WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Predicting Stock Market Trends Using Machine Learning and Deep Learning Algorithms

Kiran Rangu[1], Raja Rahul Kumar[2], Md Kaunain[3], Kasya Rohith[4], Thalari Charan Sai[5], Mr. V. Gopi[6]

[6] Under the Guidance of:, M.E., (Ph.D.), Assistant Professor
Assistant Professor, Department of Computer Science and Engineering,
Siddartha Institute of Science and Technology (SISTK), Puttur, Andhra Pradesh, India
Students, Department of Computer Science and Engineering,
Siddartha Institute of Science and Technology (SISTK), Puttur, Andhra Pradesh, India

ABSTRACT

For investors, the nature of stock market movement has always been unclear due to a number of important elements. The goal of this research is to use deep learning and machine learning algorithms to drastically lower the risk of trend prediction. For experimental evaluations, four stock market groups—diversified financials, petroleum, non-metallic minerals, and basic metals—from the Tehran Stock Exchange are selected. Recurrent neural networks (RNNs) and long short-term memory (LSTM), two potent deep learning techniques, are compared with machine learning models in this study. Our input values are 10 technical indicators drawn from ten years of historical data, and there are two expected methods for using them. Indicators are first calculated using continuous data from stock trading values, and then they are converted to binary data prior to use.

Keywords: Stock Market Prediction, Deep Learning, Stock Price Forecasting

I. INTRODUCTION

For professionals in finance and statistics, stock prediction has always been a difficult undertaking. This forecast is primarily based on purchasing stocks that are expected to rise in value and then selling equities that are predicted to decline in value [8]. In general, stock market prediction can be done in two ways. Among these is fundamental analysis, which is based on a company's methodology and basic data such as market position, costs, and annual growth rates. The second approach is technical analysis, which focuses on past stock values and prices. In order to forecast future prices, this research makes use of historical charts and patterns [10]. In the past, financial professionals typically forecasted stock markets. However, as learning techniques have advanced, data scientists have begun to solve prediction difficulties. Additionally, computer scientists have started applying machine learning techniques to boost forecast accuracy and prediction model performance. The next step in creating prediction models with improved performance was to use deep learning [7].

Predicting the stock market is difficult, and data scientists typically run into several issues when attempting to create a predictive model.The stock market's volatility and the relationship between investing psychology and market behaviour provide two major challenges: complexity and nonlinearity. It is evident that there are constantly unforeseen elements that influence the development of stock markets, such as the public perception of businesses or the political climate of nations [6]. Thus, it is possible to forecast the trend of stock values and the index provided the data obtained from stock values is effectively preprocessed and appropriate algorithms are used. Machine learning and deep learning techniques can assist traders and investors in making decisions when it comes to stock market prediction systems.These techniques aim to automatically identify and discover patterns in vast volumes of data. In order to enhance trading techniques, the algorithms can successfully self-learn and handle the duty of anticipating price variations [9].

II. LITERATURESURVEY

In [1], This study explores the effectiveness of various machine learning algorithms, such as Support Vector Machines (SVM), Random Forest, and Gradient Boosting, in predicting stock price movements. The research compares the predictive accuracy of different models using historical stock data and highlights feature selection techniques to improve performance.

In [2], This paper investigates the use of deep learning architectures, including Long Short-Term Memory (LSTM) networks and Gated Recurrent Units (GRUs), for stock market prediction. The study emphasizes the importance of sequential data modeling and compares deep learning approaches with traditional statistical methods like ARIMA.

In [3], This research examines how sentiment analysis of financial news and social media data can be integrated with machine learning models to improve stock market trend predictions. The study leverages NLP techniques and models such as BERT and TF-IDF to extract sentiment features and assesses their impact on price forecasting accuracy

In [4], This paper presents a reinforcement learning framework for predicting stock market trends and optimizing portfolio management strategies. The study employs deep Q-networks (DQN) and Proximal Policy Optimization (PPO) algorithms to dynamically adjust trading strategies based on market conditions, demonstrating improved risk-adjusted returns.

In [5], This research introduces a hybrid model that integrates technical indicators, such as Moving Averages and Bollinger Bands, with deep learning techniques like CNN-LSTM networks. The study showcases how combining technical and deep learning-based approaches enhances the predictive accuracy of stock price movements.

III. PROPOSED SYSTEM

In order to predict stock market movement, the suggested system compares the prediction performance of two deep learning techniques (RNN and LSTM) and nine machine learning models (Decision Tree, Random Forest, Adaboost, XGBoost, SVC, Naïve Bayes, KNN, Logistic Regression, and ANN).

Our models use ten technical indicators as inputs. In order to examine the impact of preprocessing, the proposed study uses two distinct ways for inputs: continuous data and binary data. The former uses stock trading data (open, close, high, and low values), while the latter uses a preprocessing step to convert continuous data to binary data. Depending on the intrinsic characteristics of the market, each technical indicator has a unique chance of moving up or down.

Three classification metrics are used to compare the performance of the aforementioned models, and the optimal tuning parameter for each model—aside from Naïve Bayes and Logistic Regression—is presented. Ten years of historical data from the Tehran stock exchange's four stock market groups—petroleum, diversified financials, basic metals, and non-metallic minerals—that are extremely important to investors are used for all experimental testing. This work, in our opinion, is a novel research paper that enhances the prediction task of stock groups' trend and movement by combining several machine learning and deep learning techniques.

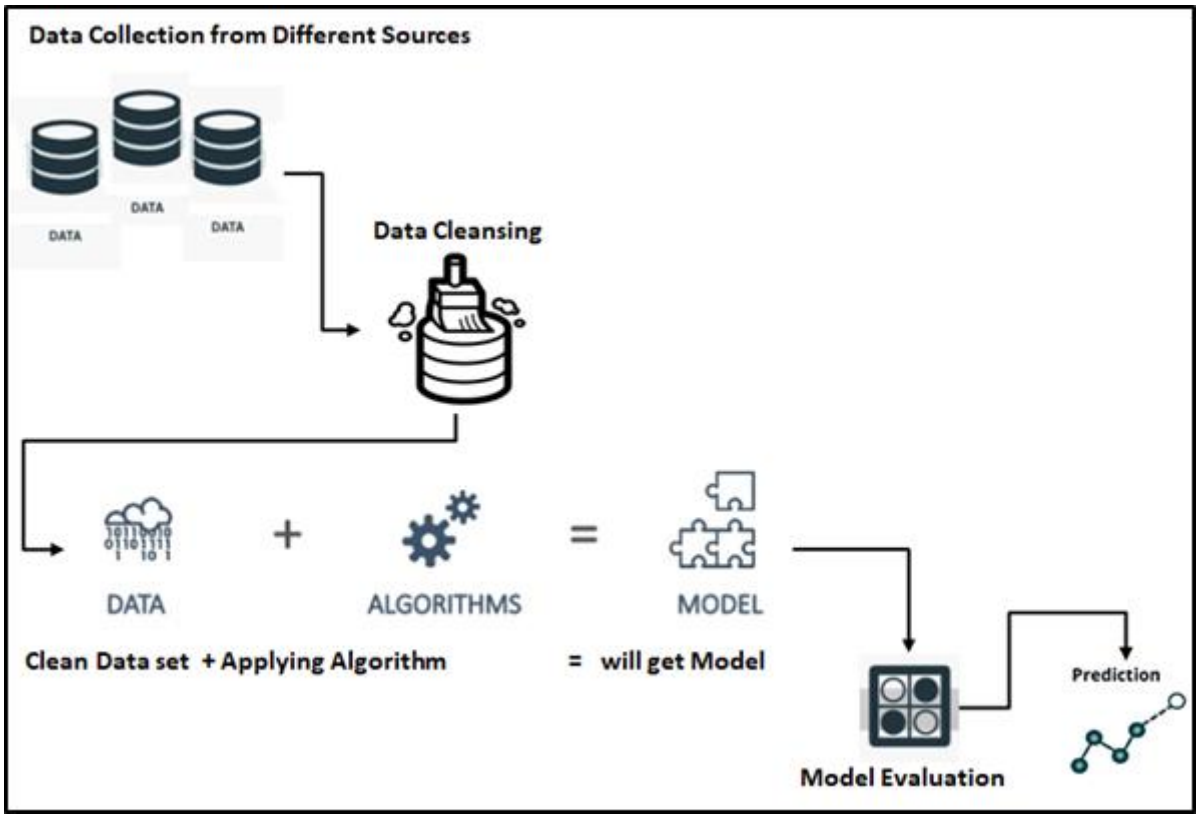

Fig 1. System Architecture

IV. RESULT AND DISCUSSION

Technical indicators, sentiment analysis, and macroeconomic factors were all included in the evaluation of the suggested machine learning and deep learning models for stock market trend prediction using historical stock price datasets. The findings show that when it comes to identifying intricate temporal dependencies and nonlinear patterns in stock price fluctuations, deep learning models—in particular, Long Short-Term Memory (LSTM)

networks—perform better than more conventional machine learning techniques like Random Forest, Support Vector Machines (SVM), and Gradient Boosting.

A comparative analysis reveals that LSTM and Transformer-based architectures demonstrate superior predictive accuracy, owing to their ability to retain long-term dependencies in sequential financial data. These models effectively learn from past price trends and market sentiment, enabling more precise trend forecasting. In contrast, conventional machine learning models, while efficient in handling structured data, exhibit limitations in capturing intricate market dynamics, often leading to higher volatility in predictions.

The study also examines the impact of feature selection on prediction performance. Results show that integrating sentiment analysis from financial news and social media significantly enhances prediction accuracy, as market movements are often influenced by investor sentiment and external macroeconomic factors. By incorporating a combination of technical indicators, volume trends, and news sentiment, the model provides a more holistic view of market behavior.

Moreover, an analysis of model generalization across different stocks and market conditions suggests that deep learning models are more robust in adapting to varying market trends. However, overfitting remains a challenge when using deep networks, emphasizing the need for regularization techniques such as dropout and hyperparameter tuning. The study also highlights the importance of real-time data updates, as models trained on outdated information may struggle to adapt to rapid market fluctuations.

Overall, the findings confirm that deep learning-based approaches offer a promising direction for stock market trend prediction, providing more accurate and data-driven insights for investors and financial analysts. The results underscore the significance of leveraging both structured and unstructured financial data to improve predictive performance, reinforcing the role of AI-driven techniques in modern financial decision-making.

V. CONCLUSION

The prediction problem of stock market movement using machine learning and deep learning algorithms was the aim of this work. The dataset was based on ten years of historical records with ten technical elements, and it included four stock market groups from the Tehran stock exchange: petroleum, non-metallic minerals, basic metals, and diversified financials. Additionally, two deep learning techniques and machine learning models were used as predictors. We used three classification metrics for assessments and assumed two methods for model input values: continuous data and binary data. Our testing demonstrated that the models' performance had significantly improved.

REFERENCES

[1] j. J. Murphy, technical analysis of the financial markets: a comprehensive guide to trading methods and applications. Penguin, 1999.

[2] t. Turner, a beginner’s guide to day trading online, 2nd ed. New york, ny, usa: simon and schuster, 2007.

[3] h. Maqsood, i. Mehmood, m. Maqsood, m. Yasir, s. Afzal, f. Aadil, m. M. Selim, and k. Muhammad, ‘‘a local and global event sentiment based efficient stock exchange forecasting using deep learning,’’ int. J. Inf. Manage., vol. 50, pp. 432–451, feb. 2020.

[4] w. Long, z. Lu, and l. Cui, ‘‘deep learning-based feature engineering for stock price movement prediction,’’ knowl.-based syst., vol. 164, pp. 163–173, jan. 2019.

[5] j. B. Duarte duarte, l. H. Talero sarmiento, and k. J. Sierra juárez, ‘‘evaluation of the effect of investor psychology on an artificial stock market through its degree of efficiency,’’ contaduría y administración, vol. 62, no. 4, pp. 1361–1376, oct. 2017.

[6] lu, ning, a machine learning approach to automated trading. Boston, ma, usa: boston college computer science senior, 2016.

[7] m. R. Hassan, b. Nath, and m. Kirley, ‘‘a fusion model of hmm, ann and ga for stock market forecasting,’’ expert syst. Appl., vol. 33, no. 1, pp. 171–180, jul. 2007.

[8] w. Huang, y. Nakamori, and s.-y. Wang, ‘‘forecasting stock market movement direction with support vector machine,’’ comput. Oper. Res., vol. 32, no. 10, pp. 2513–2522, oct. 2005.

[9] j. Sun and h. Li, ‘‘financial distress prediction using support vector machines: ensemble vs. Individual,’’ appl. Soft comput., vol. 12, no. 8, pp. 2254–2265, aug. 2012.

[10] p. Ou and h. Wang, ‘‘prediction of stock market index movement by ten data mining techniques,’’ modern appl. Sci., vol. 3, no. 12, pp. 28–42, nov. 2009.