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Review of Prediction Techniques for Stock Market Analysis

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Abstract: For investors and traders looking to make educated investment decisions, stock market forecasting has long been a difficult and crucial topic of research. The use of machine learning techniques for stock market prediction has attracted a lot of attention in recent years because of their capacity to analyze enormous volumes of data and reveal hidden patterns. More than 50 research publications on machine learning algorithms for stock market prediction are examined in this paper. The reviewed papers are primarily used to analyze and forecast the direction and amount of changes in stock prices by looking at numerous data sources, such as financial reports, social media, and news articles. In order to determine the best method for stock market prediction, the study analyses various data sets using various prediction methodologies, including Bayesian model, Fuzzy classifier, Artificial Neural Networks (ANN), Support Vector Machine (SVM) classifier, Neural Network (NN), and other machine learning methods. The findings indicate that using alternate data sources can improve prediction accuracy and that machine learning techniques are useful for forecasting stock market changes. The ability of several machine learning techniques, including decision trees, neural networks, and support vector machines to forecast stock values, is also explored in the article, along with their advantages and disadvantages. The study sheds light on the potential advantages of utilizing machine learning methods and different data sources to improve stock market prediction accuracy. The findings imply that machine learning approaches can aid traders and investors in risk management, portfolio return optimization, and the identification of lucrative investment possibilities.

IndexTerms **- Stock market, Prediction techniques, Neural Networks, Long Short-Term Memory, Artificial Neural Network, Autoregressive Integrated Moving Average, Convolutional Neural Network, Re-current Neural Network, Random Forest, Sentiment Analysis**

I. INTRODUCTION

Stock market prediction is the technique of forecasting the future behaviour of the stock market using statistical analysis and machine learning algorithms. This entails analysing past price and volume data, financial statements, economic indicators, and other important aspects aiming to forecast the movements of stock price. The purpose of stock market forecasting is to find profitable investment opportunities while minimising risk. However, due to the stock market's complexity and volatility, accurate predictions are difficult to make and frequently necessitate a combination of expertise, experience, and technology.

The goal of making stock price predictions is to make large gains. It is difficult to predict how the stock market will perform. Other elements, such as biological and psychological factors, as well as reasonable and irrational behaviour, are factored into the prediction. These forces combine to generate a turbulent and dynamic stock market. As a result, making precise stock price projections is extremely difficult. The goal of this project is to analyse the current system's flaws and design a time-series model that would mitigate the majority of them by applying more efficient algorithms.

Technical analysis and fundamental analysis are two well-known ways for predicting the stock market. The study of charts and other market data to find trends and patterns that can assist anticipate future price movements is known as technical analysis. Fundamental analysis is evaluating a company's future success by analysing its financial statements as well as other qualitative criteria such as industry trends and managerial ability.

However, stock market forecasting is complex and vulnerable to several variables, such as unforeseen occurrences and human behaviour, making effective forecasting difficult. Changes in the global economy, political instability, and even natural calamities, for example, can all have a substantial impact on the stock market. Investors' emotional reactions to news or rumours can also have an impact on stock prices, leading stock prices to fluctuate.

There are numerous things that might influence the stock market and produce price swings.

The following are some of the most major changes that can have an impact on the stock market:

- Economic variables: Economic variables such as inflation rates, GDP growth, and interest rates, can have a substantial impact on stock values. For instance, if the economy is expanding and interest rates are low, this might boost consumer spending and stock values.
- Individual company performance: Individual company performance can have an impact on the stock market. A company's stock price may rise if it publishes excellent earnings, while it may fall if it reports low results.
- Government policy: Government policy can have a variety of effects on the stock market. Changes in regulations, for example, might have an impact on certain industries, whereas changes in tax policy can have an impact on company earnings and investment decisions.

- Global events: Global events such as wars, natural catastrophes, or pandemics, can also have an impact on the stock market. These occurrences have the potential to disrupt global supply networks, influence consumer spending, and cause market volatility.
- Investor sentiment: Investor sentiment can also have an impact on the stock market. If investors are enthusiastic about the future, they will buy more and drive-up stock prices, but pessimism will cause them to sell and drive down stock prices.

Figure 1. Nifty 50 during pandemic phase

Pre-COVID, Indian Stock Market capitalization was around 2.15 trillion dollars where Sensex was around 41,952 points while As shown in Figure 1 Nifty 50 was at 12,362. This was the highest peak during Jan 2020, Since the COVID 19 strike, markets have been fearful and uncertain. Nifty 50 was trading at 7,610, while the Sensex was around 25,981 points. It has led the world's markets to crash to depths unseen since the Global Financial Crisis of 2008. The BSE Sensex and Nifty 50 both fell by 38% as a result of the strong correlation with global market trends and indicators. The overall market cap has plummeted by a startling 27.31% since the year's beginning. The stock market has mirrored the feelings that both domestic and foreign investors have regarding this pandemic. Companies have reduced spending, increased layoffs, and reduced employee compensation, resulting in no growth during the past few months. Stock values in some sectors, including hospitality, tourism, and entertainment, have fallen by more than 40%.

Once the COVID-19 pandemic settled and majorly all the business where working on the regular basis, there was a growth noticed in the market indices. Currently now, the Sensex is 61,749 points while Nifty 50 is 18255 as of 5th May 2023 and till date both the indices have never touched again as low as they were during COVID-19 pandemic. Overall, numerous factors can influence the stock market, and investors must be informed about these changes and their potential impact on their investments.

II. LITERATURE SURVEY ON DIFFERENT STOCK MARKET PREDICTION TECHNIQUES

This section showcases a review of various stock market forecasting methods in the papers surveyed. Figure 2. shows the various stock market prediction methods in the papers reviewed. Prediction-based approaches and clustering-based approaches make up the two primary groups of stock market prediction methods. Prediction-based techniques include methods such as logistic regression (LR), convolutional neural networks (CNN), autoregressive integrated moving average (ARIMA), neural networks (NN), artificial neural networks (ANN), support vector machines (SVM), long and short-term memories (LSTM), recurrent neural networks (RNN), support vector regression (SVR), and SRLP. Similar to this, clustering-based techniques include methods like Random Forest, Fuzzy, Sentiment Analysis, and Graph Convolutional.

2.1 Analysis based on prediction techniques

The analysis based on prediction techniques—LSTM, ANN, CNN, NN, ARIMA, SVM, SVR, SRLP, and LR—is elaborated in this part.

2.1.1 Long and Short-Term Memory (LSTM) based prediction techniques

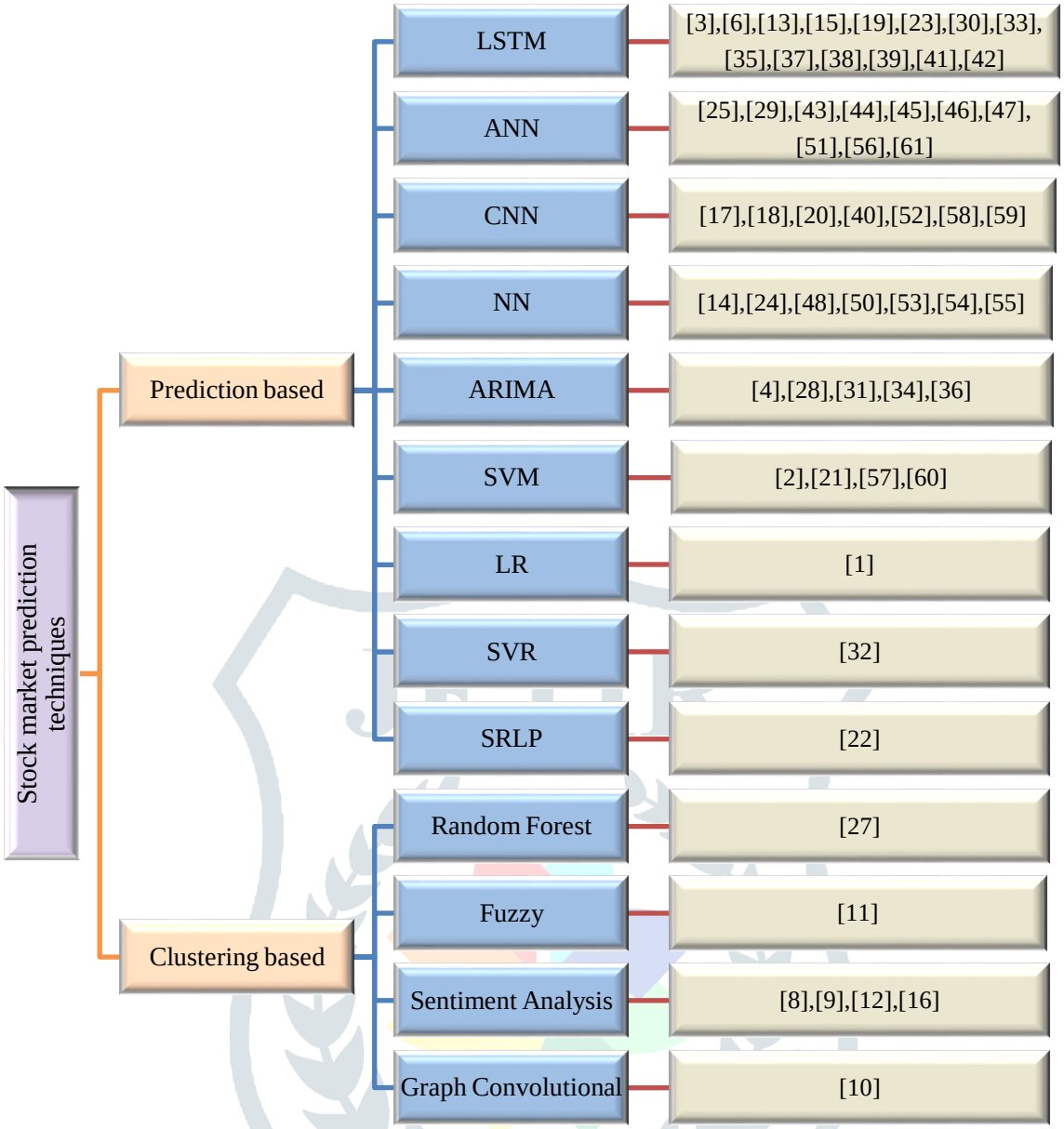

Figure 2. Distinct stock market prediction techniques categories

Two years of data was collected from the Chinese stock market by Shen, Jingyi, et al. [3] who then presented a thorough customization of feature engineering and deep learning-based models for forecasting stock market price patterns. The suggested approach is thorough since it incorporates stock market dataset pre-processing, several feature engineering techniques, and a tailored deep learning-based system for stock market price trend prediction. Ghosh, Pushpendu, et al. [6] analyze the effectiveness of forecasting out-of-sample directional movements of S&P 500 constituent stocks for intraday trading from January 1993 to December 2018 using trading approaches including LSTM networks (more specifically CuDNNLSTM) and h random forests. We provide a multi-feature setup that incorporates intraday returns in addition to returns relative to opening prices and closing prices. Frank Z. Xing and others [13] They suggest formalizing public mood into market views because market views can be included into contemporary portfolio theory. The best market perspectives in our framework will use a Bayesian asset allocation strategy to maximize returns during each period. We train two neural models to create market perspectives, and then we assess how well they perform against other well-liked asset allocation plans. Huicheng Liu [15] A self-attention method is utilized to disperse attention among the majority of relevant words, news, and days. A Bidirectional-LSTM is specifically used to encode the news content and gather context information. We demonstrate the efficacy of recent NLP technology advancements for computational finance by proving that our method is competitive with other cutting-edge methodologies in predicting directional changes in both the Standard & Poor's 500 index and individual company stock prices. By enhancing the stock data with related stocks, Sidi, Lior[19] enhanced the stock prediction models in the same way as a professional trader would. Co-integration similarity, which was studied together with five other similarities functions, was found to have the largest impact on the prediction model. The author then assesses those models on seven S&P stocks from distinct industries over a five-year timeframe. In their system proposal, Rajkar, Ajinkya, et. al. [23] used Django and React to create a web application. The React Web App shows all real-time prices and news that were collected from the self-built Django Server through web scraping. Additionally, the machine learning algorithm created with Keras and improved with Tensorflow is connected to the React frontend via the Django server. In this work, Roondiwala, Murtaza, and colleagues [30] propose a recurrent neural network (RNN) and Long Short-Term Memory (LSTM) strategy to forecast stock market indices. Long-short-term memory, also known as LTSM and ARIMA, is covered in great length by Hochreiter, Sepp, et al. in their study [33]. Dinesh, S., et al. [35] attempted to predict stock prices using machine learning. Stock price forecasting makes excellent use of machine learning. Making more informed and exact investing decisions is

the aim of stock price forecasting. To increase stock forecast accuracy and produce lucrative trades, we suggest a stock price prediction method that integrates mathematical functions, machine learning, and other outside aspects. A unique neural network methodology is being developed by Pang, Xiongwen, et al. [37] in order to improve stock market forecasting. Data from the live stock market was used for real-time and offline analysis, as well as the results of visualizations and analytics, to illustrate the Internet of Multimedia of Things for stock analysis. Standard neural network algorithms may incorrectly anticipate the stock market when used to study the influence of market variables on stock prices. This is because the initial weight of the random selection issue can be easily prone to false predictions. The gap in the LSTM for Time Series was closed by Yadav, Anita, and colleagues [38]. Utilizing information from the Indian Stock Market, the LSTM Model was created. Then, it was adjusted for the number of hidden layers and comparisons between stateless and stateful models. Nelson, David MQ, et al. [39] explore how LSTM networks can be utilized in that scenario to forecast stock price patterns based on price history and technical analysis data. The framework for examining and projecting a company's future growth proposed by Ghosh, Achyut, et al. [41] is based on the LSTM (Long Short-Term Memory) model and the net growth calculation algorithm. In order to establish the appropriate time frame for projecting the future price of a share, this article analyses the development of businesses across a range of industries. Consequently, this leads to the crucial finding that businesses in the same industry share the same dependence and growth rates. The forecast will be more accurate if the model is trained on more data sets. With the help of market data, Pramod, B. S., et al. [42] estimate the share price. The suggested approach makes use of machine learning techniques such the Long Short-Term Memory recurrent neural network. Using stochastic gradient descent, weights are adjusted for each data point during this process. Our technology will deliver accurate findings, unlike the present stock price predictor systems. To produce the graphical results, the network is trained and tested with a range of input data sizes. Some of the methods employed include machine learning, stock price prediction, long short-term memory, the stock market, artificial neural networks, and the national stock exchange.

2.1.2 Artificial Neural Network (ANN) based prediction techniques

Rao, Polamuri Subba, et al. [25] examined a number of stock market forecasting methods. For five businesses from distinct industries, Vijh, Mehar, et al. [29] employed Artificial Neural Network and Random Forest approaches to estimate the closing price for the following day. Stock prices' open, high, low, and close prices are utilised to generate new variables, which are then fed into the model as inputs. Models are assessed using common strategic metrics like RMSE and MAPE. The models are successful at forecasting stock closing prices since these two indicators have low values. Patel, Mayankkumar B, et.al [43] used Artificial neural networks to forecast stock prices for companies listed on the National Stock Exchange under the LIX15 index (NSE). The historical data of the chosen stock will be used for model creation and training. The model's output will be compared to actual data to determine its correctness. Neural network models, which are known to be dynamic and effective in forecasting the stock market, were evaluated for their effectiveness by Guresen, Erkam, et al. [44]. The models that were looked at were the multi-layer perceptron (MLP), dynamic artificial neural network (DAN2), and hybrid neural networks that extract additional input variables using GARCH (generalised autoregressive conditional heteroscedasticity). Vui, Chang Sim, et.al [45] examines alternative methods for stock market forecasting that use artificial neural networks (ANN). In order to identify what can be done in the future, the purpose of this study is to give a review of the uses of ANN in stock market prediction. Egeli, Birgul, et al. employed an Elman recurrent network and a feed-forward multi-layer perceptron (MLP) to estimate a company's stock value based on the performance of its stock shares in the past. Based on an analysis of recent literature, Strader, Troy J., et al. [47] proposed potential prospects for machine learning stock market prediction research. Peer-reviewed journal papers from the past 20 years that are relevant are found and research with comparable methodologies and contexts are categorised using a systematic literature review process. The study of artificial neural networks, support vector machines, genetic algorithms integrated with other techniques, and hybrid or other artificial intelligence methods fall into four groups. Moghaddam, Amin Hedayati, et.al [51] created ANN to forecast the daily NASDAQ stock exchange rate. For training, several feed forward ANNs used the backpropagation technique. For the prediction, the approach uses prior stock prices. The strategy uses the NASDAQ daily stock to test the model's prediction abilities. Shishir Kumar Sharma, et al. [56] employed machine learning algorithms including SVM, CHAID, Classification and Regression Technique (CART), and ANN to examine and anticipate stock movements using BSE SENSEX data. The method could not be employed with other financial datasets like the BSE 100 or Yahoo since it lacked strong predictive models for anticipating the stock market index. A useful approach based on data mining methods was developed by Zhong, Xiao, et al. [61] to estimate the daily trends of the S&P 500 Index return using economic factors. Three techniques are used to make the prediction: Fuzzy Robust Principal Component Analysis, Kernel-Based Principal Component Analysis, and Principal Component Analysis (PCA) based on dimensionality reduction. Complex kernel functions and relevant kernel parameters are required for the prediction.

2.1.3 Convolutional Neural Network (CNN) based prediction techniques

Rosyana, Kusuma Using Deep Convolutional Networks and candlestick charts, Mangir Irawan, et al. [17] examine the predictability of the stock market. The outcomes are utilized to develop a decision support framework that traders can use to offer indicators for the direction of the future stock price. Convolutional neural networks, residual networks, and visual geometry group networks are only a few of the neural networks used in this work. Jinho Lee, among others [18] They employed Deep Q-Network, which accepts stock chart images as input, to forecast the global stock market using a Convolutional Neural Network function approximator. The goal of this survey, conducted by Jiang and Weiwei [20], is to present a current review of recent studies on deep learning models for stock market prediction. The authors classify the implementation and reproducibility in addition to the different data sources, neural network architectures, and widely used assessment criteria. In addition to making it straightforward to repeat earlier investigations as baselines, our aim is to assist interested researchers in keeping up with the most recent advancements. Based on the synopsis, we also indicate a few potential lines of inquiry for this area of study. Model independence sets apart the proposed technique by Selvin, Sreelekshmy, et al. [40] In this instance, latent dynamics already present in the data are found instead of fitting the data to a particular model using deep learning architectures. The effectiveness of three various deep learning architectures for forecasting the prices of NSE-listed businesses is compared in this paper. We use the sliding window method to anticipate future values in the short term. Using percentage error, the models' performance was evaluated. A deep learning algorithm was used by Vargas, Manuel R., et. al. [52] to predict the movement's direction using the S&P 500 index and technical indicators. The trading process is sped up by the use of deep learning algorithms to identify and evaluate

complicated patterns in data. Reinforcement learning techniques were not successfully adapted by the strategy for the model's market simulation training. Zhou, Xingyu, et.al [58] created a general framework by modifying the LSTM and CNN to train for predicting frequent stock market trends. The method mimics a trader's style of operation and employs training and testing sets to examine the impact of the cycle's updates on performance prediction. The technique additionally lacks additional predictive models in multiscale situations. Xu, Bo, and others [59] produced In order to forecast stock market trends, recurrent convolutional neural networks were used. The network was able to obtain essential information from stock market results with the aid of the significant feature. To automate the learning process, an entity embedding layer was added in the first layer. Financial expertise was not taken into account when optimizing the model for stock trend prediction.

2.1.4 Neural Network (NN) based prediction techniques

Recurrent, continuous latent variables are included in Xu, Yumo, et al.'s [14] work to enhance stochasticity treatment, and neural variational inference is used to handle intractable posterior inference. Additionally, they offer a hybrid goal with a temporal auxiliary to easily capture prediction relationships. We demonstrate the state-of-the-art performance of our suggested model using a fresh stock movement prediction dataset that we gathered. MOMIN, FAISAL, et.al [24] proposed a system to find the best model for predicting stock market value. A feed forward multi-layer Perceptron (MLP) and an Elman recurrent network are used in this study to predict a company's stock value based on the historical performance of its stock shares, according to Naeini, Mahdi Pakdaman, et al. [48]. Paul D. Yoo and colleagues reviewed machine learning techniques for stock market forecasting in their article [50]. The prediction of stock markets is a challenging aspect of financial time series. In this essay, we examine the advantages and disadvantages of recent developments in stock market prediction models. A Radial Basis Function Neural Network (RBFNN) was utilised by Shen, Wei, et al. [53] to train and forecast market indices on the Shanghai market Exchange. The Radial Basis Function (RBF), which was optimized using GA and PSO, was learned using the Artificial Fish Swarm Algorithm (AFSA). The attempt to increase the accuracy of stock market forecast by including non-quantitative elements into mathematical algorithms failed. Chatzis, Sotirios P., et.al [54] developed a reliable forecasting method for predicting the stock market over a range of time frames. The approach combines different machine learning techniques while using daily stocks from a broad range of economies. To choose the right variables from vast collections, the system used a variety of machine learning techniques. Finally, a bootstrap sample was modified to correct the fitting dataset's imbalance. The approach fell short of investigating deep neural networks for highly accurate high-frequency data setting. Using fuzzy neural network topologies, Adebiyi, A. A., et al. [55] developed a better predictive model for predicting the stock index. The impacts of using hybrid technical, fundamental, and market indicators are investigated with the aim of making the prediction. To improve the accuracy of stock prediction, the input variables are altered based on market signals and processed through a fuzzy neural network. The method, however, did not consider the critical contributions of expert judgement for evaluating the accuracy of stock price projections.

2.1.5 Autoregressive Integrated Moving Average (ARIMA) based prediction techniques

Using fuzzy neural network topologies, Adebiyi, A. A., et al. [55] developed a better predictive model for predicting the stock index. The impacts of using hybrid technical, fundamental, and market indicators are investigated with the aim of making the prediction. To improve the accuracy of stock prediction, the input variables are altered based on market signals and processed through a fuzzy neural network. The method, however, did not consider the critical contributions of expert judgement for evaluating the accuracy of stock price projections. For the purpose of predicting stock prices, Chatterjee, Ananda, et al. [28] propose a variety of time series, econometric, and learning-based models. To evaluate which model works best in which industry, the data from Infosys, ICICI, and SUN PHARMA from January 2004 to December 2019 were utilized to train and test the models. One econometric model (ARIMA), one-time series model (Holt-Winters Exponential Smoothing), two machine learning models (Random Forest and MARS), and two deep learning-based models (basic RNN and LSTM) are all included in this study. The most successful deep learning model is LSTM, while MARS has been demonstrated to be the most successful machine learning model. The lengthy process of creating a stock price forecasting model based on the ARIMA model is described in detail in Ariyo, Adebiyi A., et. al.'s [31] work. In this study, Mahantesh C. Angadi et al. suggested a methodology for predicting stock market trends based on technical analysis and the ARIMA model utilizing historical stock market data. This algorithm will help financial experts choose the ideal moment to buy and/or sell stocks by automating the process of predicting the direction of future stock price indexes. The outcomes are presented in the form of R-programmed visualizations. Islam, Mohammad Rafiqul, et al. [36] contrast three techniques for forecasting stock prices: stochastic process-geometric Brownian motion, autoregressive integrated moving average, and artificial neural network. The historical stock data from Yahoo Finance is utilized to develop predictive models using each technique. Each model's output is then contrasted with the current stock price.

2.1.6 Support Vector Machine (SVM) based prediction techniques

V. Kranthi Reddy [2] Sai explains how machine learning may be used to predict a stock. When predicting stocks, the majority of stockbrokers employ time series analysis, technical and fundamental research, or both. Python is the computer language used to make machine learning-based stock market predictions. In this research, we propose a Machine Learning (ML) approach that will be trained utilising stock market data that is made available to the public in order to acquire knowledge and then use that information to produce an accurate prediction. According to Mokhtari, Sohrab, et al. [21], Technical and fundamental analysis are the two main types of analysis that may be used to predict stock market forecasts. The technical analysis approach uses regression machine learning (ML) algorithms to forecast the stock price trend at the end of a business day based on historical price data. In contrast, the fundamental analysis uses classification ML algorithms to categorise public sentiment based on news and social media. In fundamental analysis, which is different from technical analysis, public tweets about the stock market on Twitter are examined to determine the impact of feelings on the stock market's prognosis. Technical analysis uses historical price data from Yahoo Finance. Porshnev, Alexander, et.al [57] developed a strategy known as the lexicon-based method by taking into account the perspectives of Twitter users to increase the accuracy of stock market indicators. Eight key emotions can be found in more than 755 million tweets, according to the research of attitudes. In addition, DJIA and S&P500 indication forecasting is done using SVM-based algorithms. However, the technique was unable to improve sentiment analysis algorithms or maximise training times. A multi-source multiple instance model was developed by Zhang, Xi, et. al. [60] that may include events, emotions, and numerical data into a comprehensive framework. The extraction and representation techniques are

used to record the news events. News events and quantitative data, which also predicts stock market movements, have an impact on stock swings.

2.1.7 Analysis on other prediction techniques

In order to accurately estimate the future value of a stock, Banerjee, Sharanya, et al. [1] analyze enormous volumes of data and use regression techniques. A time series model is created by utilizing more effective methods. In order to predict the stock market, Kim, Raehyun, et al. [5] present a hierarchical attention network for stock prediction (HATS) that makes use of relational data. Our HATS technique carefully gathers data on numerous relation kinds and adds it to each company's representations. HATS is an initialized node representation relational modelling module. Then, node representations with the new information are sent into a layer that is specific to the job at hand. Our approach, which is comparable to the graph classification task, is used to forecast market index movements as well as changes in individual stock values. Liu, Xiao-Yang, et.al [7] teaches new stock traders how to develop their own strategies based on deep reinforcement learning. FinRL is a quantitative finance learning library that uses deep reinforcement learning. FinRL offers a virtual environment with stock market datasets, trading agents trained with neural networks, and trading performance to analyse backtesting. Zou, Jinan, et.al [22] created a platform for systematically studying NLP-assisted stock auto-trading algorithms. In contrast to their previous work, the platform is distinguished by three characteristics: (1) The authors provide financial information for each individual stock. (2) For each stock, they provide a variety of stock factors. (3) The authors assess performance using more monetary metrics. Alfonso, Gerardo, et.al [26] employs two techniques for forecasting stock prices and price intervals. Both techniques, which are based on previous works by the authors, rely on data locally extracted from a database. This data corresponds to various market states that are similar to the current one. Meesad, Phayung, et.al [32] utilised Support vector regression (SVR) analysis to predict both the price and the trend of the stock market. Additionally, many windowing operator types are employed as data pre-processing or input selection methods for SVR models. This novel method uses several windowing techniques as a data pre-process to forecast time series data. Agrawal, J. G., et.al [49] offers a survey of the various stock prediction methods. It is safe to say that the existing methodologies are unsuitable for forecasting stock market trends as well as the prices of various socks based on the published and accessible literature.

2.2 Analysis based on clustering techniques

In this section, the analysis based on clustering techniques are elaborated, which includes Random Forest, Sentiment Analysis, Fuzzy, Graph Convolutional.

2.2.1 Sentiment Analysis based prediction techniques

Pagolu, Venkata Sasank, et.al [8] describes how sentiments or tweets affect company stock prices, influencing the rise and fall of company stock prices. This research topic employs two textual representations: 1. Word2vec and 2. N-Gram. To further investigate the relationship between sentiments in tweets and stock movements, the author used sentiment analysis and supervised machine learning algorithms on tweets data. Bollen, Johan, et.al [9] describes the Dow Jones Industrial Average (DJIA), which is used for Twitter Feeds. OpinionFinder and Google-Profile of Mood States are used to analyse Twitter feeds. Based on a large collection of daily Twitter posts, this paper investigates whether public sentiments can aid in the prediction of stock prices. In this study, Prosky, Jordan, et al. [12] describe the results and experiments on the stock-market prediction utilising several textual sentiment analysis methods, such as mood analysis and event extraction, as well as prediction models, such as LSTMs and particular convolutional architectures. In this study, Shah, Dev, et al. [16] retrieved, extracted, and examined the stock market's reaction to news feelings. The development of a dictionary-based sentiment analysis model, the establishment of a financial sector-specific sentiment analysis dictionary, and the testing of the model's prognostication of the impact of news sentiments on pharmaceutical market stocks are the main contributions. Using simply news sentiments, the author was able to anticipate patterns in short-term stock price movement with a directional accuracy of 70.59%.

2.2.2 Analysis on other prediction techniques

Feng, Fuli, et.al [10] explain how traditional models, such as time series models, were used in the past, as well as the advantages and disadvantages of deep learning. They developed a new solution based on deep learning known as Relational Stock Ranking, which focuses on two situations: customizing deep learning models for stock ranking and capturing stock relations in a time-bound manner. NekoeiQachkanloo, Hadi, et.al [11] use Support Vector Regression to predict stock prices, and the predicted prices are then used to educate users on which different stocks to buy to balance risk based on user input. Two distinct methods are used to select the best portion of stocks. Markowitz portfolio theory and fuzzy investment counsellor. The goal of Polamuri, Subba Rao, et al.'s [27] novel work was to predict or feel the stock market sensex's behaviour tracking. Machine Learning methods are used to forecast stock values and characterize the activity between buyers and sellers of securities. These models include linear regression, support vector regression, decision trees, random forest regressors, and extra tree regressors. Based on the stock price and closing value, we projected the price of the stock. After analyzing the accuracy of each model and deciding which algorithm is more effective at forecasting stock price, a high accuracy method is selected.

III. ANALYSIS AND DISCUSSIONS

This section presents the findings of the review conducted in the form of the analysis of the stock market prediction-based techniques, accuracy and publication years are explained.

3.1 Analysis based on publication years

The examination of the stock market prediction methodologies under consideration is presented in this paragraph based on the publication years. Figure 3. shows the volume of research papers that were published between 1997 and 2022. 39 research publications (66%), out of the 61 papers examined, were published between the years 2010 and 2019 as per Figure 4.

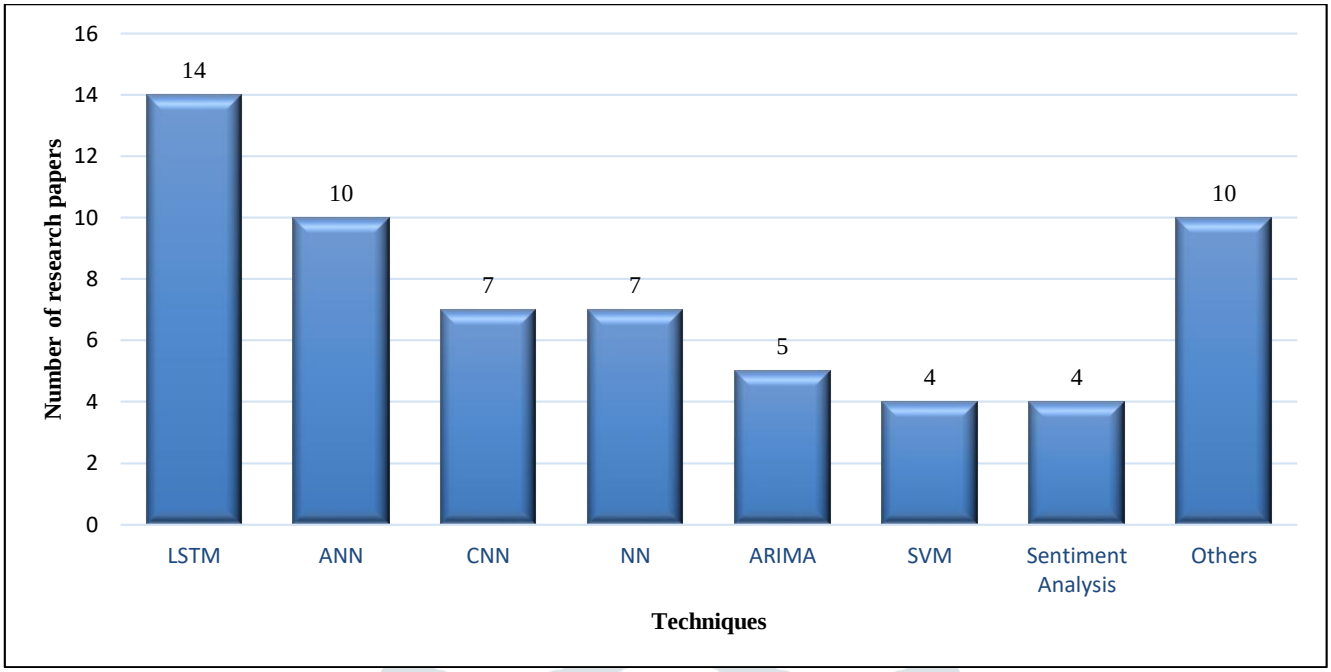

Figure 3. Analysis based on techniques

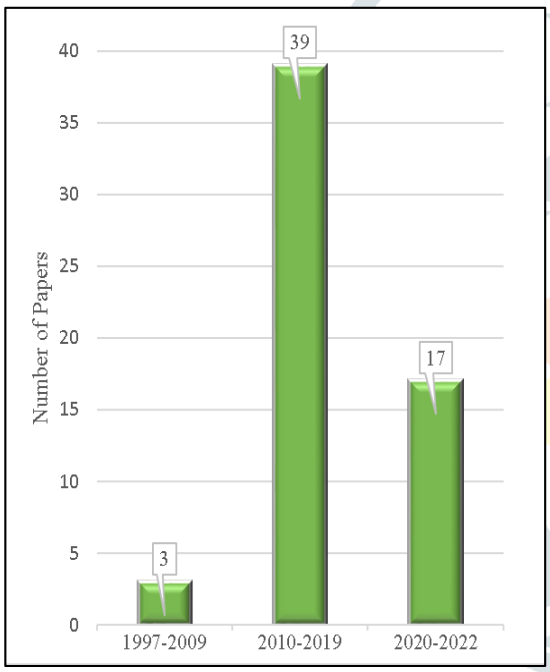

Figure 4. Number of Papers based on year of publication

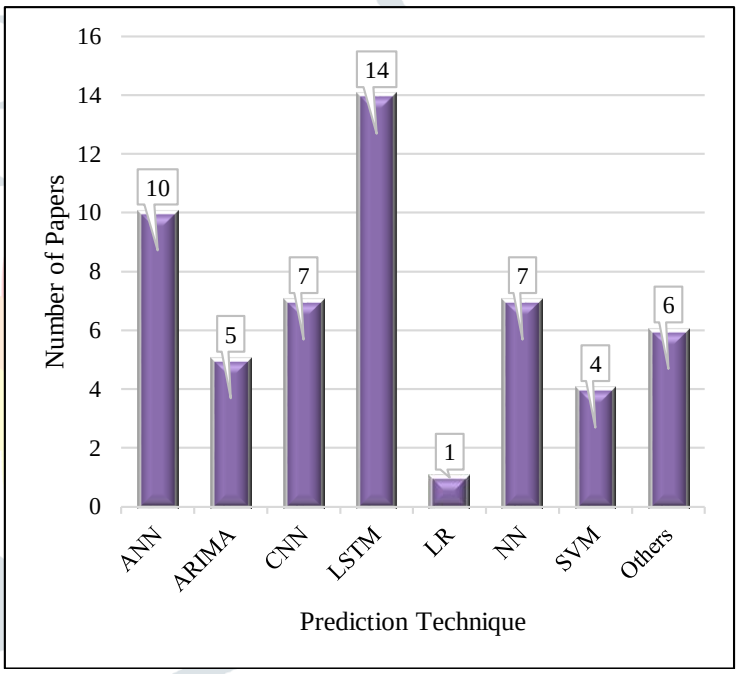

Figure 5. Analysis based on prediction techniques

3.2 Analysis based on prediction techniques

This subsection's analysis is conducted using the stock market prediction methodologies that are in use. Figure 5 shows that the LSTM was used in 14 papers i.e. about 26% of the works. ANN was utilised in 10 papers i.e. 19% of the research papers. CNN and NN were used in 13% of the research papers each. ARIMA is the basis for 9% of the work. SVM was used in 7% of the research publications, LR was used in 1%, and several approaches were used in the remaining 11%. Thus, LSTM and ANN are the most utilized techniques for stock market prediction.

3.3 Analysis based on clustering techniques

The study based on the various clustering techniques used for accurate stock market prediction is shown in Figure 6. 57% of the study paper in this case is based on sentiment analysis, followed by 14% each for Random Forest and Graph Convolutional and 15% on Fuzzy. As a result, the Sentiment Analysis technique is more frequently used for stock market prediction.

3.4 Analysis based on accuracy

This section goes into more detail about the accuracy value analysis. Using five ranges: 50%-60%, 60%-70%, 70%-80%, 80%-90%, and 90%-100%, Figure 7. elaborates the analysis based on the accuracy parameter that is specified. It should be observed that paper [51] achieved the maximum accuracy in the range of 90-100%, paper [55] achieved 80-90% accuracy range, paper [15,16,54,61] had achieved 70-80% accuracy range, paper [1,6,22,57,58,59,60], had achieved 60-70% accuracy range, and paper [37] had achieved the minimum accuracy in the range of 50-60%.

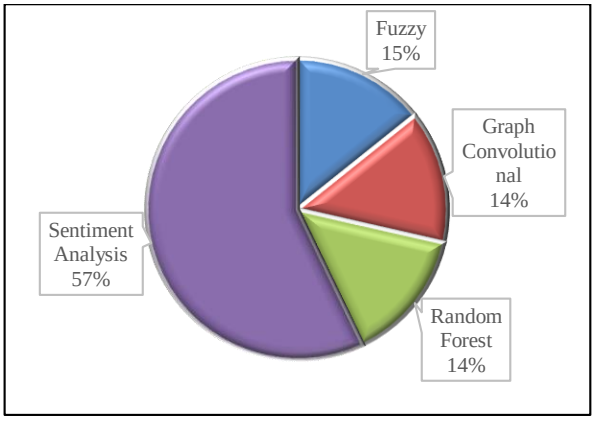

Figure 6. Analysis based on clustering techniques

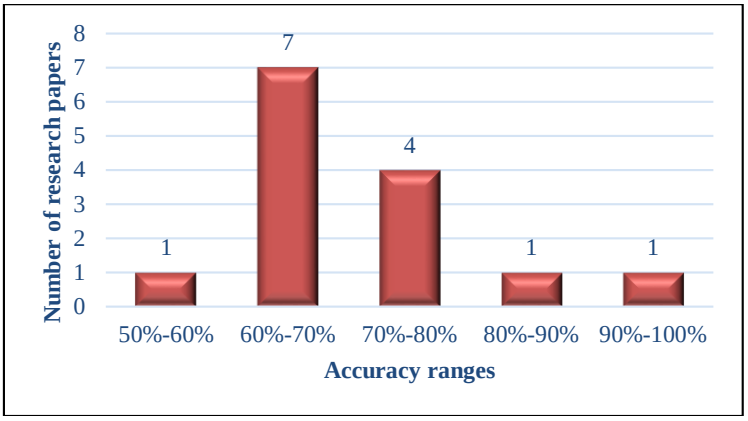

Figure 7. Analysis based on accuracy

IV. CONCLUSION

To sum up, stock market forecasting is a crucial component of trading and investing that enables traders and investors to make wise choices about buying or selling stocks. To forecast future stock values, it entails analyzing several sorts of data, including historical trends, economic indicators, and company-specific data. Regression analysis, time-series forecasting, neural networks, decision trees, and support vector machines are just a few examples of the machine learning methods that are increasingly employed to produce forecasts in the stock market.

This research gave a survey of many strategies used for effective stock market prediction, which is classified into prediction techniques and clustering techniques. Using more than 50 research publications, the goal of this survey is to categorize existing strategies based on publication years, methodologies utilized, datasets used, performance measures, and implementation tools. Stock market prediction techniques include LSTM, SVM, ARIMA, RR, Decision Tree, and others. Furthermore, the research gaps and issues for predicting the stock market are elaborated in order to suggest effective future scope. LSTM is a popular technique for making accurate stock market predictions. We learned about many approaches and technologies that can assist us attain our aim while analyzing multiple publications for this research report. The primary purpose of this study is to forecast market movements based on technical factors. There are other prediction strategies that can be utilized to accomplish our goal, and after reviewing several articles, we discovered that Long Short-Term Memory had the highest accuracy rate when compared to other prediction techniques.

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