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A Comparison of various methodologies in AI and ML for stock market prediction

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Abstract— Stock market projection patterns are becoming more successful and are regarded as an important activity. As a result, stock prices will provide large benefits for prudent decision-making. Due to old and unclear information, stock market estimates provide a considerable challenge for investors. As a result, forecasting the stock market is extremely difficult for investors seeking to maximize their return on investment. Stock market predictions are made utilizing mathematical approaches and study aids. This study article examines 30 articles to provide an understanding of the procedures involved in the stream as well as the bet calculating approach. ANN and NN algorithms are the most commonly employed to generate accurate stock market predictions. Despite considerable effort, the most recent stock market-related prediction system includes numerous flaws. In this study, it is assumed that stock market forecasting is a full process and that specific factors are more accurate.
Keywords— ANN, NARX, Stock market, NSE, machine learning, forecast, prediction, finance.

I. INTRODUCTION

The word "stock market" refers to a range of markets where investors can buy and sell shares of publicly traded corporations. One of the most fascinating innovations of our time is financial markets. These financial markets have a large impact on a variety of industries, including business and employment technology. Investors have primarily used two strategies to invest their money and enhance returns while minimising risk: invest in the stock market and make decisions that maximise returns while minimising risk. The evolution of stock market forecasting has taken on substantial relevance among experienced analysts and investors [2]. Due to the chaotic environment in the market, it is exceedingly challenging to analyse price actions [3] and stock market movements. The complexities of stock prices are influenced by a variety of factors, including quarterly earnings reports and market headlines. Stock market capitalisation is used to create stock market indices [4]. Because of the market's ever-changing nature, accurate stock market forecasting is a difficult task.[5].As a result, many statistical techniques, such as clustering and autoregressive integrated moving average, are used to forecast the stock market. Given that this model [6,7] provides historical data and ideas supporting the postulates of normalcy.

II. LITERATURE REVIEW AND ANALYSIS ON JOURNALS AND PUBLICATIONS

A. Need of Market Forecasting

By investing in the stock market, the stock market investor expresses a desire to profit. Because of advanced usage where projection may lead to successful market forecasts, the stock market has showed investor interest [34]. Predicting the behavior of the stock market is heavily reliant on prior knowledge. Fig 1. Illustrates the procedure of the techniques how the ML techniques process the data and then analyses it for further use.

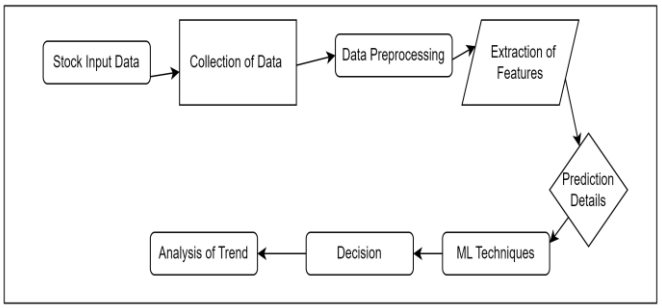


Fig1. Need of Market Forecasting

With technical advancements, forecasting the stock market may now be done using various strategies that were previously not possible. Many algorithms, primarily conventional regression, have been employed to forecast the stock market.However, the artificial neural network (ANN) and support vector machine (SVM) are two extensively utilised techniques. Each algorithm has its own method for detecting patterns and forecasting stock market trends.

The primary goal of this research is to conduct a literature review on machine learning (ML) techniques to stock market prediction.

The stock market analysis is the most common and mot difficult data analysis in the present day world. Many analysts need a more efficient way to solve the mystery of it. The research articles published since 2018- 2022 is in tremendous increase. There are about 650 articles published in the year 2022. Below are the figures to consummate the work done in researches over the years.

year	Total paper
2018	247
2019	635
2020	677
2021	414
2022	698

Fig2. Total Publication over the years

III. METHODOLOGY

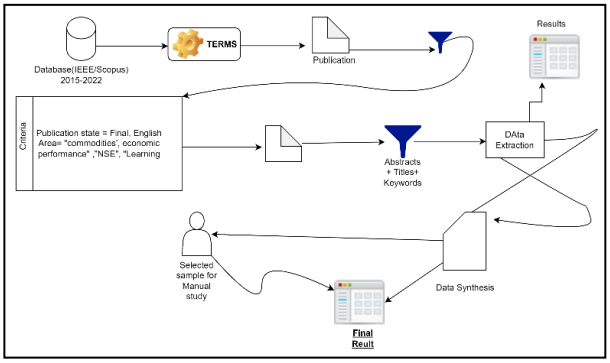


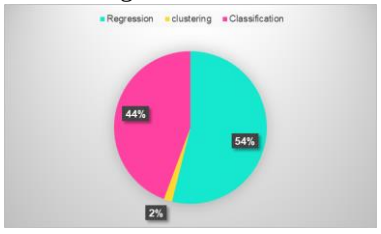
Fig3. Process of choosing Research work

The method utilized to choose the research work to be examined is quite detailed. The literature is retrieved using the Scopus database. The first step in selecting a research project is to search for all articles containing the terms "Stock Market" and "ML technique." Then, for the next iteration, we utilized the filters "NSE", "NIFTY", "Commodities", and "Economic performance". The data is then picked, cleaned, and filtered for further use in two more iterations.

According to the kind of prediction utilised, we categorised all prediction models in our collection of evaluated publications as regression (supervised learning), classification (supervised learning), or clustering (unsupervised learning) [36].

Figure 4 depicts a pie chart with percentages of each of these model types in the articles chosen. The pie chart shows that regression type studies account for the majority of instances (54.3%). Classification-based research continue to account for a considerable portion (44.3%), whereas clustering models only covered only 1.4% (two studies).

Fig4: Classification Result



1. [8] The paper "A survey on artificial neural network based stock price prediction using various methods" the authors examine different deep learning algorithms for prediction of stock price. Stock price is very unpredictable and in every second the is a transaction going on in the world so it is very important for the stock holder to have the accuracy about the stock price that they are holding.
2. [9] The paper "International Stock Index Prediction Using Artificial Neural Network (ANN) and Python Programming" the authors. Proposed a combine method containing tuned Python console program based on the Neural Network (NN), and the Artificial Intelligence (AI) to predict future stock security shell that works with voice and PIN to authenticate the user. It contains machine learning and deep learning algorithms for prediction and the users can have the data on the contact mail id given by them.
3. [10] The paper "Stock price forecasting and news sentiment analysis model using artificial neural network "the authors have attempted to study the prediction of stock price with the help of ANN in which the authors have built 3 models for that first to predict the future stock price, second for the prediction of the stock value on the next day and third one will analyze the sentiments of the news articles using R-studio.
4. [11] The paper "A repairing artificial neural network model-based stock price prediction "the authors have given the summary of various literature. In the literature the conclusion was depend on the training model i.e. the training phase in which the past record is use for prediction of future stock records. There are many errors in the data itself so the removal of error a model is proposed which is a self-repairing dynamic model called repairing artificial neural network (RANN).
5. [12] The paper, the authors of "Stock price prediction using artificial neural network integrated moving average" integrated the data to improve the accuracy of the neural network forecasts. The experiment is carried out with 10 different parameter combinations on the neural network, and the validation is performed on t-test, which likewise revealed a substantial difference when compared to the prior model.
6. .[13] The paper "Application of artificial neural networks for predicting the stock price in law" authors used direct propagation method for forecasting the company's share price and for the selection of training method reverse error propagation is used.
7. [14] The authors of "Time series forecasting of the Austrian traded index (ATX) using artificial neural network model" researched and analyzed the Austrian Traded Index of the Vienna Stock Exchange using the ANN approach from 2009 to

2017. The goal of this study is to discover the best model that can forecast fresh impending but unseen data with high accuracy.

8. [15] The paper “Prediction of Closing Stock Prices Using the Artificial Neural Network in the Stock Exchange of Thailand's (SET) Market for Alternative Investment (MAI)" the authors used an artificial neural network to investigate daily closing stock prices in the Stock Exchange of Thailand's (SET) Market for Alternative Investment (MAI). The results reveal that day traders can profit by trading the most active stocks in MAI.
9. [16]. The paper "Stock price prediction using artificial neural networks" employed LSTM to predict the identified stock future prices. After training the model with 60 days of data from a certain firm stock, it is feasible to forecast the 61st day stock price. Different optimization strategies can be applied to improve model performance. RMS prop optimization is the best optimization for predicting stock price. The results suggest that these neural networks outperform existing linear models.
10. [17] The paper “The authors proposed machine learning techniques in stock market closing prices of various stocks that are predicted using different algorithms on the ANN toolbox in MATLAB and correlation of predicted and acquired value analysis pertaining to a NARX network.
11. [18] The paper "Prediction of financial time series using artificial neural networks" want to investigate the predictive capacity of artificial neural networks in predicting stock indices. The functionality of dynamic nonlinear autoregressive networks with varying time delays was investigated. It is possible to argue that this type of neural network should be used in stock market technical analysis.
12. [19] The paper Indian stock market prediction using artificial neural networks on tick data" employed neural networks based on three distinct learning algorithms: Levenberg-Marquardt, Scaled Conjugate Gradient, and Bayesian Regularization. The results suggest that using tick data to predict the stock market improves and increases accuracy.
13. [20] In the paper “An Experimental Study on the Effectiveness of Artificial Neural Network-Based Stock Index Prediction" employed Keras as a neural network library and TensorFlow as a backend for the MLP and LSTM analysis, using the Dow Jones Index (DJI) as the data source. The results suggest that the prediction abilities of MLP and LSTM are equal.
14. [21] In the paper Prediction of agriculture and mining stock value listed in kompas100 index using artificial neural network backpropagation" employs technical analysis in conjunction with the Artificial Neural Network Backpropagation method, one of the machine learning techniques that has grown in popularity in tandem with the rapid development of data mining and big data analytics, to generate predictions with the highest accuracy and fewest errors. Stock prediction accuracy can be inferred from the accuracy performance prediction of using MAE, MSE, RMSE, and MAPE, which shows that the deviation of the predicted values of artificial neural network backpropagation from the actual values at agricultural and mining stock prices is sufficiently small.
15. [22]. In the paper “Forecasting portfolio optimization using artificial neural network and genetic algorithm” authors performed a study which shows that prediction of future stock values using ANN and then form optimal stock portfolios using GA with aims to get the best optimization of maximal return and minimal risk value.
16. [23] In the paper “Implementation of Artificial Neural Network to Predict S&P 500 Stock Closing Price" presented ANN back-propagation to predict the closing price of the S&P 500 exchange traded stocks using historical data, and the findings demonstrate that the average MAPE has a high stock prediction rate.
17. [24] In the paper Stock Price Prediction Based on Information Entropy and Artificial Neural Network" suggested a combined machine learning framework with information theory and Artificial Neural Network (ANN). This approach cleverly uses information entropy to allow ANN time series modelling, non-linear causation, and stock relevance. Our analysis of the stock prices of Google, Amazon, Facebook, and Apple demonstrates that this machine learning approach is realistic.
18. [25] The writers of "Stock market prediction using artificial neural networks" suggested an application to tackle stock evaluating, which is a testing issue that can precisely anticipate bearings of stock value movement.
19. [26] The paper “Stock prediction scrutiny using artificial neural network” authors have conducted a survey of neural networks in predicting stocks price in the market. The study explains how neural networks outperform the current methods.
20. [27] In the paper “A Comparative Study of Artificial Neural Networks and Support Vector Machines for predicting stock prices in National Stock Exchange of India” authors proposed a system for prediction of future trend of a stock price in share market and for that both Support Vector Machines and Artificial Neural Networks models are used to forecast the closing price of a specific stock listed on the National Stock Exchange.
21. [28] The paper “Variable Selection for Artificial Neural Networks with Applications for Stock Price Prediction” propose a new ANN method by selection of set of variables that are the input variables and compared the result using some set of data and predict the accuracy for stock price.

22. [29] The paper "Short term prediction framework for Moroccan stock market using artificial neural networks" they present a framework for stock markets based on ANN that is short term forecasting in which future prediction for trends of stock market for which framework is proposed to efficiently implement different ANN architectures like Multi-Layers Perceptron (MLP) and the Long Short- Term Memory (LSTM). The framework involves the use of tick-by-tick data and a selection of technical indicators as input variables and fixes the issues related to the imbalanced target classes and the non-regularly spaced input data.
23. [30] In the paper "Literature review on artificial neural networks techniques application for stock market prediction and as decision support tools" in this paper the literature review was conducted where the use of ANN in the field of Stock price prediction was used and database was collected from ProQuest electronic the studies shows that the ANN stock market prediction have high accuracy in prediction of stock rate.
24. [31] In the paper "Hybrid models for intraday stock price forecasting based on artificial neural networks and metaheuristic algorithms" author proposed hybrid model for the highest prediction rate of stock price in this comparison was made by integrating 9 models and result show that PSO-BPNN model yielded the highest prediction.
25. [32] In the paper "Forecasting stock price using integrated artificial neural network and metaheuristic algorithms compared to time series models" the authors with the help of artificial neural network (ANN) predicted the stock price indices and train it with social spider optimization (SSO) a metaheuristic algorithms and bat algorithm (BA) and also have used some input variables. Following the application of the techniques known as genetic algorithms (GA), a heuristic algorithm for feature selection, and various loss functions, such as mean absolute error (MAE), as error evaluation criteria for stock value prediction.

IV. CONCLUSION

The above paper consists the study of high-quality journal papers which shows that Artificial Neural Networks along with various machine learning algorithm helps in prediction of stock market price. We can propose different models and can use MATLAB for the prediction of stock which results in better accuracy for the prediction of price. Many machine learning algorithms can anticipate the stock market with excellent accuracy. Some suggest novel ML models to improve accuracy. The majority of ML models are NNs, while SVM and LSTM are also utilised.

According to an assessment of current studies, the significant growth in the application of deep learning techniques will continue into the 2020 and 2021 years. This new research indicated that all deep learning-based studies used better LSTM models to predict stock market characteristics. Based on this data, we can infer that LSTM networks are far more successful than other types of deep learning (such as CNN and RNN), producing more robust predictions.

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