and other demographic factors.

Fig. 13. Individual Opinion

Ultimately, all the stock associated decisions that people take were based on their personal choice or some source of information that could be highly unreliable. And most probably, the result might not be in favor because the factors that the decision is based on is not so dependable.

2 People believed News paper

Newspaper is quite a powerful tool. It is the first reliable source of information that circulates updates or facts to people. People get their daily dose of news from newspapers early in the morning. It is quite a reliable source which gives us information only after thoroughly investigating the report.

Besides, newspapers are readily available in the most remote regions as well. They are also very economical, which gives an abundance of information at a low cost. Most importantly, newspapers are published in various languages that make it easier for people of all regions to get news in their local language. Thus, we see how newspapers have numerous advantages that help people stay informed of stock trends or updates.

Fig. 14. Stock trends in the newspaper

Though newspapers provide them with all the accurate data, it was not easy to predict the stock trends. Though it's cost-friendly, it is very time taking to understand all the stock trends and make a decision based on the knowledge or information gained from the newspaper

Fig. 15. Business information from the newspapers

3 People believed Agencies

Eventually, people evolved to depend on agencies that act as stockbrokers. These agencies analyze the stock trends deeper by considering many factors like the investor's portfolio, stocks trends over the last few weeks or months, economic growth, price to earnings ratios, and related market trends. The agency's goal is to provide the best suitable suggestion to an investor whether or not he/she should invest since the agency has a much deeper insight into how to decide to incur greater profits.

Fig. 16. Decision Making

Though the agencies do their part as stockbrokers, their decision or suggestion might not have worked for the best. Besides, it costs the investors some money to approach an agency for stock decisions and get their help. So unlike earlier, it isn't free of cost. But since stock decision costs them a lot of money, people tend to approach stockbrokers anyway.

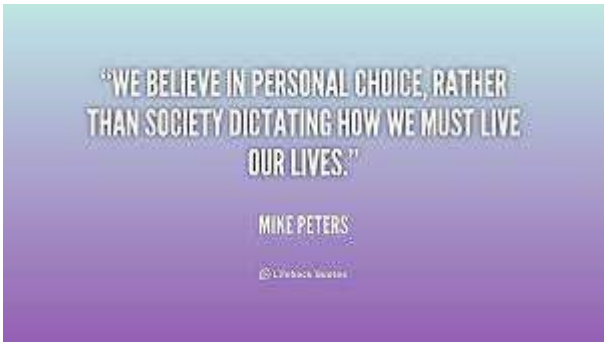


Fig. 17. Quote on Personal Choice

To a great extent, the analysis of stock trends to make decisions relies upon the personal choice based on what factors the investor wants to consider to make his decision. But when an investor depends on an agency for their stock decisions, then investor lose their sense of choice in making the decision. Investors personal preference is not the priority in making decisions when an agency is hired as stockbrokers. These are the drawbacks of hiring an agency for associated stock decisions.

4 People believed Technology

Everything has started once the internet has got into the world. The complete trading style has changed.

Fig. 18. Technology for analysing stocks

Internet is a vast global area network that connects computer systems across the world. It includes several high-bandwidth data lines that comprise the Internet "backbone." These lines are connected to major Internet hubs that distribute data to other locations, such as web servers and ISPs.

To connect to the Internet, you must have access to an Internet service provider (ISP), which acts as the middleman between you and the Internet. Most ISPs offer broadband Internet access via a cable, DSL, or fibre connection. When you connect to the Internet using a public Wi-Fi signal, the Wi-Fi router is still

connected to an ISP that provides Internet access. Even cellular data towers must link to an Internet service provider to offer connected devices with access to the Internet.

The Internet provides different online services. Some **examples** include:

- **Web** – a collection of billions of webpages that you can view with a web browser
- **Email** – the most common method of sending and receiving messages online
- **Social media** – websites and apps that allow people to share comments, photos, and videos
- **Online gaming** – games that allow people to play with and against each other over the Internet
- **Software updates** – operating system and application updates can typically download from the Internet

In the early days of the Internet, most people connected to the Internet using a home computer and a dial-up modem. DSL and cable modems eventually provided users with "always-on" connections. Now mobile devices, such as tablets and smartphones, make it possible for people to be connected to the Internet at all times. The Internet of Things has turned common appliances and home systems into "smart" devices that can be monitored and controlled over the Internet. As the Internet continues to grow and evolve, you can expect it to become an even more integral part of daily life.

The first recorded description of the social interactions that could be enabled through networking was a series of memos written by J.C.R. Licklider of MIT in August 1962 discussing his "Galactic Network" concept. He envisioned a globally interconnected set of computers through which everyone could quickly access data and programs from any site. In spirit, the idea was very much like the Internet of today. Licklider was the first head of the computer research program at DARPA, four starting in October 1962. While at DARPA, he convinced his successors at DARPA, Ivan Sutherland, Bob Taylor, and MIT researcher Lawrence G. Roberts, of this networking concept's importance.

At MIT, Leonard Kleinrock published the first paper on packet switching theory in July 1961 and the first book on the subject in 1964. Kleinrock convinced Roberts of communications' theoretical feasibility using packets rather than circuits, which was a significant step towards computer networking. The other critical step was to make the computers talk together. To explore this, in 1965, working with Thomas Merrill, Roberts connected the TX-2 computer in Mass. to the Q-32 in California with a low-speed dial-up telephone line creating the first (however small) wide-area computer network ever built. This experiment's result was the realization that the time-shared computers could work well together, running programs and retrieving data as necessary on the remote machine, but that the circuit-switched telephone system was inadequate for the job. Kleinrock's conviction of the need for packet switching was confirmed.

In late 1966 Roberts went to DARPA to develop the computer network concept and quickly put together his plan for the "ARPANET," publishing it in 1967. At the conference where he presented the paper, a paper on a packet network concept from the UK by Donald Davies and Roger Scantlebury of NPL.

Scantlebury told Roberts about the NPL work as well as that of Paul Baran and others at RAND. The RAND group had written a paper on packet switching networks for secure voice in the military in 1964. It happened that the work at MIT (1961-1967), at RAND (1962-1965), and NPL (1964-1967) had all proceeded in parallel without any of the researchers knowing about the other work. The word "packet" was adopted from work at NPL, and the proposed line speed to be used in the ARPANET design was upgraded from 2.4 kbps to 50 kbps.

In August 1968, after Roberts and the DARPA funded community had refined the ARPANET's overall structure and specifications, an RFQ was released by DARPA to develop one of the critical components, the packet switches called Interface Message Processors (IMP's). The RFQ was won in December 1968 by a group headed by Frank Heart at Bolt Beranek and Newman (BBN). As the BBN team worked on the IMP's with Bob Kahn playing a significant role in the overall ARPANET architectural design, the network topology and economics were designed and optimized by Roberts working with Howard Frank and his team at Network Analysis Corporation, and Kleinrock's team at UCLA. 6 prepared the network measurement system

Due to Kleinrock's early development of packet switching theory and his focus on analysis, design and measurement, his Network Measurement Center at UCLA was selected as the first node on the ARPANET. All this came together in September 1969 when BBN installed the first IMP at UCLA, and the first host computer was connected. Doug Engelbart's project on "Augmentation of Human Intellect" (which included NLS, an early hypertext system) at Stanford Research Institute (SRI) provided a second node. SRI supported the Network Information Center, led by Elizabeth (Jake) Feinler and including functions such as maintaining tables of hostname to address mapping and a directory of the RFC's.

Once the Internet entered India in a small way, the trading style changed. According to the Securities and Exchange Commission, investors have unprecedented access to information about companies and their stocks. The Internet provides current stock prices, company earnings reports, and breaking news about stocks and the companies issuing those stocks. Financial advisers can relay recent developments to their clients, and companies can track their stock's performance in real-time. The result of this nearly instantaneous information is better-informed investors, traders and advisers.

Execution of Trades:

Computer systems record buy and sell orders quickly that investors can know their price and other details within seconds. Also, because electronic trading eliminates the handling of transactions by people, errors have become infrequent. Though the long-established standard of three days remains in effect for verification that money has changed hands and the stocks have been recorded in the buyer's account, electronic trades accomplish all of that in seconds in practice.

High-Frequency Trading:

Electronic trading has encouraged the phenomenon of high-frequency trading. People using this trading style buy and sell stocks within the same day, sometimes executing a full buy-and-sell cycle within minutes. Though this gave rise to what is commonly called "day trading" for individuals, the actual impact comes from institutional investors who initiate trades in millions of stocks in a matter of moments. This can trigger a buying or selling frenzy among other investors who want to participate in what they see as a trend developing in a particular stock. This type of trading was unavailable when trading was much slower.

Program Trading and Glitches:

Many institutional investors, such as mutual funds, hedge funds and pension funds, use programs to buy and sell stocks. This can result in a sudden sell-off or purchase of supplies because the program has a specific date and time to make the trade. The sudden volume can fool investors. Besides, some institutional investors experience technology glitches that can trigger impulsive buying and selling. These events can put traders in a panic because they see no news to justify the trades and assume that they should buy or sell the stock to be in on the action.

EVOLUTION OF TECHNOLOGY IN STOCK ANALYSIS

In the beginning, only agencies used the internet. But slowly, the internet penetrated into everyone's life. After the internet, Artificial intelligence rose and conquered everything. Mainly, it is a specialist in predicting trends. This helped many people in many ways. Technology took over everything. Technological developments have influenced a lot of businesses, governments, social lives, and education.

Nowadays, people can easily access the resources and information they need to maintain and run their businesses. One of the areas that have been greatly influenced by technology is the stock market. If you want to be successful in stock trading, you must embrace technology. As an investor or broker, you may have realized how technology can help one become a great investor. The following are **different ways technology influences stock markets**.

- **Stock Brokers and Technology:**

  In the past, traders at the stock exchange used to shout out orders. They would gather around the stock trading area and begin shouting matches. Fortunately, that is no longer the case, as trading has been made a lot easier. Nowadays, you do not have to call orders, and you can quickly get the best stocks by researching online.

Moreover, research has dramatically improved. In the past, people had to look for information in the library, contact companies, and read financial literature. You can now get the information you need about different companies quickly.

- **Digital Stock Trading:**

Fig. 19. Digital Stock Trading

Technology has changed how people trade. For instance, technology resulted in high-frequency trading. This is where traders ought to purchase and sell stocks within a short period. High-frequency trading is also known as day trading.

This has had a massive impact on people's lives. That is because it is simple to make investments in stock trading with minimal risk. You can even earn a lot of money within a single day. Investors that want to make huge investments will always feel a significant impact on the returns.

- **Monitoring Real-time Stock Performance**:

The use of advanced computers has made it easy to buy and sell stocks. Also, it makes displaying them relatively easy. That makes it for investors or brokers to know the Stock prices of a given stock and get the details within a few seconds. Also, you can get information you can trust. If you want to invest in a given company, you can quickly gather a lot of information concerning the company before investing your hard-earned money. Also, technology has reduced the incidences of human errors in transactions. That is because most of the transactions are now made by advanced computers. It is easy to research the company's progress and choose the right investment and close your trade if you feel it is at significant risk. That explains why a lot of people go for day trading as it is less risky. The invention of the internet and technology is the most significant revolution. That is because they have changed how people carry out their businesses and even make trades.

- **Use of apps in trading:**

Various stock trading apps have been developed. These apps have made it easier to access the stock markets. Also, stock trading providers that are technology-driven have substantially fewer overheads resulting in a drastic reduction in fees. You should note that huge costs turn off most investors and traders as they reduce their overall turnover. With decreasing costs, investors can now trade any given amounts and create wealth.

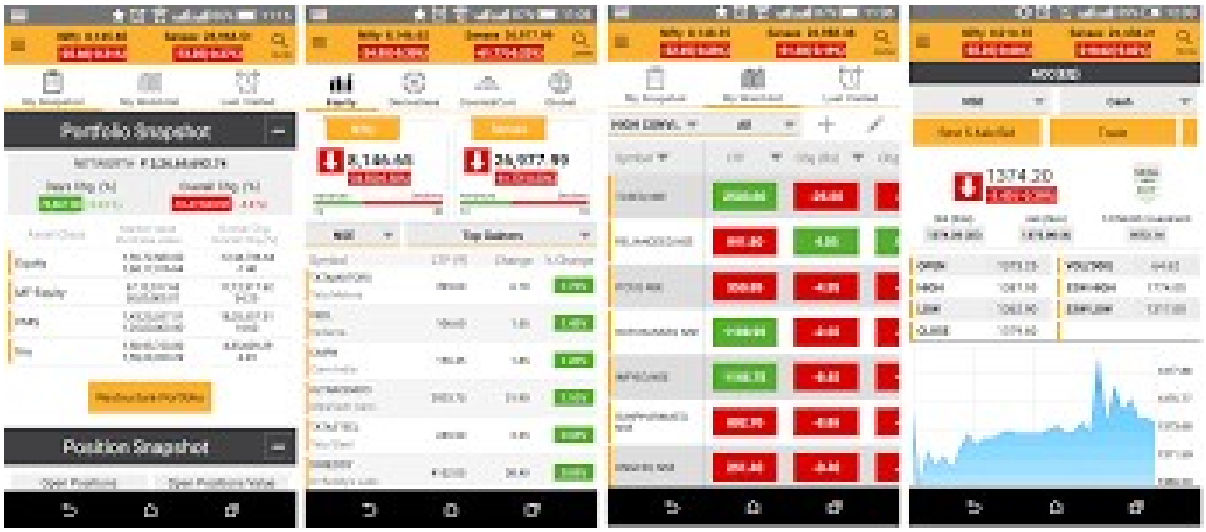


Fig. 20. Apps for trading

These apps can be installed on smartphones means they allow people to trade anywhere and anytime. Therefore, people are less restricted as far as stock trading is concerned. The good thing about the less static method is that it opens up many possibilities that change how stock trades are carried out. For instance, you can find a lot of websites that provide free trading. With a demo account, you can learn the basics of stock trading before you start trading with real money.

- **Speedy Transactions**:

You will agree that most transactions are now done instantly. In the past, transactions were done by shouting from one person to another and through telephones. Now they are done online. As a result of speedy transactions, more trades are being executed. As the market changes take place, investors can now react as quickly as possible. Quick reactions to the new information mean that the markets keep changing faster than ever.

- **Easy Decision Making:**

With easy access to the internet, people can now get the information they need. In this way, you can easily make decisions. Rather than relying on other people's analysis and recommendations, they can now download company reports and make their judgments whether the investment is good or not. Also, the information you get is in-depth, as various technological tools can analyze it for you. Thus, you have everything you need to make informed decisions. A lot of companies offer real-time information on stock markets. In this way, they allow you to see potential trends you should capitalize on and take advantage of the ever-changing stock market.

- **Sporadic Shifts**:

It is vital to note that not all aspects of technology have been useful in the stock market. There are situations where the stock movements have been found to have been triggered by false signals. Considering how quickly information is disseminated in this era, there have been instances where investors have relied upon misleading information. Also, automated trading has got rid of the need for market signals. Moreover, mechanical trades have been found to cause sudden shifts and panic in stock markets. Well, technology has also proven to help correct such situations.

Technology has revolutionized many sectors and areas of the world. For instance, it has improved the quality of life, accelerated manufacturing, and has made various aspects of life more effective and efficient. The stock market and financial markets have received their fair dose of technology. The above are some of the many ways that technology is shaping the future of stock trading. If technology is removed from stock trading today, huge losses will occur. It is a fact to say that technology has had a tremendous impact on stock markets, and it is bound to shape their future. Remember that technology has its merits and demerits in stock trading and the financial market.

Artificial intelligence showed unbelievable change. It is a trend setter, world started running 10 times faster to use AI usefully.

Artificial intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions. The term may also be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving.

The ideal characteristic of artificial intelligence is its ability to rationalize and take actions that have the best chance of achieving a specific goal.

When most people hear the term artificial intelligence, the first thing they usually think of is robots. That's because big-budget films and novels weave stories about human-like machines that wreak havoc on Earth. But nothing could be further from the truth.

Artificial intelligence is based on the principle that human intelligence can be defined in a way that a machine can easily mimic it and execute tasks, from the simplest to those that are even more complex. The goals of artificial intelligence include learning, reasoning, and perception.

As technology advances, previous benchmarks that defined artificial intelligence become outdated. For example, machines that calculate basic functions or recognize text through optimal character recognition are no longer considered to embody artificial intelligence, since this function is now taken for granted as an inherent computer function.

AI is continuously evolving to benefit many different industries. Machines are wired using a cross-disciplinary approach based in mathematics, computer science, linguistics, psychology, and more.

The applications for artificial intelligence are endless. The technology can be applied to many different sectors and industries. AI is being tested and used in the healthcare industry for dosing drugs and different treatment in patients, and for surgical procedures in the operating room.

Other examples of machines with artificial intelligence include computers that play chess and self-driving cars. Each of these machines must weigh the consequences of any action they take, as each action will impact the end result. In chess, the end result is winning the game. For self-driving cars, the computer system must account for all external data and compute it to act in a way that prevents a collision.

Artificial intelligence also has applications in the financial industry, where it is used to detect and flag activity in banking and finance such as unusual debit card usage and large account deposits—all of which help a bank's fraud department. Applications for AI are also being used to help streamline and make trading easier. This is done by making supply, demand, and pricing of securities easier to estimate.

Since its beginning, artificial intelligence has come under scrutiny from scientists and the public alike. One common theme is the idea that machines will become so highly developed that humans will not be able to keep up and they will take off on their own, redesigning themselves at an exponential rate.

Another is that machines can hack into people's privacy and even be weaponized. Other arguments debate the ethics of artificial intelligence and whether intelligent systems such as robots should be treated with the same rights as humans.

Self-driving cars have been fairly controversial as their machines tend to be designed for the lowest possible risk and the least casualties. If presented with a scenario of colliding with one person or another at the same time, these cars would calculate the option that would cause the least amount of damage.

Another contentious issue many people have with artificial intelligence is how it may affect human employment. With many industries looking to automate certain jobs through the use of intelligent machinery, there is a concern that people would be pushed out of the workforce. Self-driving cars may remove the need for taxis and car-share programs, while manufacturers may easily replace human labour with machines, making people's skills more obsolete.

AI has created strong impact on stock market. Companies and their usage of AI in stock market.

- TRADING TECHNOLOGIES:

Location: Chicago
How it's using AI in trading: Through its acquisition of Neurensic, Trading Technologies now has an AI platform that identifies complex trading patterns on a massive scale across multiple markets in real time. Combining machine learning technology with high-speed, big data processing power, the company provides clients with an ongoing assessment of compliance risk.
Industry impact: Chicago-based Neurensic was acquired by Trading Technologies in late 2017.

- GREENKEY TECHNOLOGIES

Location: Chicago
How it's using AI in trading: GreenKey Technologies' AI for trading uses speech recognition and natural language processing technology to save traders time searching through conversions, financial data and notes. With the company's platform, financial professionals are using AI to sift through, and access, notes, market insights and trending companies in real-time.

- KAVOUT

Location: Seattle, Wash.
How it's using AI in trading: Kavout's "K Score" is a product of its Kai intelligence platform that processes massive diverse sets of data and runs a variety of predictive models to come up with stock-ranking rating. With the help of AI, the company recommends daily top stocks using pattern recognition technology and a price forecasting engine. Its model portfolios are enhanced by AI algorithms.

- AUQUAN

Location: London, U.K.
How it's using AI in trading: Auquan's data science competition platform democratizes trading by allowing data scientists from all backgrounds to produce algorithmic trading strategies that help solve investment challenges. As a result, investment clients can reap the benefits of data science without the need for pricey in-house expertise.
Industry impact: Auquan graduated Techstars 2018 and were recently named Hottest Fintech in Europe at the 2019 Europa awards.

- EPOQUE

Location: Switzerland
How it's using AI in trading: Epoque's fully automated AI trading has three "engines": a strategy engine that observes and analyses potential trades; an order engine that creates orders and performs operational actions; and a logical engine that handles active orders and uses machine learning to improve its performance.

- SIGMOIDAL

Location: Warsaw, Poland
How it's using AI in trading: Sigmoidal is a consulting firm that offers end-to-end machine learning, data science, AI and software development for business — including the trading sector. In one case, its team of experts helped formulate an investment strategy by developing an intelligent asset allocation system that used deep learning to predict every asset in a particular portfolio.

- EQUBOT

Location: San Francisco
How it's using AI in trading: IBM-affiliated EquBot's proprietary investment technology combines AI with an active exchange-traded fund (ETF). By gathering and processing data gleaned from various sources (news articles, social media postings, financial statements) around the world, the company systematizes the investment process to "build a cause-and-effect understanding of markets, companies and management."
Industry impact: EquBot recently launched the AI Powered International Equity ETF targeting opportunities in developed international markets outside the U.S.

- AITRADING

Location: London, U.K.
How it's using AI in trading: Startup AITrading's "trading ecosystem" combines AI and the trading community to increase earnings by scanning markets to locate optimal trading opportunities. Deals are done via blockchain-based smart contracts. All actions are logged on blockchain and cannot be changed.
Industry impact: The company recently announced a crowdfunding campaign to raise funds for its trading platform.

- TRADE IDEAS

Location: San Diego, Calif.
How it's using AI in trading: Overnight, Trade Ideas' AI-powered self-learning robo-trading platform "Holly" subjects dozens of investment algorithms to more than a million different trading scenarios to increase the alpha probability in future sessions. Only those strategies with a success rate of 60% and above and a 2:1 profit factor are shared with traders the next day.
Industry impact: The company's actionable intelligence considerably outperformed market benchmarks in the first quarter of 2018, returning 16% to the S&P's -1.0%.

- IMPERATIVE EXECUTION INC.

Location: Stamford, Ct.
How it's using AI in trading: Comprised of experienced traders, analysts and engineers, Imperative Execution builds "efficient financial exchanges" with the help of its product IntelligentCross, which uses AI to optimize the trading of U.S. equities.
Industry impact: Hedge Fund chief Steve Cohen's Point72 Ventures LLC recently became the first to invest in Imperative Execution.

- INFINITE ALPHA

Location: London, U.K.
How it's using AI in trading: Infinite Alpha uses AI to facilitate crypto-asset trading. It offers protection to trading professionals via advanced authentication, encryption, hardware security modules and more. Using its intuitive dashboard interface, users can easily access account details, balances and transaction histories.

- WOA

Location: London, U.K.
How it's using AI in trading: WOA (which stands for War of Attrition) aims to boost client profits in part by employing AI for real-time market analysis. The service is available for only a select group of users that include fund-to-fund, hedge funds, ultra-high net worth individuals and sovereign wealth funds.

- TECHTRADER

Location: San Francisco
How it's using AI in trading: A fully autonomous stock trading system that requires no human intervention, Techtrader has been live for seven years. Requiring no adjustments or updates, it combines a human-like perspective on stocks with the discipline and attention span of a machine. According to the company, that's like "having a thousand traders each focusing on a single stock." A related hedge fund launched in 2015.

Coming to researches:

1. **Before the Internet**: Only formulas and relations between factors
2. **After the Internet:** How to use the internet for the stock market? Only article but not research papers.
3. **After AI:**
   a) Prediction of stock price:
      1. Example - Stock Market Prediction Using Machine Learning - IEEE Ishita Parmar; Navanshu Agarwal; Sheirsh Saxena; Ridam Arora; Shikhin Gupta; Himanshu Dhiman; Lokesh Chouhan
      2. Example - Stock Closing Price Prediction using Machine Learning Techniques - Elsevier Mehar Vijh; Deeksha Chandola; Vinay Anand Tikkiwal; Arun Kumar

   b) Predicting trends:
      1. Example - Stock market prediction using machine learning classifiers and social media, news - Wasiat Khan; Mustansar Ali Ghazanfar; Muhammad Awais Azam; Amin Karami; Khaled H. Al Youbi; Ahmed S. Al Fakeeh and many more.

Recent researches:

Alostad H, Davulcu H (2015) Directional prediction of stock prices using breaking news on Twitter. In: IEEE/WIC/ACM international conference on WI-IAT 1, pp 523–530

Attigeri GV, MM MP, Pai RM, Nayak A (2015) Stock market prediction: a big data approach. In: IEEE Region 10 conference on TENCON, pp 1–5

Bastianin A, Manera M (2018) How does stock market volatility react to oil price shocks? Mach Dyn 22(3):666–682

Brown GW, Clif MT (2004) Investor sentiment and the near-term stock market. J Empir Financ 11(1):1–27

Chakraborty P, Pria US, Rony M, Majumdar MA (2017) Predicting stock movement using sentiment analysis of the Twitter feed. In: IEEE 6th international conference ICIEV-ISCMHT, pp 1–6

Chen L, Qiao Z, Wang M, Wang C, Du R, Stanley HE (2018) Which artificial intelligence algorithm better predicts the Chinese stock market? IEEE Access 6:48625–48633 and many more

3. PROBLEM ANALYSIS

3.1. PROBLEM DEFINITION:

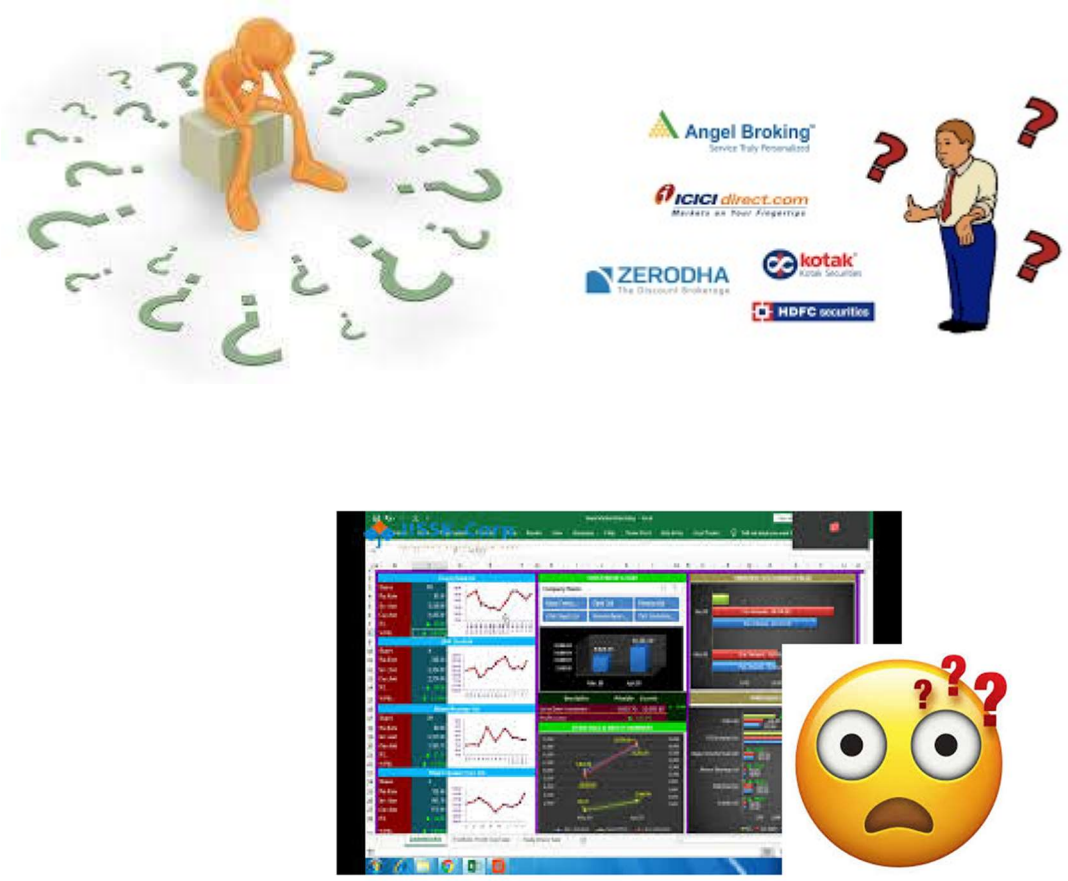


Fig. 21. Stock related doubts

Whenever we think of the stock market, we get frustrated with many glitches. Some of the main glitches are: -

- Where to invest?
- Buy or sell?
- Whom to believe?
- How to tackle a dashboard? And many more.

Fig. 22. Confusion about investing

3.2 ROOT CAUSES

The main problem is the fluctuations in the market. These depend upon the various factors. The following are the factors that influence stock prices: -

1. Demand and Supply:

Demand and supply of securities influence the price of securities. Suppose the demand for deposits is more than the supply (buyers are more than the sellers), securities increase. On the other hand, if the securities' market is less than the supply (buyers are less than the sellers), deposits decrease.

2. Bank Rate:

In the case of a lower bank rate (lower interest rate), the demand for funds would be higher, and the demand for securities would be high, whereas in the case of a higher bank rate (high-interest rate). the demand for funds would be lower and therefore the demand for securities would be lower.

3. Market Players:

The market players influence security prices. If the number of bulls is more than the bears, then the costs of securities would increase. On the other hand, if the bears are more than the bulls, the securities prices would decline.

4. Dividend Announcements:

Dividends act as a signaling device for stock price movement. Dividend announcements influence stock prices. If companies announce dividends, generally, stock prices of those companies tend to increase. An important point to note is that if the dividend rate is less than expected by investors, stock prices will decline, whereas if they are up to expected. Stock prices would increase.

5. Management Profile:

Management profile significantly influences companies' success and, therefore, they have an essential influence on stock prices. If the management comprises educated, experienced professionals with a successful track record, then stock prices would be higher. In case the company is taken over by management having a low reputation, then the stock prices would fall.

6. Trade Cycle:

Trade cycles refer to cyclical fluctuations in economic activity. During boom conditions, the stock prices would be at their peak, and during the depression, they would be at their lowest point. Stock prices would gradually increase during recovery conditions and would fall during conditions of recession.

7. Speculation:

In case speculation in the market is high or the stock's premise is high, then the price of that stock would show high fluctuations. In case speculation is at a low level, then the changes in stock price would be lower.

8. Political Factors:

Political factors such as the party's ideology in power, policies of the government, relations with other countries influence stock prices. E.g. when the UPA government won elections, stock prices fell greatly because it was felt that the communist parties would control the government policies.

9. Industrial Relations:

If there is a good relationship between the workers and the management of a company, the productivity would be high, leading to better profits. Therefore, stock prices would be higher. If industrial relations are poor and strikes and lockouts occur regularly, its performance would be insufficient. Therefore, stock prices would fall.

10. Stability of Government:

When there is a stable government, businessmen feel confident to invest in new businesses and expand existing businesses. Production, sales and profits are higher, and consequently, stock prices would increase. In case of instability in the government, new investments do not take place. Demand, production and profits are lower, and stock prices fall.

11. General Market Sentiments:

It is generally said that sentiments move the markets. If there is optimism among market players, more buying will occur, leading to an increase in stock prices. In case market players are pessimistic, then more selling would take place, pushing down stock prices.

12. Actions of Institutional Investors:

Stock prices are influenced by Institutional investors such as mutual funds, investment trusts, pension funds etc. They have a large number of funds at their disposal. When they start buying, stock prices will increase, and when they sell, stock prices decline.

13. Level of Foreign Investment:

In recent times, foreign institutional investors (FII's) have played a significant role in influencing stock prices. If the level of foreign investment in the market increases (more buying of stocks), then the stock prices increase. If the level of foreign investment decreases or if FIIs sell their assets, then the markets fall.

14. Returns Offered by Other Markets:

If the Indian markets offer high returns, institutional investors (especially FII's) will invest in Indian markets. Demand for stocks would increase, and prices rise. In case returns offered by markets in other countries are attractive, then institutional investors would sell their securities to invest in those markets. In such cases, stocks would be sold in large quantities lowering prices.

15. Availability of Credit:

In case credit is available without much restriction, investors would borrow to invest in the markets. Demand for stocks would be more, and therefore prices rise. In case credit is restricted, then the level of borrowing would be less and demand for stocks would also be lower.

16. Effective Regulation:

If the stock market is run transparently with effective regulation, the investors would feel confident to invest. Therefore, more buying would take place, and stock prices increase. But when code is ineffective, and scams occur (Harshad Mehta scam, MS shoe scam, CRB scam, Ketan Parekh scam and the recent IPO scam), investors would lose confidence. They would panic and sell their stocks. So, prices would fall.

Majorly if we see these factors, we get confused a lot. To get clarity about these, we do the following: -

1. Reading Market news daily
2. Following analysts in social media
3. Specialized services
4. Leave all factors and go by gut feeling (LUCK)

With the above factors also, we have **some problems**. Let us see one by one aspect:

⇒ **Reading Market news daily:** We should understand the information clearly and make wise decisions, which is possible only for a few masterminds.

⇒ **Following analysts in social media:** They may be wrong sometimes

⇒ **Specialized services:** Decision making is challenging and costly sometimes

⇒ **Leave all factors and go by gut feeling (LUCK):** VERY RISKY

3.3 LIMITATIONS OF THE PROBLEM

1. Manipulated piece of information:

Rumours are pieces of information or a story that has not been verified. Typically, rumours are spread from person to person and can change slightly each time they are told. As a result, they can become exaggerated and altered over time. Similarly, when word spreads about the stock trends, they are manipulated from person to person and can be wildly inaccurate or sometimes even absurd.

Fig. 23. Stock related rumours

3. Uncertainties:

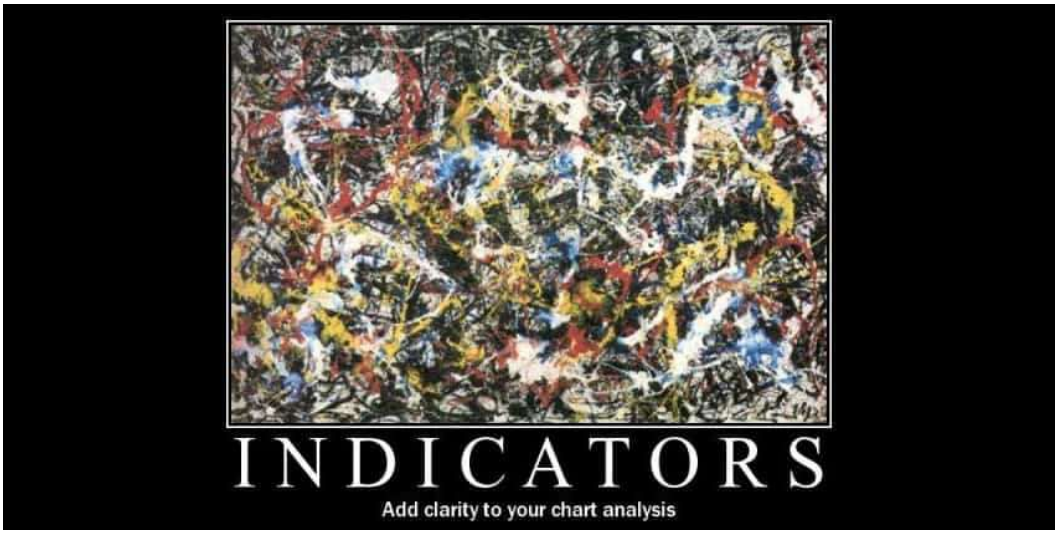


Fig. 24. Uncertainties in Stock Market

The stock market is full of uncertainty. There can be sudden, unpredictable changes. Some minor things can tremendously affect the stock trends and cause the investors to incur huge losses or profits. So the investors must consider little factors too sometimes.

3. Heavy Losses:

The stock market is associated with big money. Sometimes investors tend to invest more beyond their financial ability hoping for profits, especially when they are most confident of the results. When an unexpected work is seen, leading the investors to a vast economic crisis becomes a complicated situation for the investors to handle. And it takes them time to cope with the losses incurred.

Fig. 25. Losses incurred by stock trading

4. Fluctuations in Stock Trends:

It is a very well-known fact that stock trends are incredibly volatile. The unpredictability of the stock trends is because of the sudden fluctuations in the stock trends. These fluctuations might result from some small factors that might've been ignored, not considered essential or unexpected events like geopolitical events, festivals, government policies, trends in related markets, or even developments within a company.

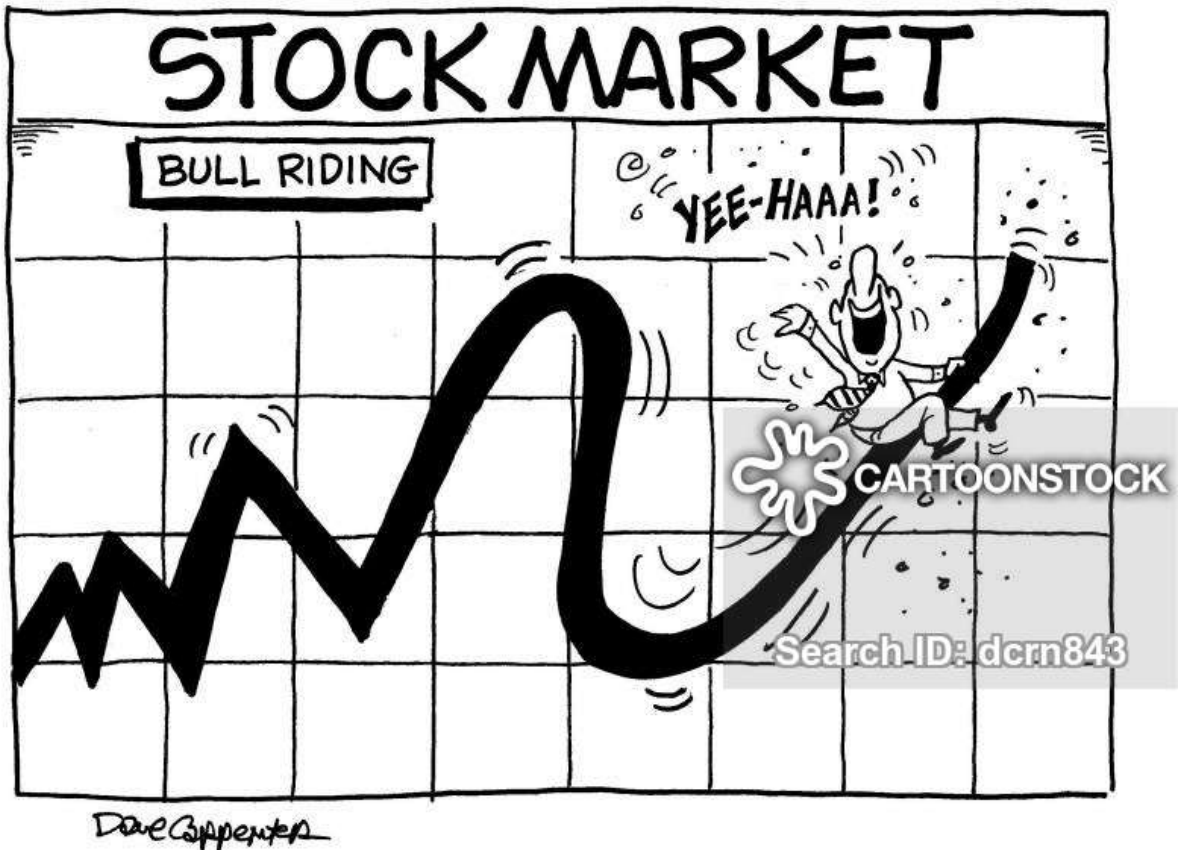


Fig. 26. Fluctuations in Stock Market

5. Politicians take on stock trends:

Politicians are responsible for policy decisions that affect certain parts of the business, for instance, change in taxes on imports and exports, lifting or cutting the interest rates, subsidizing a particular product, etc. In some extreme cases, political shocks can lead to significant swings in stock prices.

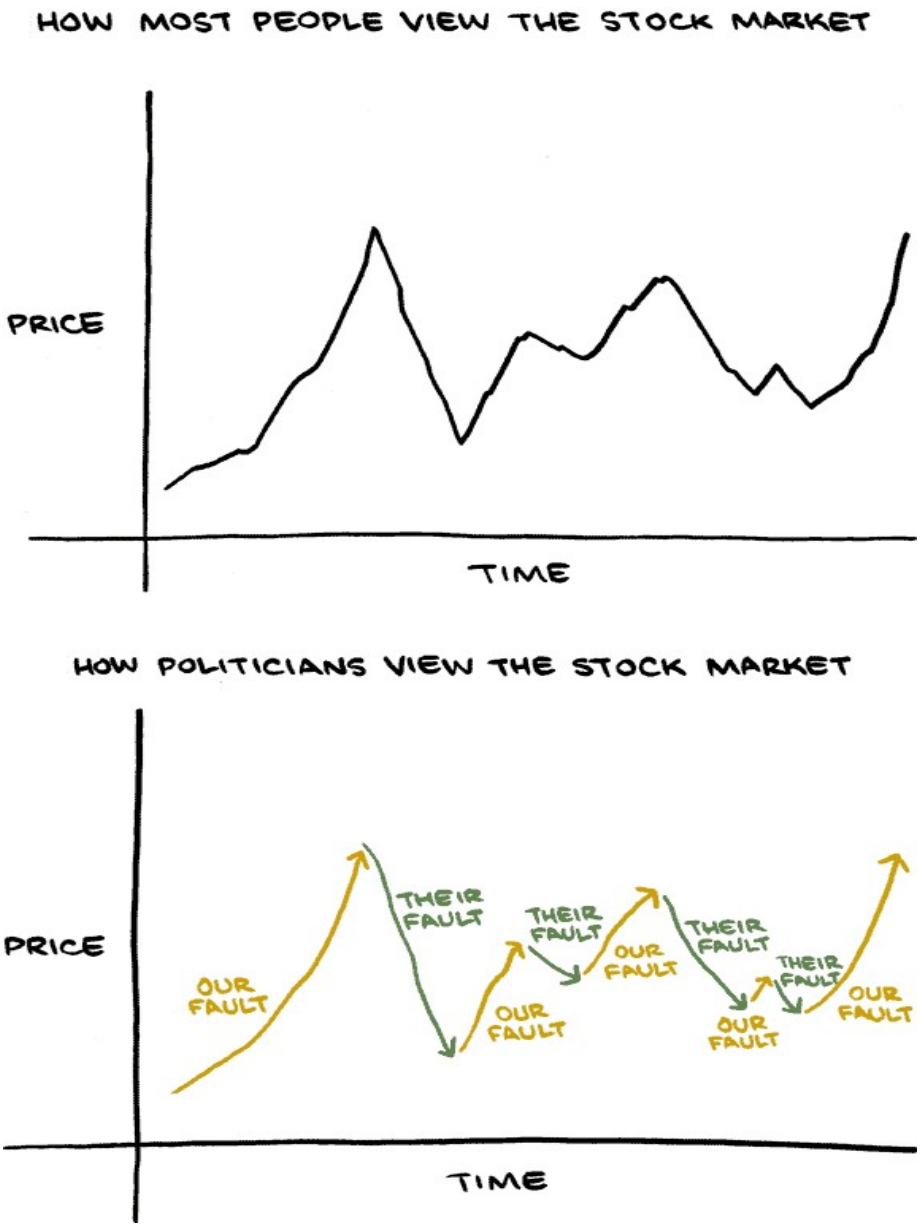


Fig. 27. Politics influence on stock trends

Generally, the more stable the political situation is in the country, the more favourable the stock market investors. "Political uncertainty commands a risk premium whose magnitude is more extensive in weaker economic conditions. Politicians sometimes act recklessly and play the blame game by blaming the other person or the other party.

3.4 FINAL OBJECTIVES:

The main objectives of the project are: -

- Creating a dashboard
- Adding predictors to predict the future trend
- Show the values based on preferences
- Print all the latest tweets and news
- Dashboard should be understood easily
- Graphical representation should be given

MY SOLUTION:

Considering all factors, we are with a solution which is cost-effective, easy to understand and gives an idea to take decision easily

SOLUTION⇒ "A DASHBOARD FOR STOCK MARKET ANALYSIS"

- It takes news and tweets and does sentiment analysis, and gives out Sentiment scores
- It uses a machine-learning algorithm to predict the output
- It uses Flask and Dash for dashboard
- It uses logics to gives us the best output
- We can conclude easily
- It helps to analyze the trends of the market
- It predicts trends of future

Fig. 28. Stock Trade Dashboard

4. DESIGN

4.1 DESIGN PHASE:

In the design phase, one or more designs are developed, with which the project result can be achieved. Depending on the project's subject, the products of the design phase can include dioramas, sketches, flow charts, site trees, HTML screen designs, prototypes, photo impressions and UML schemas. The project supervisors use these designs to choose the definitive design that will be produced in the project. The development phase follows this. As in the definition phase, once the invention has been selected, it cannot be changed in a later stage of the project.

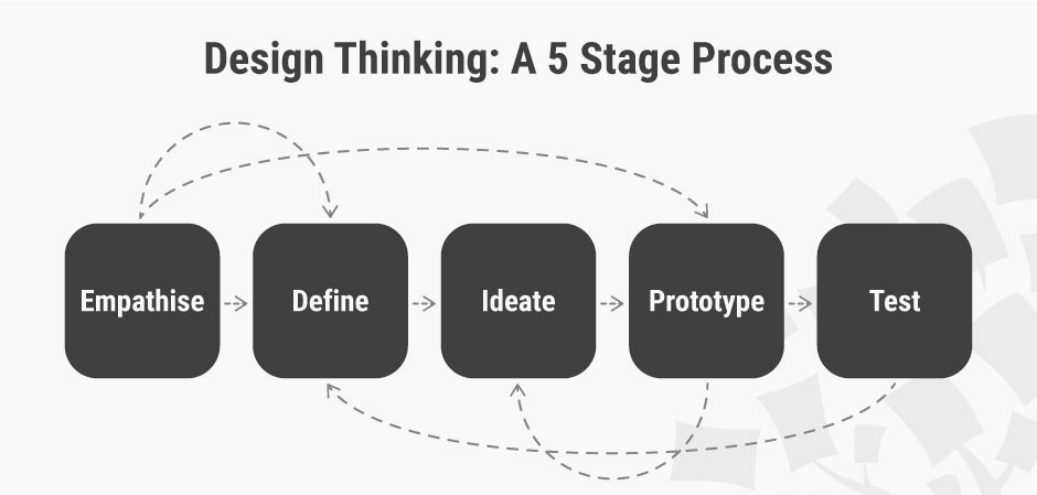


Fig. 29. Stages of Design Thinking

1. The first stage of the Design Thinking process is to gain an empathic understanding of the problem you are trying to solve.

2. During the Define stage, you put together the information you have created and gathered during the Empathise stage.

3. During the third stage of the Design Thinking process, designers are ready to start generating ideas.

4. The design team will now produce several inexpensive, scaled-down versions of the product or specific features found within the product to investigate the problem solutions generated in the previous stage.

5. Designers or evaluators rigorously test the complete product using the best solutions identified during the prototyping phase.

Design is very important phase because:

1. Modularity Is Of Great Convenience:

Modularity, the first concept of software design it is. It means cleaving your huge software project into small modules. It simply means splitting the software project into small pieces, small tasks called modules for the simplicity of work. Splitting your critical software project into modules only makes it easier to work on every requirement of the project. It also gives the convenience of making changes in the future. If in case, the requirement of your client changes, then you can anytime go for restructuring a module, not the whole project. It gives you the ease of finding errors in the modules, not the whole structured complicated code. Therefore, modularity makes the software simpler and simplicity makes it effective, this is why software design is important.

2. Maintainability Is A Plus:

As software design is performed by creating modules, it makes the task easier to maintain. Tasks like finding bugs, debugging, restructuring, and changing the functionality of specific elements in the software application become quite easy due to software design. A good software design gives you the privilege of changing the appearance, functionality, etc, of the software by working on a specific module. For example; in case you have already completed the creation of a software application, but now you need a change in its interface then you can just make changes in the module that relates to the interface, you need not mess up with any other module. This is how software design helps in the maintenance of your software application.

3. The Flow Of Functionality And Performance:

Software design is a reflection of the performance of the software application. A good software design effectively displays the flow of functions taking place while the software is running. From input to the output, a software design shall show all the steps so that the performance of the software application can be analyzed. If in case the software project is handed over from a software developer to another, then the new developer should understand the software by just reading the software design and this is what the privilege is given by good software design.

4. Portability And Trackability:

When it comes to making changes in the software, the elements like portability come handy. Portability in the software design gives the convenience of transferring functions from a module to another, as it can make a whole lot of changes in the functionality of software applications. Another, important element of software design is Trackability. Trackability is as its name suggests, it is the aptitude for tracking the flow of functions taking place in the software working. Good software design provides track ability to the software application which makes it easier to use and maintain.

Now that I have mentioned the reasonable approaches towards the importance of software design, let's have a talk about how it is done the right way.

Software design can be done with several different ways. It can be done utilizing some software using some modelling language, such as UML, it can be written text and images or it can even be a drawing on a whiteboard. Important here is that the design can be saved and revisited during the development of the software—The design will need some refining so if you don't want to always draw the design to the whiteboard from scratch, it might be good idea to stay with digital ways of doing the design. This and how it's done of course depends on your projects needs. Small projects can easily be just drawn or written on a single paper while bigger projects usually tend to change a lot during their lifetime affecting also the software design.

I must admit that I am one of those persons who like to jump into the code straight away and I haven't done so much software design, at least not very detailed, in my previous projects. Also I have somewhat hated all the bureaucracy what software design can introduce to the work at its worst. Of course I have done single component designs drawn on a whiteboard or to a notebook but most of these designs are forgotten and never maintained once the code has been completed. During my current position I have learned a lot about software design and while there is lot more to learn, I have noticed and would like to share some good things about it and why it's important.

Basic design:

Basic design→ Basic idea how project should look like

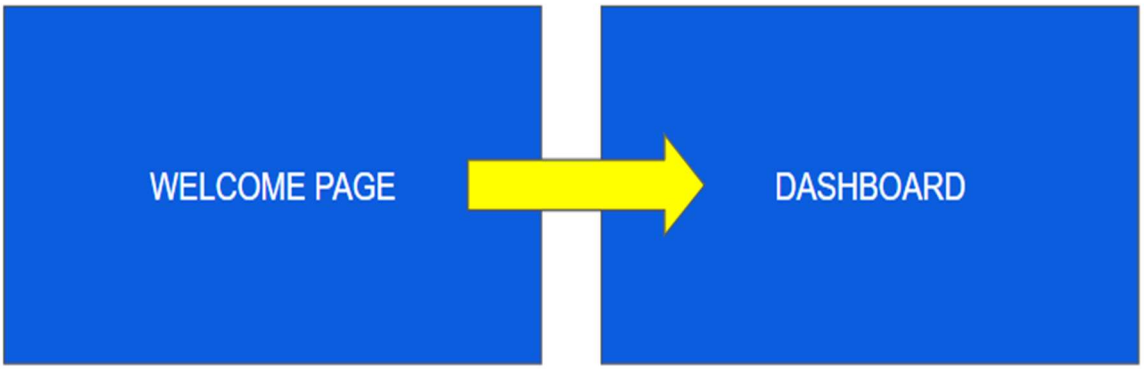


Fig. 30. Basic design of dashboard

The main idea behind the project design is to have two pages

- Welcome page
- Dashboard page

Welcome page:

- It should be a single point to enter the dashboard
- Its theme should match with the dashboard theme

Dashboard page:

- It should contain all statistics
- It will have different representations
- It should have everything in detail
- Dashboard shouldn't be congested
- Dashboard should be self-understandable
- Dashboard should be with the simple theme

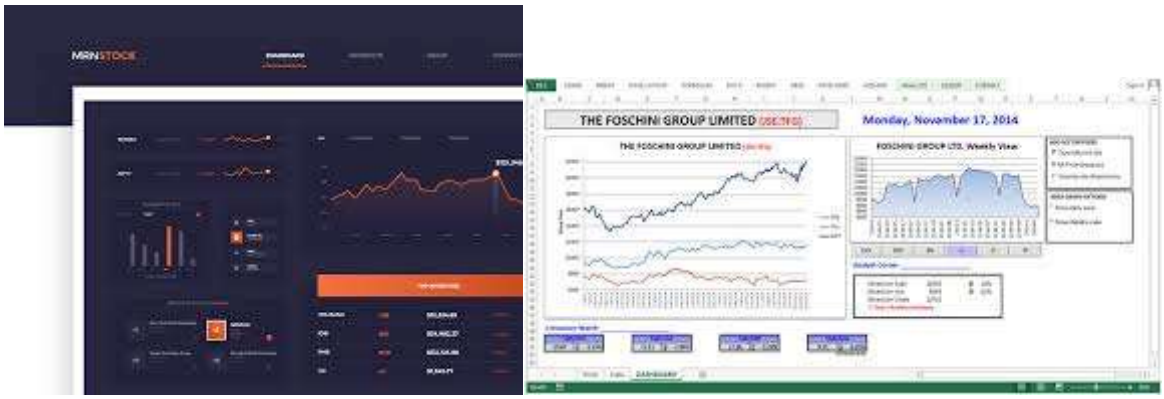


Fig. 31. References of Dashboard

Detailing's of Design

- Welcome Page:

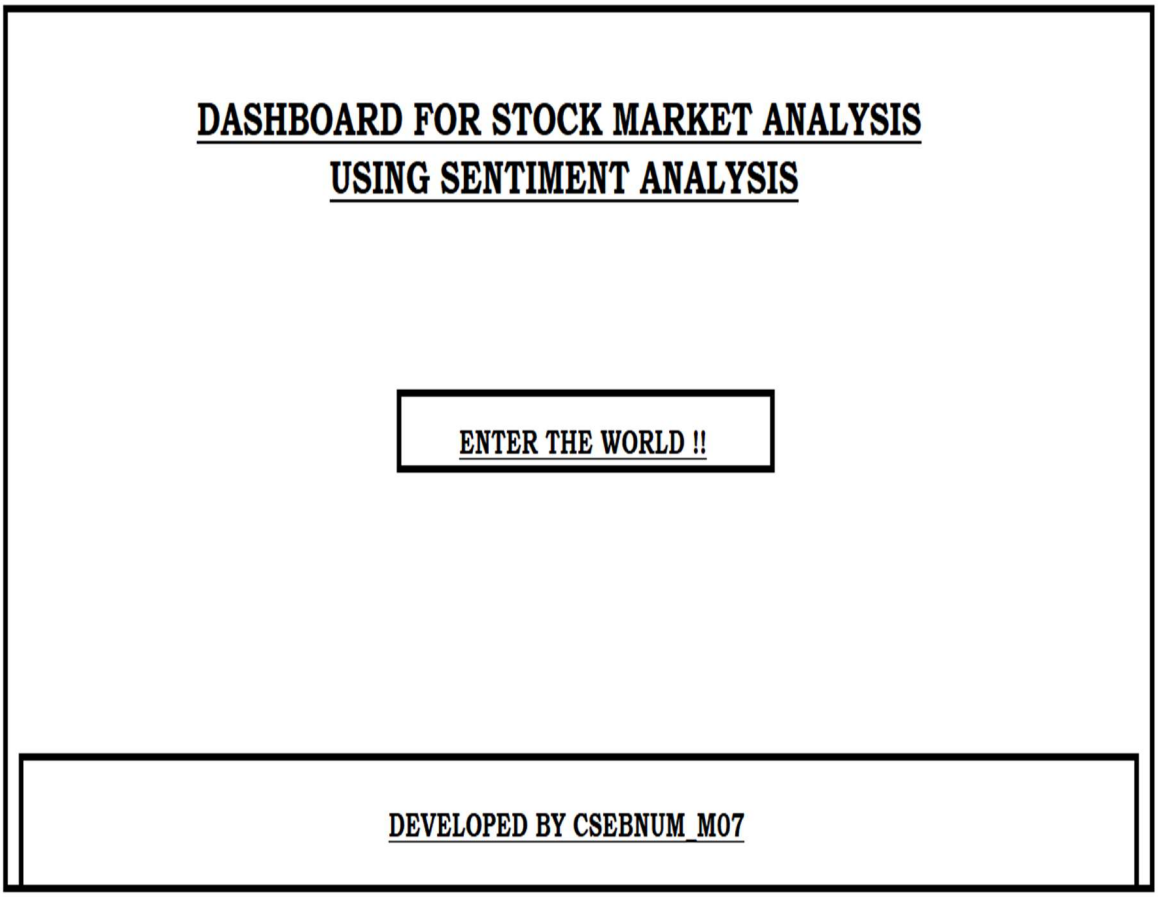


Fig. 32. Welcome Page

- The home page is designed with a fundamental thought

- Home page should contain
  - Heading
  - Button
  - Data in different forms

- This page is mainly focussed on
  - Understandability
  - Simplicity
  - Eye-catching
  - Ease to use

- This page is to create a welcome for all users

- Main Dashboard:
    - Main Dashboard is heart of the project
    - Main Dashboard created with only DASH

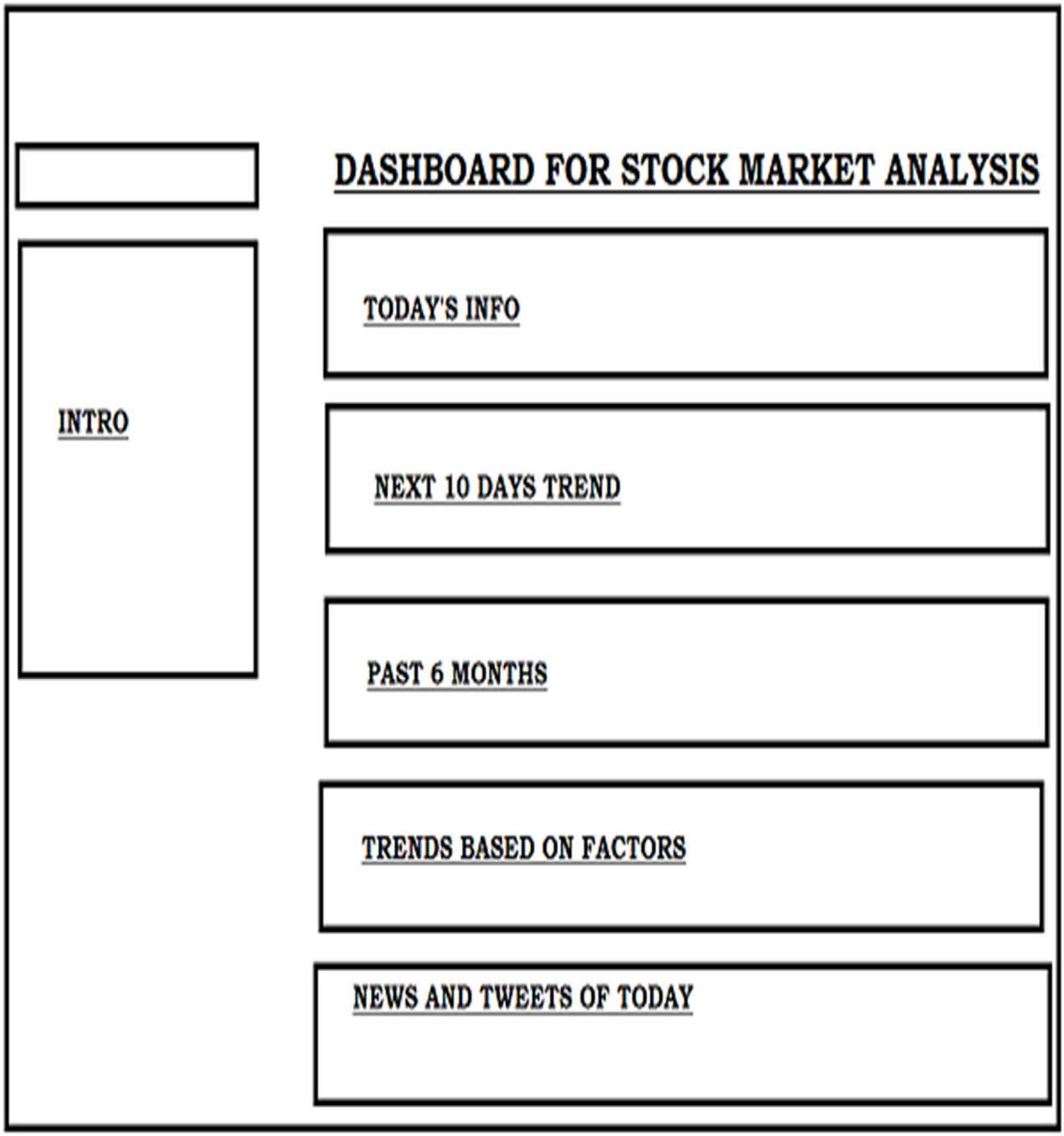


Fig. 33. Main Dashboard

- The main dashboard is designed with simplicity
- Main dashboard should contain
    - Heading
    - Explanation about dashboard
    - Particular column for every section
    - Data in different forms:

        - Future trends - Graph
        - Trends of the past 6 months - Graph
        - Present-day price - Text
        - Present-day trending news - Text
        - Present-day tweets - Text
        - Comparison of companies based on market capital – Graph
        - Top companies based on factors – Text
        - Our choice – Text
- This dashboard is mainly focussed on
    - Understandability
    - Ease to use
- Many other dashboards inspired this dashboard's design

4.2 SYSTEM ARCHITECTURE:

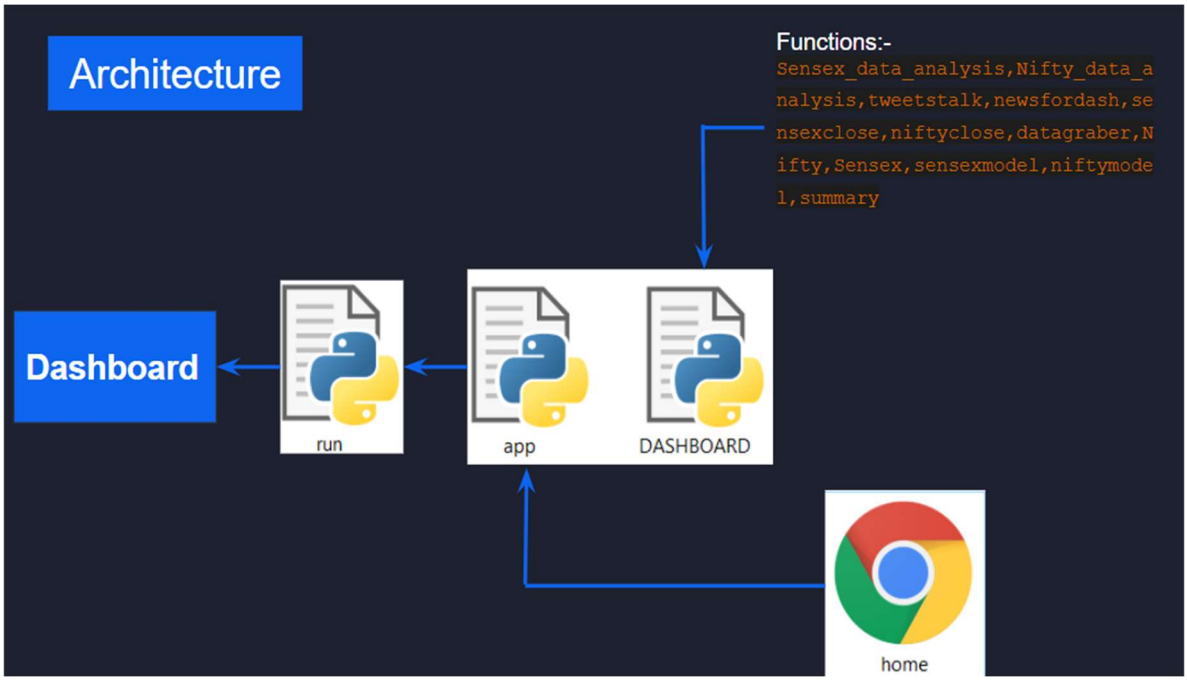


Fig. 34. System Architecture

- This project entirely runs on 1 python file (run.py), which runs two other python files (app.py, dashboard.py) simultaneously.
- App.py is an initial page developed with Flask with home.html as a template.
- Dashboard.py is the main dashboard page developed with Dash, and it has many methods to analyze data.

Dashboard.py – Contains many functions like

Sensex_data_analysis,Nifty_data_analysis,tweetstalk,newsfordash,sensexclose,niftyclose,datagraber,Nifty,Sensex,sensexmodel,niftymodel,summary

App.py – Doesn't contain important methods

It is just a display page.

4.3 DATA FLOW:

The path of data from the source document to data entry to processing to final reports. Data changes format and sequence (within a file) as it moves from program to program.

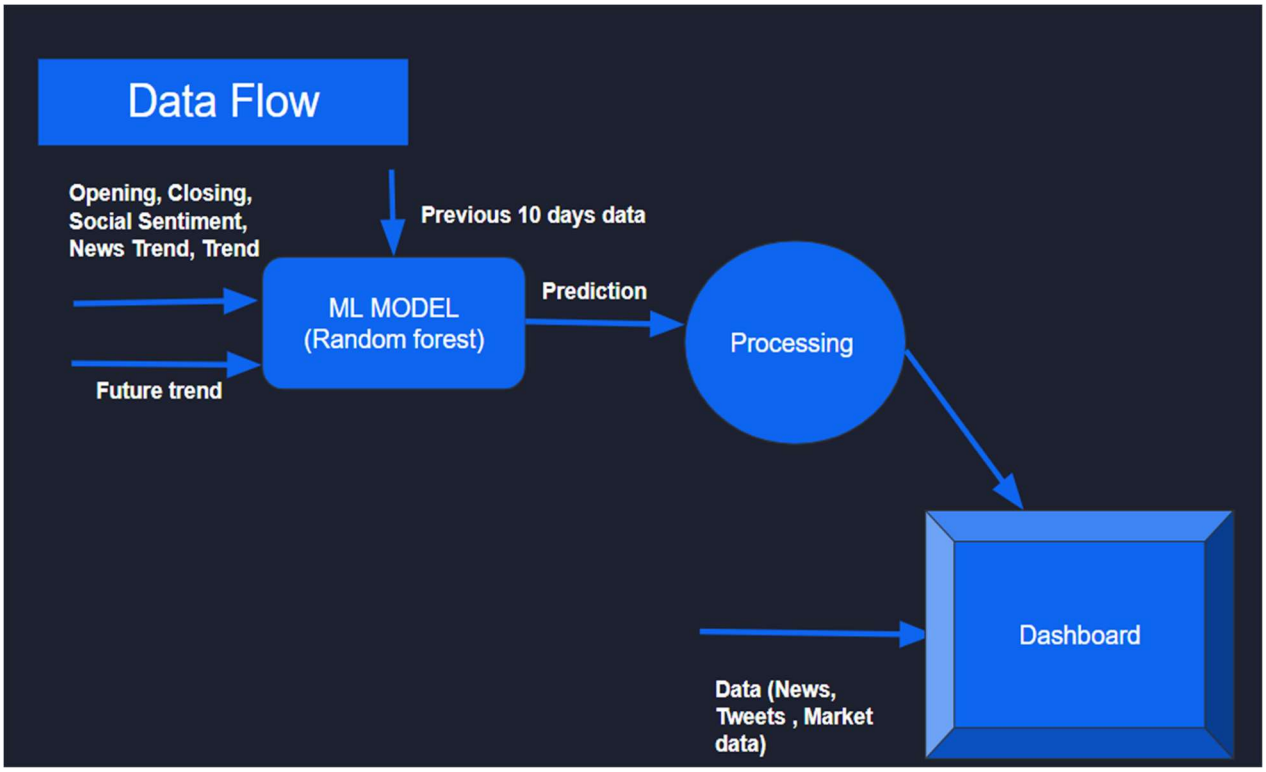


Fig. 35. Data Flow

- Data is collected from various resources, pre-processed and given to the ML model for training.
- After training, ML model will be given the previous 10 days' data to predict. We forward predicted data to the dashboard.
- All other required data is directly given to the dashboard
- Dashboard collects rest all required data directly using python packages
- At least some data is given to plotly package
- Plotly package visualizes data
- Finally, we will be able to see data in particular formats

4.4 HOW IT WORKS:

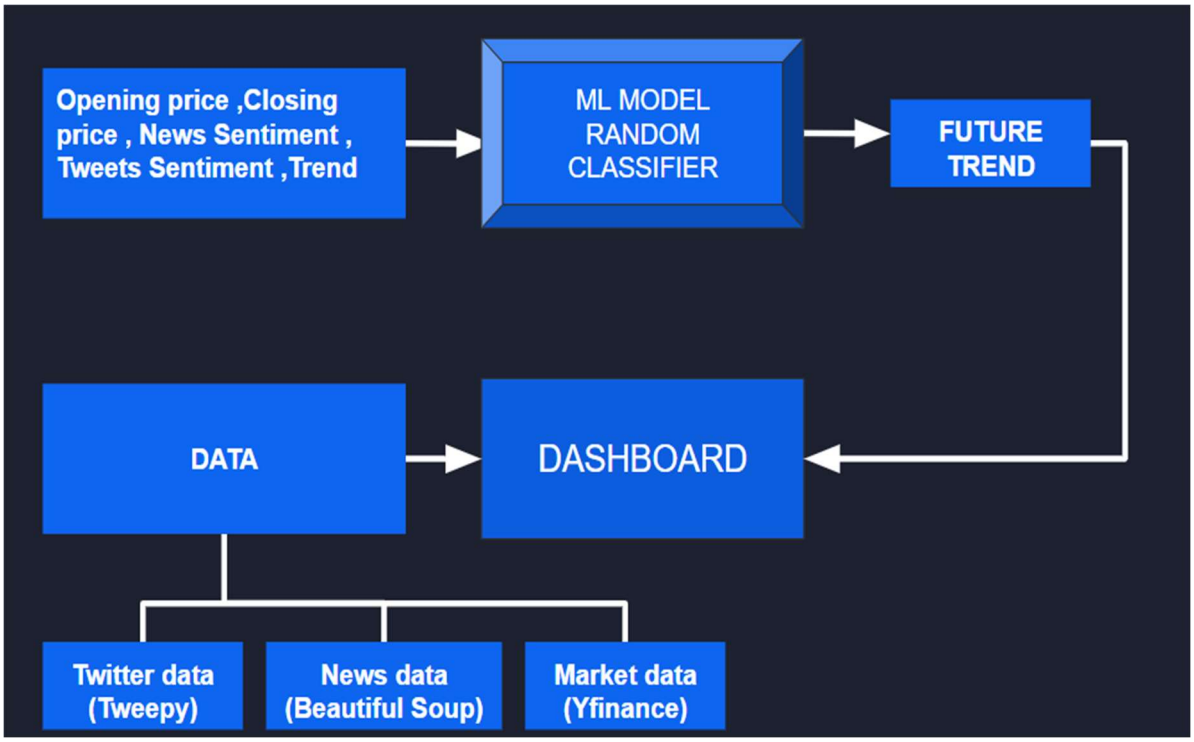


Fig. 36. Working Model

The main component of the project is the dashboard. Dashboard is wholly developed with Dash. The working of the dashboard is:

- Total working of dashboard can be divided into two parts: -
  - Predicted data
  - Analysed data

- **Predicted data:**
  - After data collection and pre-processing of required data (Opening price, closing price, News Sentiment, Tweets Sentiment, Trend), we will train a machine learning model that gives us Future Trends.
  - For the model, we are using the Random forest algorithm.
  - We are mainly using a Random classifier to perform classification
  - Random classifier takes data and trains a model by creating n of decision trees and using to majority voting and stem.
  - We collect present data of previous data, and we will provide it to the trained model.
  - Trained model uses all n created decision trees and collects the outputs of every tree. Based on the majority, it gives out value.
  - These predicted values will be given to the dashboard and presented with Plotly as a graph.

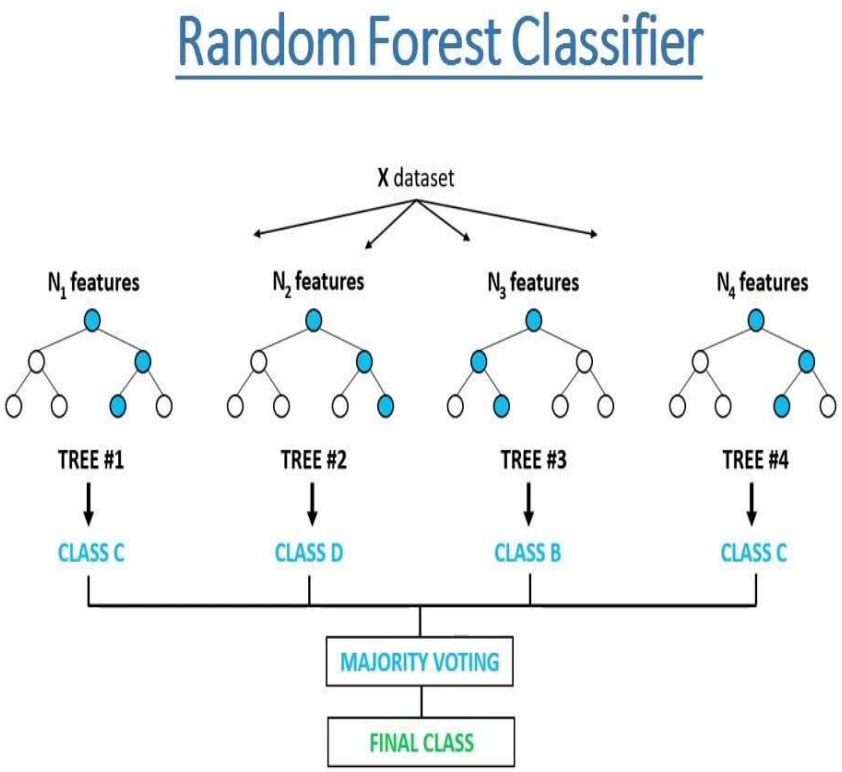


Fig. 37. Random Forest Classifier

- **Analysed data:**
    - We collect all data using beautiful soup, tweepy and yfinance packages.
    - Using simple conditions, we analyze and pass data to the dashboard.

Based on our requirement, we present data using plotly package or print collected data.

Finally, we are ready to ahead with the designs which we made.

Design Requirement	Status
Clarity	Done
Theme	Done
Structure	Done
Idea of contents	Done
Prototype	Done

5. IMPLEMENTATION

5.1. TECHNOLOGIES REQUIRED

5.1.1. System Requirements:

- **Software Requirements:**

  1.Languages: Python, HTML, CSS

  2.Packages: Plotly, Flask, Dash, NumPy, Pandas, Scikit-learn, Beautiful Soup

  3.Software tools: Microsoft Visual Studio, Python

  4.Algorithm: Random Forest

- **Hardware Requirements**

  1.Operating System: Windows 10,8

  3.CPU Speed: 2.30 GHz

  4.Memory: 2 GB (RAM) Minimum

5.1.2. Python:

Fig. 38. Python Logo

Python is a general-purpose interpreted, interactive, object-oriented, and high-level programming language. Guido van Rossum created it during 1985- 1990. Like Perl, Python source code is also available under the GNU General Public License (GPL).

Advantages of learning Python:

- Python is Interpreted − Python is processed at runtime by the interpreter. You do not need to compile your program before executing it. This is similar to PERL and PHP.
- Python is Interactive − You can sit at a Python prompt and interact with the interpreter directly to write your programs.

- Python is Object-Oriented − Python supports an Object-Oriented style or technique of programming that encapsulates code within objects.
- Python is a Beginner's Language − Python is an excellent language for beginner-level programmers and supports developing a wide range of applications from simple text processing to WWW browsers to games.

Characteristics of Python:

Following are essential characteristics of Python Programming −

- It supports functional and structured programming methods as well as OOP.
- It can be used as a scripting language or can be compiled to byte-code for building large applications.
- It provides very high-level dynamic data types and supports active type checking.
- It supports automatic garbage collection.
- It can be easily integrated with C, C++, COM, ActiveX, CORBA, and Java.

Applications of Python:

As mentioned before, Python is one of the most widely used languages on the web. I'm going to list a few of them here:

- Easy-to-learn − Python has few keywords, a simple structure, and a clearly defined syntax. This allows the student to pick up the language quickly.
- Easy-to-read − Python code is more clearly defined and visible to the eyes.
- Easy-to-maintain − Python's source code is fairly easy-to-maintain.
- A broad standard library − Python's bulk of the library is very portable and cross-platform compatible on UNIX, Windows, and Macintosh.
- Interactive Mode − Python has support for an interactive mode that allows interactive testing and debugging code snippets.
- Portable − Python, can run on a wide variety of hardware platforms and has the same interface on all platforms.
- Extendable − You can add low-level modules to the Python interpreter. These modules enable programmers to add to or customize their tools to be more efficient.
- Databases − Python provides interfaces to all major commercial databases.

- GUI Programming − Python supports GUI applications that can be created and ported to many system calls, libraries and windows systems, such as Windows MFC, Macintosh, and the X Window system of Unix.

5.1.3. HTML & CSS:

Fig. 39. HTML and CSS

HTML stands for Hyper Text Mark-up Language, the most widely used language on the Web to develop web pages. Berners-Lee created HTML in late 1991, but "HTML 2.0" was the first standard HTML specification published in 1995. HTML 4.01 was a major version of HTML, and it was published in late 1999. Though HTML 4.01 version is currently widely used, we have the HTML-5 version, an extension to HTML 4.01, and this version was published in 2012.

Cascading Style Sheets, fondly referred to as CSS, is a simple design language intended to simplify making web pages presentable. CSS handles the look and feel part of a web page. Using CSS, you can control the colour of the text, the style of fonts, the spacing between paragraphs, how columns are sized and laid out, what background images or dyes are used, layout designs, variations in display for different devices and screen sizes as well as a variety of other effects.

CSS is easy to learn and understand, but it provides powerful control over an HTML document's presentation. Most commonly, CSS is combined with the mark-up languages HTML or XHTML.

5.1.4. Machine Learning:

Fig. 40. Machine Learning

Machine learning is an application of artificial intelligence (AI) that provides systems with the ability to learn and improve from experience without being explicitly programmed automatically. Machine learning focuses on developing computer programs that can access data and use them to learn for themselves.

The learning process begins with observations or data, such as examples, direct experience, or instruction, to look for patterns in data and make better decisions in the future based on the examples that we provide. The primary aim is to allow the computers to learn automatically without human intervention or assistance and adjust actions accordingly.

Using the classic algorithms of machine learning, text is considered a sequence of keywords; instead, an approach based on semantic analysis mimics the human ability to understand the meaning of a text.

Some machine learning methods:

Machine learning algorithms are often categorized as supervised or unsupervised.

- Supervised machine learning algorithms can apply what has been learned in the past to new data using labelled examples to predict future events. Starting from analyzing a known training dataset, the learning algorithm produces an inferred function to make predictions about the output values. The system can provide targets for any new input after sufficient training. The learning algorithm can also compare its output with the correct, intended output and find errors to modify the model accordingly.

- In contrast, unsupervised machine learning algorithms are used when the information used to train is neither classified nor labelled. Unsupervised learning studies how systems can infer a function to describe a hidden structure from unlabelled data. The system doesn't figure out the right output, but it explores the data and can draw inferences from datasets to describe invisible structures from unlabelled data.

Semi-supervised machine learning algorithms fall somewhere between supervised and unsupervised learning. They use labelled and unlabelled data for training – typically a small amount of labelled data and a large amount of unlabelled data. The systems that use this method can considerably improve learning accuracy. Usually, semi-supervised learning is chosen when the acquired labelled data requires skilled and relevant resources to train it / learn from it. Otherwise, obtaining unlabelled data generally doesn't require additional resources.

Reinforcement machine learning algorithms is a learning method that interacts with its environment by producing actions and discovers errors or rewards. Trial and error search and delayed reward are the most relevant characteristics of reinforcement learning. This method allows machines and software agents to automatically determine the ideal behaviour within a specific context to maximize its performance. Simple reward feedback is required for the agent to learn which action is best; this is known as the reinforcement signal.

5.1.5. Random Forest:

Random Forest is a popular machine learning algorithm that belongs to the supervised learning technique. It can be used for both Classification and Regression problems in ML. It is based on the concept of ensemble learning, which combines multiple classifiers to solve a complex issue and improves the model's performance.

As the name suggests, "Random Forest is a classifier that contains a number of decision trees on various subsets of the given dataset and takes the average to improve the predictive accuracy of that dataset." Instead of relying on one decision tree, the random forest takes the prediction from each tree and, based on the majority votes of forecasts, predicts the final output.

The more significant number of trees in the forest leads to higher accuracy and prevents overfitting.

5.2 CODING:

We have 5 main files. They are:

1. Run.py
2. App.py
3. Dashboard.py
4. Home.html
5. Hi.css

Run.py

- It is a file which runs other two other files simultaneously as sub-processes
- Dashboard.py is one subprocess, and app.py is another

```
import os
from subprocess import *

Popen(["python.exe", "DASHBOARD.py"],shell=True)

Popen(["python.exe", "app.py"],shell=True)
```

App.py

- It is a file which creates the starting page with a button
- It renders the home.html template
- On click of that button, we will be directed to 127.0.0.1:8050, the main dashboard

```
# -*- coding: utf-8 -*-
"""
Created on Sat Oct  3 21:15:00 2020

@author: MANTHRI BHARADWAJ
"""
from flask import Flask,render_template,request,redirect
import dash
import dash_core_components as dcc
import dash_html_components as html
import requests
from bs4 import BeautifulSoup

app = Flask(__name__)
@app.route('/')
def index():
    return render_template('home.html')

@app.route('/Data')
def data():
    #return '<a href="http://127.0.0.1:8050/" style="color:red;">HI,
 Please click ME TO VERIFY THAT YOU ARE HUMAN</a>'
    return redirect('http://127.0.0.1:8050/',code=301)

if __name__ == '__main__':
    app.run(debug=False)
```

Dashboard.py

- It is the main file which will create dashboard
- It consists of functions, dash layout and plotly graph
- The main functions are: -
    - `Sensex_data_analysis & Nifty_data_analysis`
    - `Tweetstalk`
    - `Newsfordash`
    - `Sensexclose & niftyclose`
    - `Datagraber→Nifty, Sensex, sensexmodel, niftymodel`
    - `Summary`

- Sensex_data_analysis & Nifty_data_analysis
    - These functions collect Sensex and nifty data for analysis
    - They use yfinance package to get data
    - Retrieved data is stored in dataframes.

- Tweetstalk
    - This method retrieves tweets of present day
    - This uses tweepy package
    - It gathers tweets of two or more Twitter users and prints them onto dashboard

- Newsfordash
    - This method retrieves news of the present day
    - This uses beautifulsoup package
    - It gathers news from moneycontrol.com and prints them onto dashboard

- Sensexclose & niftyclose
    - These functions collect Sensex and nifty closing data for analysis
    - They use yfinance and plotly package to get data
    - Retrieved data is returned in the form of graphs

- Datagraber
    - It contains many functions in it. They are:
        - Nifty & Sensex

        - Sensexmodel & niftymodel
    - Nifty and Sensex
        - These functions collect past 10 days data of Sensex and Nifty respectively
        - These output an numpy array as output
    - Sensexmodel & niftymodel
        - These functions train the random forest classifier with the data of Sensex and Nifty, respectively
        - Outputs of Sensex and Nifty methods are givens as inputs to get outcomes.
    - Finally, we will use plotly, and we return graphs with Sensexmodel and niftymodel data
- Summary
    - This function gets the stock prices of present day

Home.html

- It is html designed for the home page

```
<body>
<header class="bgimg" id="home">
  <div>
    <center><span class="" style="font-
size:60px; color: white;">DASHBOARD FOR STOCK MARKET ANALYSIS USING
SENTIMENT ANALYSIS</span></center>
  </div>
 <center><a href="/Data"><button type="submit" class="button" style=
"font-size:30px; background-color: royalblue; color: white;margin-
top: 100px;box-
shadow: blue 1px;">ENTER THE WORLD !</button> </a></center>
</header>
<footer class="bottom">
 <center> <p>Developed by CSEBNUM_M07</p> </center>
</footer>
<script src="//ajax.googleapis.com/ajax/libs/jquery/1.9.1/jquery.min
.js"></script>
<script type=text/javascript>
        $(function() {
          $('a#test').bind('click', function() {
            $.getJSON('/Data',
                function(data) {
              //do nothing
            });
            return false;
          });
```

```
        });
</script>
</body>
</html>
<!DOCTYPE html>
<html>
<title>Layout</title>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1">
<style>
body, html {
  height: 100%;
  color: white;
  background-color: #1E212F;
  font-family: "Inconsolata", sans-serif;
}
.bgimg {
  background-position: center;
  background-size: cover;
  background-color: #1E212F;
  min-height: 75%;
  padding-top: 105px;
}
.bottom{
    height: 50px;
    padding-top: 10px;
    background-color: #161A27;
}
.button {
  background-color: #4CAF50; /* Green */
  border: none;
  color: white;
  padding: 15px 32px;
  text-align: center;
  text-decoration: none;
  display: inline-block;
  font-size: 16px;}
</style>



<body>

<!-- Header with image -->
<header class="bgimg" id="home">
  <div>
```

```
    <center><span class="" style="font-
size:60px; color: white;">DASHBOARD FOR STOCK MARKET ANALYSIS USING
SENTIMENT ANALYSIS</span></center>
  </div>
 <center><a href="/Data"><button type="submit" class="button" style=
"font-size:30px; background-color: royalblue; color: white;margin-
top: 100px;box-
shadow: blue 1px;">ENTER THE WORLD !</button> </a></center>
</header>

<!-- Footer -->
<footer class="bottom">
 <center> <p>Developed by CSEBNUM_M07</p> </center>
</footer>
<script src="//ajax.googleapis.com/ajax/libs/jquery/1.9.1/jquery.min
.js"></script>
<script type=text/javascript>
        $(function() {
          $('a#test').bind('click', function() {
            $.getJSON('/Data',
                function(data) {
              //do nothing
            });
            return false;
          });
        });
</script>
</body>
</html>
```

Hi.css

- This is a file used to give style to the dashboard page
- As dashboard page need css we have used a .css file by uploading it to Github

```
*{
color: white;}
.row.content {
height: 2000px;}
div {color: #ffffff;}
.sidenav {
background-color: #f1f1f1;
height: 100%;}
@media screen and (max-width: 767px) {
.row.content {height: auto;} }
```

6. TESTING & VALIDATION

Testing starts once the coding is complete and the modules are released for testing. In this phase, the developed software is tested thoroughly and any defects found are assigned to developers to get them fixed. While running the modules/dashboard we found some errors. All the errors were fixed.

For finding and fixing all errors we have used: -

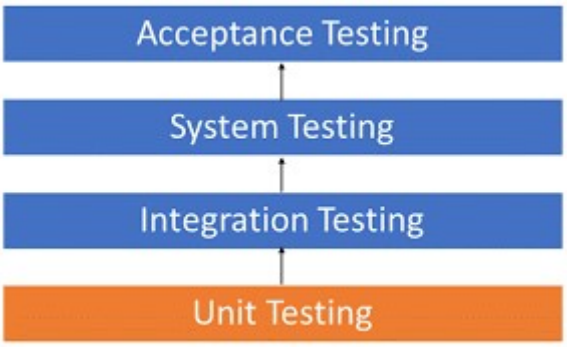


Fig. 41. Testing

Unit testing:

Testing of an individual software component or module is termed as unit testing. It is typically done by the programmer and not by testers, as it requires detailed knowledge of the internal program design and code. It may also require developing test driver modules or test harnesses.

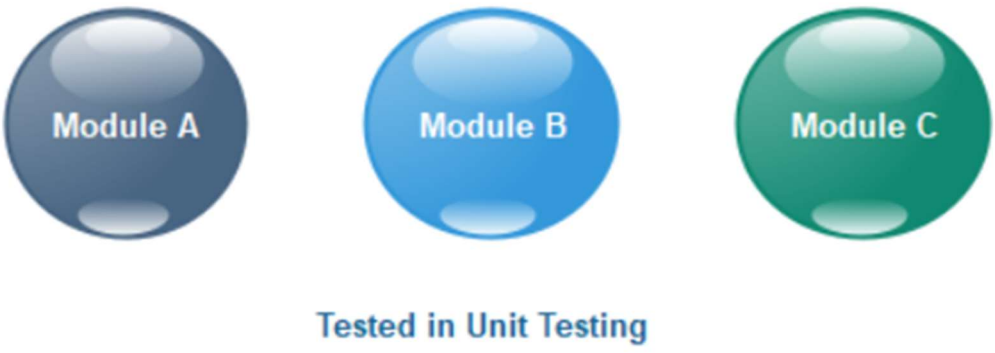


Fig. 42. Unit Testing

Advantage – Clear execution of the project with no errors.

Integration testing:

Testing of all integrated modules to verify the combined functionality after integration is termed as integration testing. Modules are typically code modules, individual applications, client and server applications on a network, etc. This type of testing is especially relevant to client/server and distributed systems.

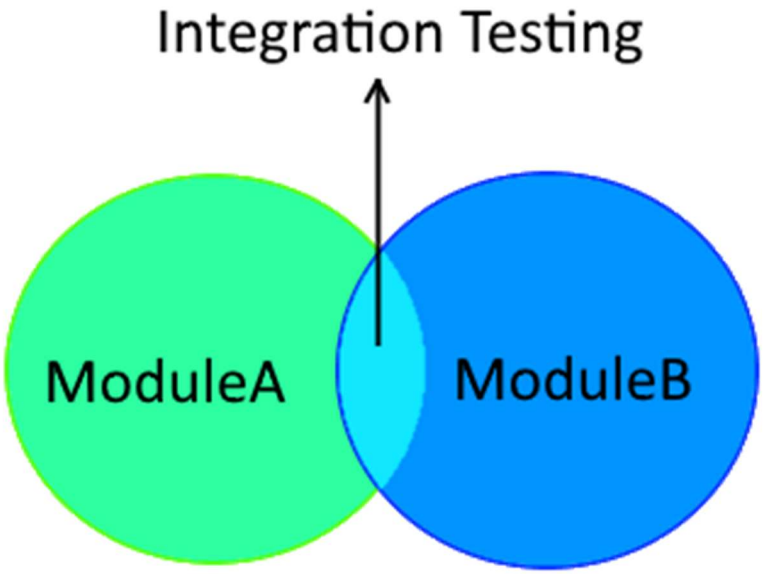


Fig. 43. Integration Testing

Advantages –

- It makes sure that integrated modules work correctly as intended.
- The tester can start testing once the modules to be tested are available.
- It detects errors related to the interface between modules.
- Helps modules interact with API's and other third-party tools.

System testing:

System testing is a level of testing that validates the complete and fully integrated software product. The purpose of a system test is to evaluate the end-to-end system specifications. Usually, the software is only one element of a more extensive computer-based system.

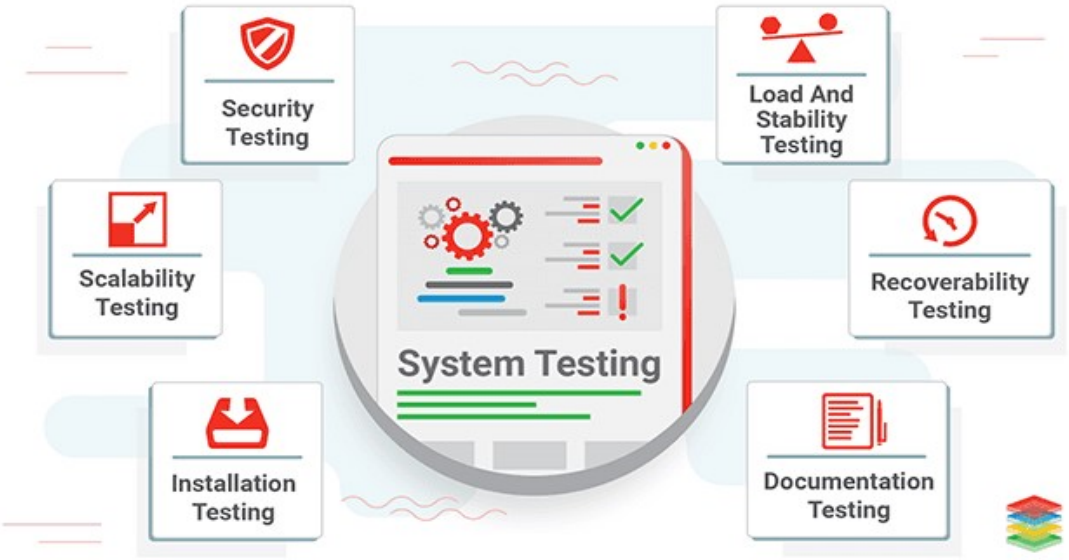


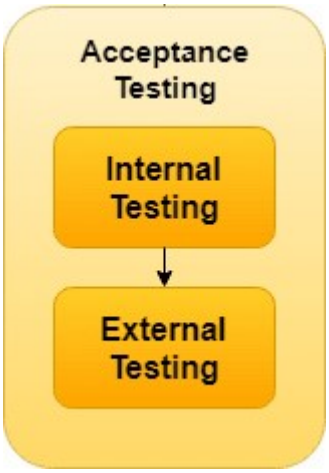
Fig. 44. System Testing

Advantages –

- Verifies the system against the business, functional and technical requirements of the end-users.
- It helps in getting maximum bugs before acceptance testing.
- System testing increases the team's confidence level in the product before the product goes for acceptance testing.
- It is the first testing level in which the whole system is under test from end to end. So, it helps in finding critical defects which, unit and integration testing could not detect.
- This testing phase uses the test environment, similar to the real business environment or production environment. Consequently, it helps in boosting the confidence of users in the product.

Acceptance testing:

Acceptance testing is a level of software testing where a system is tested for acceptability. The purpose of this test is to evaluate the system's compliance with the business requirements and assess whether it is acceptable for delivery (or writing that big check).



Fig, 45 Acceptance Testing

Internal (Alpha) Testing:

Alpha testing is the testing at the developer's site, which happens before delivering the product to the customer for their acceptance.

External (Beta) Testing:

The second phase of acceptance testing, which occurs at the users site, usually follows ad-hoc testing where users start using the product in their real environment.

Advantages –

- Uncovers the problems and defects before the product's release for the business.
- Provides insight into how users feel about the product and collect their valuable feedback.
- Increases the confidence of all the stakeholders in the product.
- Helps to detect show-stoppers by testing the product in a real business environment.

Black box testing:

Black Box Testing is a software testing method in which software applications functionalities are tested without knowing internal code structure, implementation details, and internal paths. Black Box Testing mainly focuses on the input and output of software applications, and it is entirely based on software requirements and specifications. It is also known as Behavioural Testing.

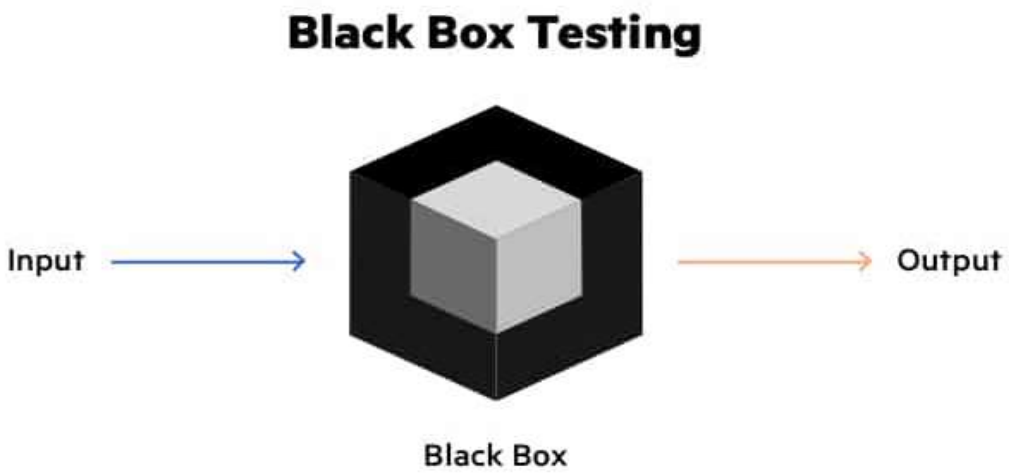


Fig. 46. Black Box Testing

Some of the important characteristics of black box testing are:

- Requirements, specifications, use cases, and user stories form the basis for test scenarios and conditions.
- Test cases focus on identifying the gap between requirements that form the expected output and the actual output.
- The test coverage measures the functionalities or test items covered during testing.

Advantages-

- Testers do not need coding and internal architecture knowledge.
- Tests do not have the complexity of verifying the product internally. Hence, they are simple to design and easy to execute.
- This is an effective way of testing an application from the user's perspective.
- Test scenarios can be written early when requirement specifications are available.

White box testing:

White Box Testing is a software testing technique in which internal structure, design, and software coding are tested to verify input-output flow and improve the design, usability, and security. In white box testing, code is visible to testers, so it is also called Clear box testing, Open box testing, transparent box testing, Code-based testing and Glass box testing.

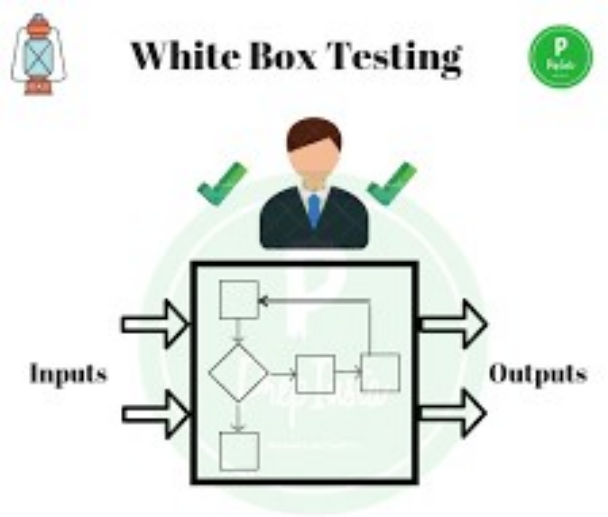


Fig. 47. White Box Testing

Some of the important characteristics of white box testing are:

- In white box testing, design, code, and data flow form the basis of testing. Therefore, test scenarios and conditions are obtained from the internal architecture of the product.
- It requires coding and design knowledge from the tester. Moreover, he should also know the tools to perform the testing and calculate the coverage.
- Test coverage is the measure of thoroughness of the testing. To define, it is the lines of code covered by tests divide by total lines of code in a particular test item.
- It exposes internal security loopholes, dead code, dataflow defects, and low coding standards.

Advantages-

- It identifies the unreachable code, memory leaks, and other coding related errors.
- White box testing helps maintain clean and optimum code conforming to the coding standards.
- These test cases are easy to automate as each targets a section of code.
- It helps improve the quality of the product enormously.

Results of all testing:

- **Unit testing:**

  Tested all components. "NO ERROR"

- **Integration testing:**

  Tested all integrated components. "NO ERROR"

- **System testing:**

  Tested complete system. "NO ERROR"

- **Acceptance testing:**

  "100% Acceptable"

- **Alpha testing -** success

- **Beta testing -** success

- **Black box testing & White box testing:**

INPUT	ACTUAL OUTPUT	EXPECTED OUTPUT
([30968.84, 28869.51, 0.123757, 0.10818, -1])	-1	-1

"NO ERRORS SUCCESSFULLY TESTED"

Validation:

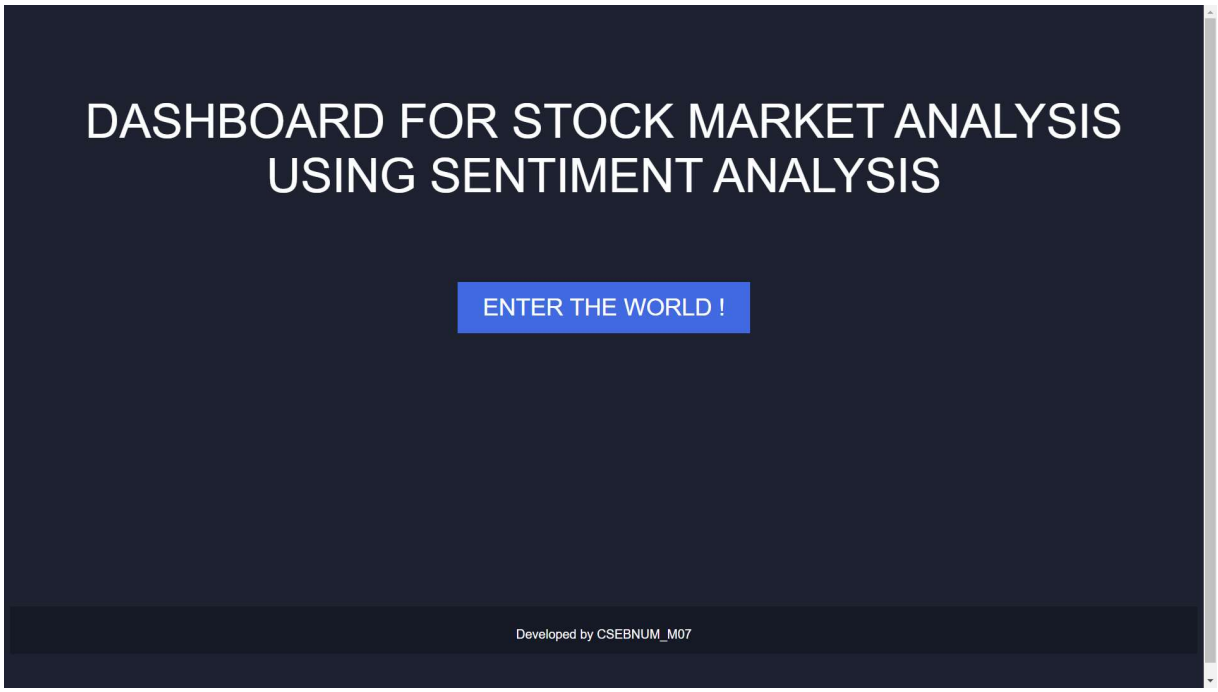
Validation → Are we building the right product?

Test all features after building and testing.

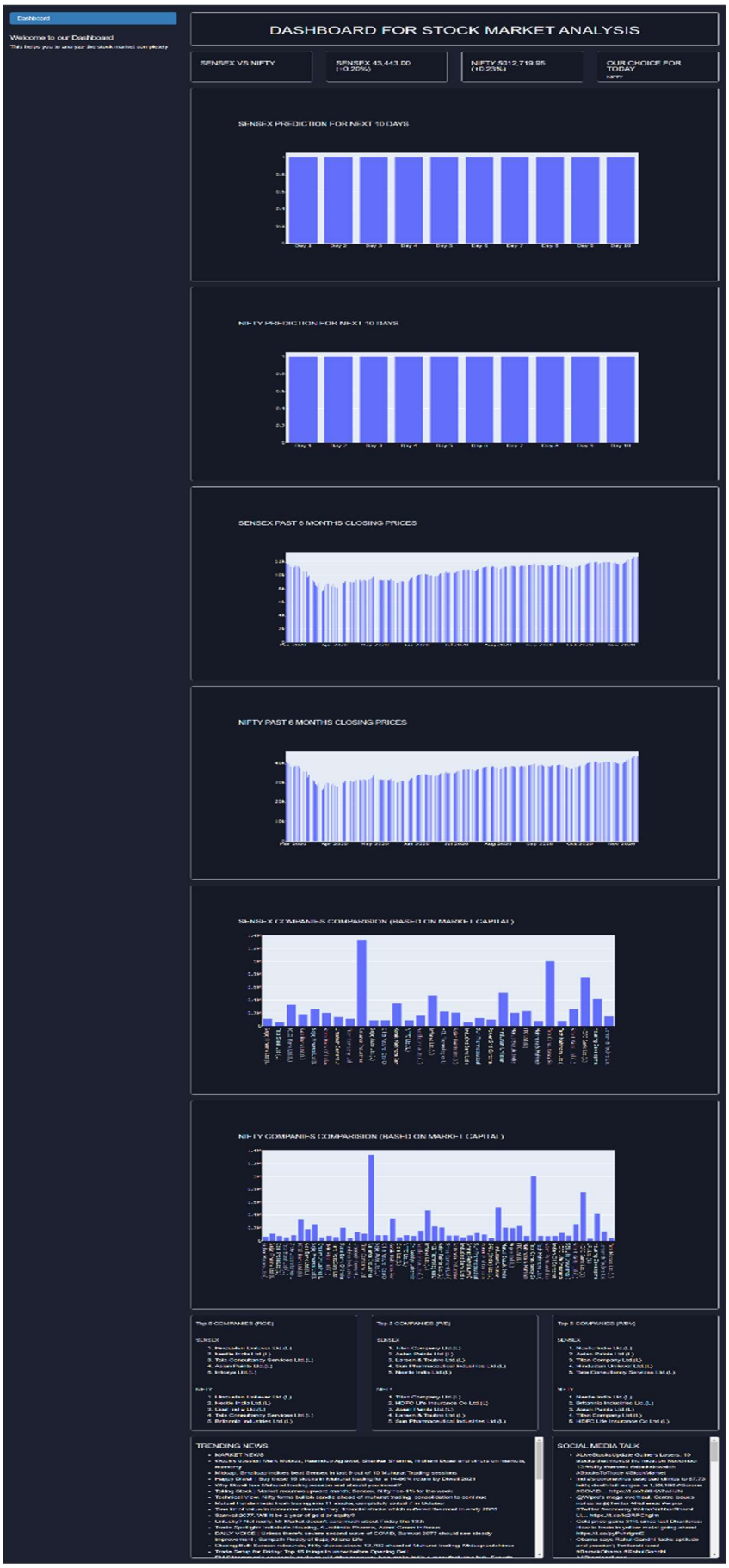
Features	**Check**
GRAPHS	DONE
TABLES	DONE
NEWS & TWEETS	DONE

7. RESULTS & DISCUSSIONS

We have two screens as output



Screen 1. Welcome Page of the Dashboard



Screen 2. Main Dashboard

8. CONCLUSION & FUTURE SCOPE

In this research, an algorithm for Stock Market Analysis is developed using Machine Learning algorithms to predict the stock trends for the next 10 days. The algorithm is developed based on the latest stock-associated news, tweets from the highly acclaimed Twitter accounts like NSE India, ……, and the past stock records of different companies. To understand further and predict future stock trends, this research developed a dashboard using technologies like Flask and dash to depict the stock market predictions. The dashboard provides a visualized summary, greater insight, promotes decision-making, and saves time.

In future, we can except more developments in machine learning by which we correctly predict trends.

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