

Pharmaceutical Company's Stock Leap through Machine Learning and AI Driven Input Injection

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Abstract–

Human intelligence simulation in machines programmed to think like humans and mimic their actions is referred to as artificial intelligence (AI). The term may also be used for any machine or computer that exhibits characteristics resembling the human mind, such as problem-solving and learning. The optimal feature of artificial intelligence is defined as the ability to rationalize, learn and take actions that have the highest potential to be most beneficial for the intended goal and objectives. Machine learning is the ability of computers to read and process data while learning from the data with human interference or influence. Stocks are shares in a company. Owning a share in a company gives the owner rights as well as liabilities in a company. This work focused on how stock market investment can be made using Artificial Intelligence with machine learning abilities. It also looked into the advantages of using AI for stock market investors. Some of which are the reduced time of research, reduction of risk, among others.

Keywords -StockMarket, Investment, Machine Learning, Artificial Intelligence, Deep Learning, Neural Network, Pharmaceutical Company

Introduction

Stock market investment is one of the many ways to raise funds and generate income for investors. The need to invest in stocks also creates the need for proper analysis, data gathering, stock review, an investigation into the stock market and the stock you are investing in (Vadlamudi, 2017).

The age of technological advancement has brought different improvements and development to help ease the ways things are done. Artificial Intelligence is one of the various developments that have impacted several industries in finance, banking, securities, and so on.

Artificial intelligence may be used for stock investment analysis and data gathering on stocks and the stock market using machine learning.

How the Stock Market Works

They are also referred to as equity. Stocks are means of security, and they represent ownership of part of a company or corporation. The issuing of stocks by a company is raising funds for the corporation's operations.

Stocks give the owner the right to share in the dividend, profit, and assets of a corporation in an amount proportionate to the value of their stock. A unit of stock is referred to as "shares." Different stocks are listed on different exchanges where trading (buying and selling) of stocks mostly occurs. They can also be open privately for persons to buy. Government agencies usually regulate stock trading through different laws to protect investors. Stock trading must be in line with the regulations. There two main types of stocks.

Common stock: This type of stock gives the owner voting rights in shareholders' meetings and shares in the accruing dividends or profits the corporation pays out shareholders.

Preferred stockholders: These types of stockholders are the first in line to receive profits shared by the corporation. They get paid before common stockholders do. They normally are not entitled to vote in shareholders' meetings. However, where the corporation goes bankrupt, they also rank higher in priority than common shareholders.

Stock markets are where stock trading by corporations or private individuals occurs. It can be an open place or online (recently). The price of stocks is set by market flow (demand and supply). Current big-time companies started small. For instance, Alibaba Group Holding LTD stated from his garage in 1999. Companies in issuing stocks generate revenue and raise capital.

There are thousands of traders on the stock market with different stock value ideas and potentials. Stock traders use their idea of the market to buy and sell stocks which cause the available stocks to move up or down during trading hours. Stock exchange platforms provide a place where buying and selling of stock can be done quickly. Stockbrokers act as middlemen for buyers and sellers. They help amateur who want to get access to the exchanges.

Web Crawlers

Web crawlers are internet robots or spiders, as they most times called, that systematically browse the internet (Vadlamudi et al., 2021). Crawling is typically used by search engines for indexing the web for contents.

A web crawler bot can be compared to somebody who goes through every one of the books in a not-so-coordinated library and assembles a card list. Any person who visits the library can rapidly and effectively discover the data need.

Presently to help in the arrangement, one would then need to record the books by point; the coordinator will peruse the title, outline, and a portion of the content within each reader to discover more about it. It can also be likened to the index usually at the back of a book, which gives point by point blueprint of the relative multitude of spots in the book where a specific theme or expression is referenced (Ganapathy&Neogy, 2017). Apart from search engines, some sites use web crawlers to keep their content update to date with other sites' contents.

Search engines utilize crawlers to mimic pages to enable clients to get contents easily. Most times, crawlers visit pages without permission and use their storage space and other resources. Also, some data and tools may not want to be crawled. The large and excess pages on the internet make it impossible for even the largest crawlers to index in earlier times (Vadlamudi, 2020a).Crawlers have been used for data gathering, web scraping, hyperlinks, and HTML code validations.

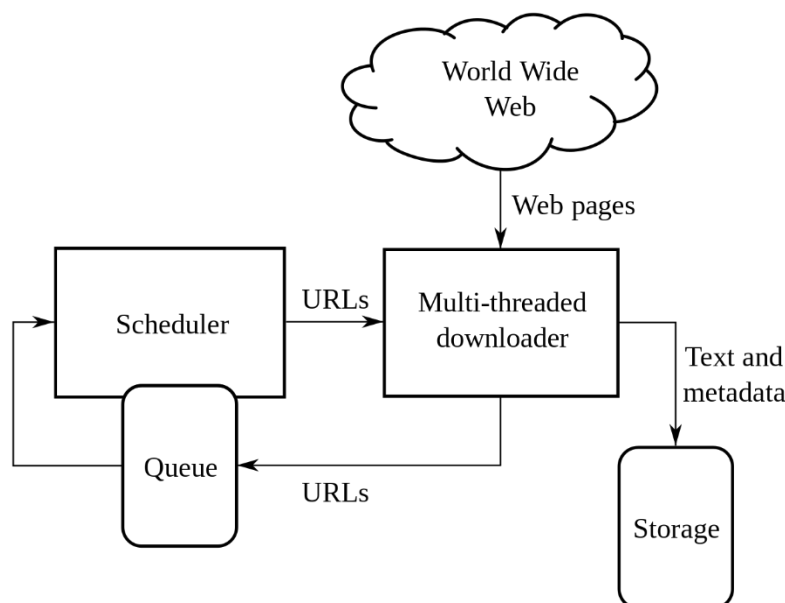


Figure 1: Web crawlers (Source: <https://en.wikipedia.org>)

How it Works

Web crawlers make a list of sites called seeds to visit and detects all the inserted page hyperlinks. It then adds them to crawl frontier, the URL list to visit. The crawlers visit the crawl frontier repeatedly as programmed. The crawlers archives the websites, save copies of the data, and stores it to be easily accessed, read, and used, and so on. They are saved as ‘snapshots.’

The archives (Repositories) are databases. They are structured to manage the list of web pages. Only HTML pages are stored in the repository and are stored as different files. A crawler repository is quite like any other database but doesn’t need the type of maintenance that other database needs and does not provide the features of another database. It stores the earliest version of retrieved webpages by crawlers.

The repository can only download a certain number of web pages. This is due to the huge volume of web pages and content that come up in a short time. In this case, the crawler system prioritizes pages to download.

Web scraping is a software package used for gathering data and content online from websites. Numerous free scraper mechanisms are provided by scraping sites. Hypertext transfer protocol is a technique used by all web scrape tools. It is a program that gives access to web pages for data mining automatically. Scrape websites help provide corporations extract and save content automatically. Scraping data increases the rate of web crawling. It anonymously scrapes the web.

There are advantages and disadvantages to web crawling and data scraping.

Benefits of Web Crawling and Scraping to Pharmaceutical Industries

- **Automation:** Web crawlers and scrapers have made data retrieval from the internet. With just a few clicks, several content and data from diverse categories of websites could be accessed. Data extraction before these techniques was rigid and crude. The required contents were difficult to get. The process of data retrieval has been advanced by scraping and crawling tools. Many financial institutions and investors can use these tools to get information and analysis of the stock market (Paruchuri, 2018).

- **Accuracy in data management:** Web crawling and data scraping tools increase the data extraction accuracy. The tools have reduced the human error factor from data extraction. The manual and traditional gathering of data may lead to errors and would be slow. Investors have employed these tools to gather data and information on sales, prices, etc. Web crawling and data scraping allows automatic and accuracy in data mining management.
- **It saves cost:** Manual data gathering and extraction take a large workforce. It also requires a huge budget. Web crawling and scraping have reduced the need for a high budget and a considerable workforce. These tools have made data mining and gathering less expensive. Web crawlers collect data from the main sites, and the scrapers gather and analyze them.
- **Easy to implement:** Proper utilization of these tools requires just a single and easy implementation and investment.
- **Data management:** Web scraping tools provide a data management system where data are downloaded onto your local computer system on a spreadsheet or database.
- **Minimum maintenance and high speed:** It requires minimum maintenance over a long period of time, and this saves cost on maintenances. The speed at which data are mined and scraped is significantly high.



Figure 2: Benefit of web scraping (Source:webmenza.com)

Drawbacks of Web Crawling and Scraping

Analyzing difficulty: Despite the significant impact of data scraping and mining in content management, it has made people with little knowledge of programming face difficulty analyzing data. However, it can be resolved by studying the system.

Analysis of Data: Understanding data after scraping takes a process that is usually time and energy-consuming. Without this process, it would be impossible to read and understand the data correctly. Also, web crawling involves a large number of requests received from a particular IP address.

Machine Learning and AI

Machine learning (ML) is a component of Artificial intelligence and computer system. ML is majorly concerned with the use of programmed machines through Algorithms and data to mimic human intelligence, from studying, learning, and improving it steadily without human influence.

Machine learning in data gathering, storing, and processing has come to play an important part (Azad et al., 2021). Algorithms based on statistical techniques make categorizations and estimations that discover key information inside data mining tasks. This discovered information is used to pre-informed decisions in diverse industries and software, thereby causing unique growth in those areas.

As technology advance and the internet with it, it makes data, and demand for data also increases (Vadlamudi, 2021). This will cause a data analyst to identify essential and relevant data for business and industries.

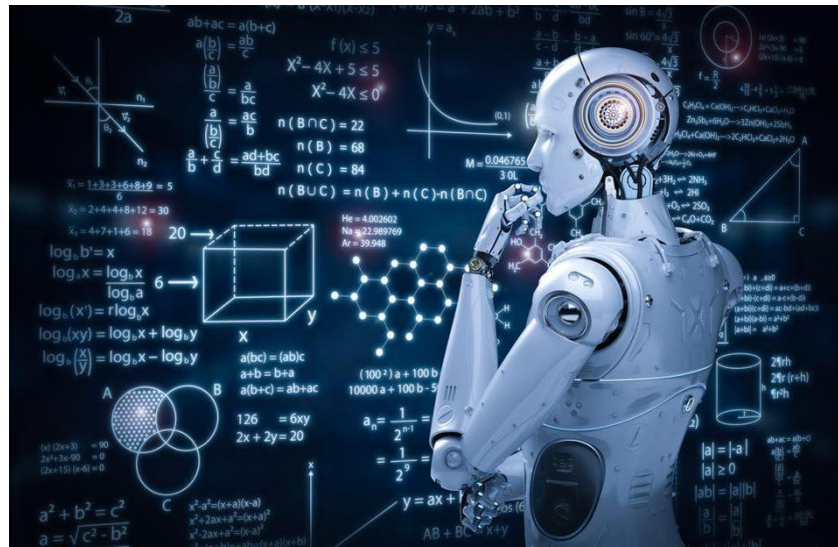
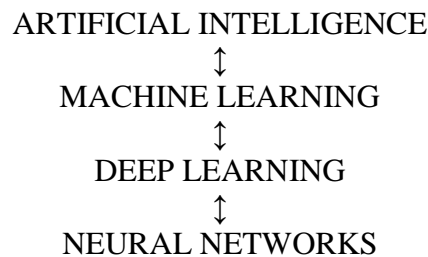


Figure 3: Machine Learning (Source:www.analyticsvidhya.com)

Machine Learning, Deep Learning, and Neural Networks

Most persons use machine learning and deep learning interchangeably. However, some distinctions and differences separate them. Machine learning, neural network, and deep learns are basic components of artificial intelligence. To be more specific in the order of ranking.



From the arrangement above, under Artificial intelligence, which is computer science and machine application, we have machine learning. Then deep learning, which follows machine learning, is followed by neural networks.

Machine learning and deep learning Algorithms learn using different patterns. Most of the FEP (feature extraction pieces) are automated in deep learning processes. It removes most of the need for human influence and enables the using bigger data sets. In his notes in MIT lecture, Lex

Friedman opined that deep learning could be seen as “scalable machine learning.” Machine learning (ML) relies more on manual human intervention to learn. A data analyst or expert determines the class of features to learn the disparities between data inputs (Paruchuri, 2021). ML is also referred to as “non-deep machine learning.

Leveraging on marked sets of data, also called supervising learning, deep machine learning informs its algorithm. However, the marked sets of data may not be required. Instructed data can be ingested in its unprocessed form. Also, deep learning can choose the set of characters that differentiate the various classes of data. Deep Learning carries out all functions without human interference. These include data processing as it allows for more scalable machine learning in unique means. Computer visions, recognizing speech, and processing language have been greatly enhanced by deep learning and neural networks.

Neural networks consist of node layers that house an input layer, some layers which are hidden, and a layer for output. Neural networks are also referred to as Artificial Neural Networks (ANNs). Each artificial neuron is connected to another one, just like a network. It has its connected weight and property. A specific node goes outside its threshold value, the node is activated, and then sends data to the next connected layer on the network.

Deep learning comes from how deep the layers are in the neural network. ANN with more than three layers (including the input and output layers) may be held as an algorithm for deep learning, while those with three or lesser layers are neural networks.

How Machine Learning Works

Decision process for pharmaceutical companies: Machine learning Algorithms have been utilized and used to make predictive analysis and classify. It uses data inputs that may be labeled or unlabeled. The machine learning Algorithm makes a prediction or estimate about specific data patterns (Paruchuri, 2021). The Error Feature: this feature evaluates the predictions and checks for possible errors. It makes a comparison between models to get accurate data. Model Optimization Process (MOP): weights are adjusted to make data fit. The machine learning algorithm continues to update with human interference until a threshold of accuracy is met.

Machine Learning Techniques

There different categories of machine learning. However, three main categories have been provided below:

Unsupervised machine learning: This is known as unsupervised learning. It utilizes ML Algorithms to examine and categorize unlabeled sets of data. Hidden patterns are discovered using this algorithm. After the discovery, they are categorized with human supervision or interference. Machine learning is used to explore data and carry out analysis, pattern detection, image recognition, client categorization because not its similarities and disparities detection feature (Ahmed et al., 2021). This makes it the ideal tool to use. Principal Component Analysis and Singular Value Decomposition (PCA and SVD) are two common techniques utilized by machine learning to reduce the quantity of data in a model unsupervised. Other algorithms like K-means clustering, neural networks, and Probabilistic Clustering technique have been employed unsupervised.

Semi-supervised: This category of learning allows for a better platform for supervised and unsupervised learning. Semi-supervised proves to be a solution to inadequate labeled data for training a supervised learning Algorithm. This method sets guide classification using a smaller labeled dataset.

Reinforcement machine learning: This is like supervised machine learning. However, sample data are not used in training the Algorithm. It is machine learning that employs behavioral techniques. It uses trial and error to learn. A pattern is formed, reinforcing the algorithm to develop the best solution to solve a particular problem.

Some real-world cases where machine learning is used include:

- **Speed Recognition:** Artificial intelligence through machine learning has been deployed for ASR (Automatic Speech Recognition) purposes. It could be text to speech. The AI uses Natural Language Processing to analyze convert speeches to writings. Many smartphone devices have incorporated the speech recognition system into their devices. An example is Apple's software care Siri which also does more than transcribing speech.
- **Customer service:** Many industries with websites use chatbots to answer frequently asked questions. This has replaced the need for human agents. Areas such as marketing, making the simplest suggestions from users, renewed customers' engagement across social media platforms. For instance, chatbots on marketing sites with virtual agents and even social media apps such as Facebook usually use virtual or voice assistants.
- **Computers vision:** Data can be mined or extracted from videos, virtual inputs like Digital images, and computer systems using this Artificial intelligence technology. This is different from image recognition because it also provides outputs, results, and suggestions based on the mined data. Convolutional neural networks power computer vision, and it has been used by some social media apps such as Instagram and Facebook to tag within photos. Various industries have also applied this AI technology.
- **Recommendation Engines:** Data can be mined using a history of consumption behavior. The AI Algorithms detects data pattern that can be utilized in marketing for more effective cross-selling techniques. Through data gathering, the AI finds patterns and sequences. It then uses this Pattern for targeted add-on suggestions during the process of payments for online retailers.
- **Automated Stock trading:** AI-driven trading platforms make many transactions per day with human agents interfering. They are structured to improve stock portfolios using collected data.

Challenges of Machine Learning in Pharmaceutical Industries

Despite the enormous advantages of Artificial intelligence and machine learning in making some operations easier, the introduction of machine learning to businesses and investments has been a source of concern for some people who have raised ethical worries concerning the use.

Some of the raised issues include -

- **Technological singularity:** There have talked about what Nick Nostrum referred to as "superintelligence." Superintelligence is the concept machines would grow to become more intelligent than a human. However, this has not been held as an idea worth being concerned about. According to Nick, superintelligence as "any intellect that vastly outperforms the best humans brains in practically every field, including scientific creativity, general wisdom, and social skills." Many researchers hold the view that super AI and superintelligence are not about to happen soon in society (Ganapathy et al., 2020). However, the concept has been a cause for interesting theories on utilizing autonomous machines like self-driving cars. For

instance, it would be farfetched to think that self-driving vehicles would never be involved in accidents. Legal issues would also come up as to who becomes liable for damages when they do. Questions like whether or not to scrap fully autonomous cars for semi-autonomous cars to enhance road safety. This is still up for debate. However, issues like this come to play from time to time as AI technology advances.

- **Impact of AI on Jobs:** The impact of AI on job and employ have raised so much public perception about it. The majority of the public sees the resultant effects of artificial intelligence deployment as huge job loss. However, the perception of AI from owners of technologies and big industries is different. AI reduces the workforce and saves costs on workers' pay. The argument of a job loss should be kept aside as the development of new technology tends to reduce market demand for workers in a field while increasing another. Like in the auto industry, electric cars, which is a relatively new industry, would shift the market demand for workers from the oil energy industry. The AI utilization would have similar effects. It would cause job demand to shift from one sector to another. The AI system would be monitored by expert personnel as it becomes more advanced.
- **Privacy:** Data privacy, protection, and security have been raised as issues for consideration in the AI industry. It has gone to influence policymakers in making helpful laws in recent years. There have been more laws in the U.S and even Europe which has come up to give individuals increased data control. For instance, the California Consumer Privacy Act (CCPA), among others, mandates enterprises to inform users before collecting their data. It has caused businesses to seek ways of gathering, storing, and processing personally identifiable data (PII). This has invested within security a destination for enterprises seeking to reduce security threats like hacking, surveillance, and cyber-attacks (Ganapathy, 2019).
- **Bias and discrimination:** Also, issues have been raised about AI bias. How can data gathering by AI be protected from bias and discrimination? The intention of using AI is usually without the bias factor. However, AIs sometimes identify and Mark some of the unintended data when learning. Sometimes this data may be intentionally inputted during programming. Artificial intelligence bias and discrimination can be found in the image and facial recognition software, hiring and evaluating software, and other algorithms. The spread of technology into investment would also increase the awareness of the risks involved in using AI.
- **Accountability:** Very few legislations on AI utilization exist to regulate AI, especially in terms of ethical deployment of software to manage data and content privacy. The inadequacy of regulation also means that there are very limited enforcement mechanisms. The few legislations mandating enterprises to maintain the guidelines result from the effects of unethical AI practice. There is a need for ethical frameworks to serve as a guide in the utilization of AIs. These frameworks would be back by enforcement mechanisms for accountability.

Stock Leap through Machine Learning and AI-Driven Input Injection

Through protocols and scripts, they learn, think, and perform tasks just like humans do by mimicking and copying human actions. Different Industries have employed AI to carry out tasks and functions. This has led to the increased influence of AI across several industries including, health, agriculture, finance, education, and so on.

A machine can automatically learn and study the input and output of data automatically without human assistance. AI programmed by scripts which set protocols and commands learn, reason and perceive things the way human do and take actions using algorithms that would result in the best results possible.

Some persons would invest in the stock market. The stock market is also still quite volatile, and prices fluctuate remarkably sharp upwards and downwards.

Artificial intelligence can be used to predict, analyze and study stock market swings. It will use data from various streams and figure out for each vertical of stock what the price would be after 12 months and further. Artificial intelligence through machine learning will analyze the history, current market trend, stock market-related tweets, and sentiments behind them to reach a calculated and analyzed result of the future price (Paruchuri et al., 2021).

Artificial Intelligence would function using the machine learning concept. It will learn, identify, process, and input data without human intervention. Different persons may utilize the tool in different areas, such as prospective investors, traders, and stockbrokers.

Knowing the stock market price is one of the goals of using an AI. The volatile stock market price is mostly unpredictable. It follows a random sequence and Pattern that makes it difficult to determine. Stock market prices fluctuate at inconsistent rates. AI predicts change using the news feeds through machine learning (Ahmed et al., 2020). It predicts the news that could affect the price of stocks instead of the stock price itself. The AI gathers data and combines them for analysis and machine learning to create more knowledge about a particular stock in the future. Stock price volatility is caused by factors such as decisions of a big investor or many investors and human sentiment in trading. The sharp changes in stock prices form a random price sequence. This can be seen when analyzing charts of specific range and noting the point of increase and decrease in value of a stock. This analysis usually would reveal that there is a sequence to price fluctuations and stability. The AI uses these patterns to determine the future price. Users of the software would also find it useful and as a tool for income generation.

- **Discovering patterns:** AI can read thousands of data in minutes. It can also understand historical and reoccurring patterns that humans may not notice for predictive trading in the stock.
- **Sentiment-based prediction:** It Analysis social media content, like posts and comments, write-ups, articles, and so on, about the stock market. In traditional financial trade, sentiments and become quite popular and a term used frequently among traders (Vadlamudi, 2020b).

Use of AI for Stock Investment in Pharmaceutical Industries

Using an AI to determine the future price and best investment can increase a stock investor's ability to trade. It gives the trader a competitive advantage by reducing decision-making processes and giving important reports to enhance the best actions. Investors may use manual analytics to understand the market's history and what went wrong with a specific investment. The AI provides users with a view of the entire picture, allowing pre-informed decisions in the stock market.

Here are some specific ways Artificial intelligence can help investors in the stock market:

- **It helps investors in choosing the right stock investment:** Generating income is the main goal of every investor. Stock market investors need to choose the right investment that will result in profit and not loss. AI can help identify the right investment using its price predicting ability. Investors who want to maximize profit by choosing the right investment would find an

AI very reliable for predictive analytics of the stock market. It will identify the best investment that will lead to high returns.

- **It improves the decision-making speed:** Finding a suitable investment using the manual and normal method involves lots of research. It could take a long while also. An AI can enable an investor to find the right stock investment without much personal research and in a shorter time.
- **Minimizes investment risk:** Every investment has some level of risk. The volatility of the stock market makes it even riskier to invest. An AI reduces investment risk by providing accurate information based on stock data gathered. This information can help avoid the harsh effect of stock market fluctuations.
- **Makes stock investment finding easier:** An Artificial Intelligence software can remove the complexities associated with stock trading and makes it simple to use. Anyone can invest in the stock market using an AI regardless of their knowledge or background.

Conclusion

As one of the many advancements in technology, Artificial Intelligence has become part of human life and plays an essential role in our day-to-day activities. Diverse innovations have revolutionized so many aspects of human activities, including finance, stock market trade, and investment. The use of Artificial intelligence will make stock investment easy and more efficient. This is because machine learning analyzes data relating to the stock market to discover patterns in the market.

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