Real-Time Stock Price Prediction

Mr. Sagar A. Dhanake[1], Mr. Rushikesh Fade[2], Ms. Anushka Alhat[3],
Mr. Dhananjay Gadhe[4], Ms. Sakshi Gaikwad[5]

Assistant Professor, Department of Computer Engineering[1]

Students, Department of Computer Engineering[2,3,4,5]

Dr. D. Y. Patil College of Engineering and Innovation, Pune, India

Abstract*: Researchers have been studying different methods to effectively predict the stock market price. Useful prediction systems allow traders to get better insights about data such as: future trends. Also, investors have a major benefit since the analysis give future conditions of the market. One such method is to use machine learning algorithms for forecasting. A number of researchers have come up with various ways to solve this problem, mainly there are traditional methods so far, such as artificial neural network is a way to get hidden patterns and classify the data which isused in predicting stock market. This project proposes a different method for prognosing stock market prices. By this model, users can easily analyse the sales and identify the current stock's profit. Stock market prediction analysis involves the application of various techniques to forecast future price moments and trends of financial, primarily stocks. These techniques are rooted in quantitative analysis, statistical modelling, and machine learning models. The prediction of stock sales is required for Businesses to make decisions and to change market conditions*

Keywords: Stock Market Prediction, Machine learning , Feature Engineering, CNN , LSTM(Long Short-Term Memory),Time Series Forecasting, Algorithmic Trading, Market Sentiment Analysis

I. INTRODUCTION

The stock market plays a vital role in the economies of all countries. It provides companies with the opportunity to raise funds by selling stocks to investors, while also allowing investors to participate in the financial success of these firms, earning profits through capital gains and dividends, despite the risk of potential losses. Stock investors rely on market trendpredictions to make informed decisions about when to buy or sell stocks. [1] To mitigate the risk of buying volatile stocks,investors typically conduct assessments of a company's performance, examining factors such as its social media presence,financial news, and the performance of linked goods or companies. However, due to the sheer volume of data from social media and financial news sources, investors cannot fully analyse all of this information manually. An automated decision-making assistance system is necessary to process and evaluate stock trends using large amounts of data. Machine learningtechniques can be employed to create such a system, and identifying algorithms that best utilize external data, such as socialmedia information and oil prices, to predict stock market trends is critical. Machine learning researchers have shown significant interest in this area, as accurate stock predictions based on external factors can enhance investor profits.[3] To maximize profits, investors seek to purchase stocks that are projected to increase in value and sell those that are expectedto decrease in value. Accurate prediction of the stock market is not a simple task, as it is influenced by numerous variables, including the impact of social media and commodity prices, such as oil. The impact of these factors can be either positive or negative, thus necessitating their consideration in accurately predicting the stock market. Investing in the stock market is inherently risky; however, it can also offer considerable profits if done properly.[4]

II. METHODOLOGY

Long Short-Term Memory (LSTM):

The primary method for stock price prediction is LSTM, a type of recurrent neural network (RNN) that excels in time series forecasting. LSTM networks are designed to learn from historical data to predict future values, which is essential in the highly volatile stock market environment .LSTM networks are designed to process andpredict sequences of data.

This is crucial in stock market analysis, where past prices and trends influence future movements. The ability to remember long-term dependencies makes LSTM suitable for capturing the temporaldynamics of stock prices.[5]

Convolutional Neural Network (CNN):
CNNs are primarily used for image processing but have been adapted for time series analysis in this study. Theyexcel at identifying spatial hierarchies in data, which can be beneficial for recognizing patterns in stock price movements. [6] CNNs can enhance real-time stock price prediction by processing historical price data andtechnical indicators, enabling the identification of patterns and trends for improved forecasting accuracy. Theseare utilized for their ability to capture spatial hierarchies in data, which can be beneficial in identifying patternsin stock price movements.[7]

Sentiment Analysis:
Sentiment analysis is a technique that evaluates the emotional undertones of texts. It involves analyzing varioussources of information, such as social media posts, news articles, and financial reports, to determine the general sentiment of investors towards specific stocks or the market as a whole. The primary goal of sentiment analysisin this context is to predict stock market trends by understanding how public sentiment can influence investor behavior. Positive or negative sentiments can lead to fluctuations in stock prices, making it a valuable tool forforecasting.[8]

Hybrid Approach (LSTM + CNN):
The hybrid approach of LSTM and CNN in stock price prediction combines the best features of both models, resulting in improved accuracy and generalization, which is essential for effective financial forecasting. The hybrid model leverages the strengths of both CNN and LSTM. CNN is adept at feature extraction from data, while LSTM excels in processing sequential data, making them complementary in handling stock price prediction tasks. The empirical results demonstrate that the CNN-LSTM hybrid model exhibits strong generalization capabilities, meaning it can effectively apply learned patterns to different stocks beyond those used in training. This adaptability makes it a valuable tool for investors seeking to develop informed strategiesbased on predictive analytics.[9]

III. LITERATURE SURVEY

Machine Learning Techniques Employed: The study utilizes various machine learning techniques, including vector-based methods, lexicon-based analysis, and long short-term memory (lstm) networks. these techniques are essential for effectively processing and interpreting the sentiment expressed in financial news headlines, which can have a direct impact on stock prices [10]. The classifying model made out of historical data can be relentlessly honedto give even more accurate results since its outcome is always compared to the next tick of the clock. In this study, an attempt is made to develop machine learning models to predict the potential prices.[11]

A comparative analysis is conducted between LSTM and RNN models to evaluate their effectiveness in stock price prediction. The authors report that the LSTM model demonstrates a better accuracy rate compared to RNN, indicatingits superiority in capturing the complexities of stock market data . Need for Automation: The paper identifies a gap in the availability of automated approaches for stock market prediction. The authors argue that developing such automated systems is essential for improving prediction accuracy and efficiency in trading strategies [12].

Hybrid Model Development: The authors developed a hybrid model that combines Convolutional Neural Networks (CNN) with Long Short-Term Memory (LSTM) networks. This hybridization aims to improve the accuracy of stock market predictions by leveraging the strengths of both models. CNNs are effective in capturing spatial hierarchies in data, while LSTMs are well-suited for time series forecasting due to their ability to remember long-term dependencies.[13]

LSTM Model: The LSTM model is particularly noted for its superior predictive accuracy. It was trained on historical stock price data along with technical indicators, which are essential for making informed predictions in stock trading .The paper suggests that LSTM can effectively capture temporal dependencies in stock price movements, making it a valuable tool for financial analysts and traders.[14]

Convolutional Neural Networks (CNN): CNNs are highlighted as a significant component of Artificial Neural Networks (ANNs) that excel in detecting information. Discuss the advancements in CNN capabilities, particularly in

Natural Language Processing (NLP) and sentiment analysis . The paper also cites a study by Putra Setiawan (2023), which achieved a high accuracy of 95.56% using CNN on Twitter datasets related to the Indonesian government.[15]

IV. ARCHITECTURE
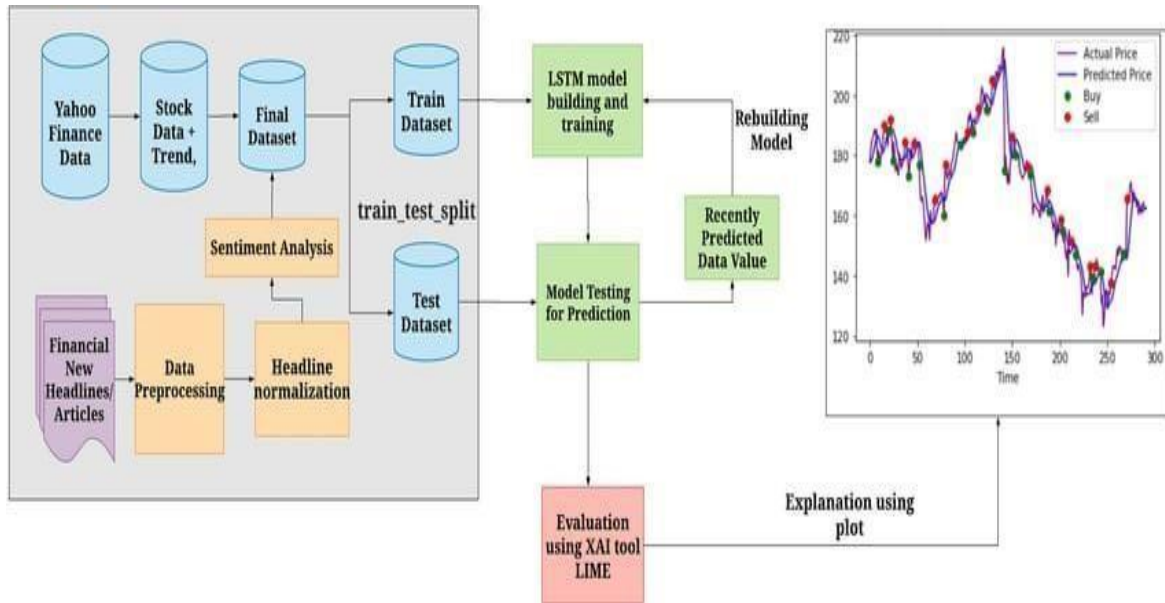
V. RESULTS AND DISCUSSION

Impact on Trading :

- **Use of Real-Time Data**: By utilizing real-time data from the yfinance API, the research demonstrates the importance of current information in making accurate stock price predictions. This approach allows for timely analysis and enhances the relevance of the predictions in a fast-paced market environment .[16]
- **Advancement of Existing Research:** The study aims to further the current research on stock price prediction by demonstrating the successful integration of real-time data with linear regression. This contribution is particularly valuable for researchers and practitioners looking for effective and efficient methods in stock market analysis.
- **Focus on Relevant Signals**: The external attention mechanism enables the model to focus on the most relevant signals that impact stock price movements. By prioritizing important information, the model can filter out noise and distractions, which enhances the accuracy of its predictions
- **Dynamic Adaptation**: The External Attention (EA) module allows for dynamic adaptation to changing market conditions. As financial markets are influenced by various factors, the ability to adjust attention based on real-time data ensures that the model remains responsive and accurate in its predictions [17]

Challenges :

- **Real-time Prediction**: Making accurate real-time predictions for stock prices is inherently challenging. Traders require forecasts for the next few minutes, which necessitates models that can learn and adapt quickly to new data as it becomes available. Achieving real-time prediction capabilities is another challenge. The stock market is dynamic, and models need to adapt quickly to changing conditions, which requires advanced algorithms and computational resources
- **Complex Patterns**: Stock prices are influenced by multiple parameters that form complex patterns. This complexity makes it challenging to identify the right features and relationships that can effectively predict future prices.[18]

- **Market Volatility**: Stock prices are influenced by numerous unpredictable factors, leading to high volatility. This makes it difficult to forecast future price movements accurately. The study emphasizes that predicting future stock volatility is a demanding task for researchers, indicating the inherent uncertainty in the stock market.[19]
- **Data Collection and Validity**: One of the primary challenges is the collection of valid data points. With the vast amount of data available on the internet, distinguishing between useful and irrelevant data can be difficult. The paper emphasizes the importance of extracting valid data points for accurate predictions, which is crucial for the model's effectiveness.[20]

Application :

- Investment Strategies: The primary application of stock price prediction is to inform investment strategies. By accurately predicting future stock prices, investors can make informed decisions about buying or selling stocks, potentially maximizing their returns. The research highlights the effectiveness of linear regression in this context, demonstrating its utility in real-time data analysis for stock forecasting.
- Risk Management: Predicting stock prices can also aid in risk management. Investors and financial institutions can use these predictions to assess potential risks associated with their investment portfolios. By understanding future price movements, they can implement strategies to mitigate losses during market downturns.
- Market Analysis: Stock price prediction models can be employed for broader market analysis. Analysts can use these models to identify trends and patterns in stock prices, which can provide insights into market behavior and help in forecasting overall market movements.
- Research and Development: The findings from studies like this one contribute to the ongoing research in financial technology and machine learning. By demonstrating the effectiveness of linear regression over more complex models like LSTM, the research encourages further exploration and development of predictive models in finance.[21]

Future Scope :

- **Enhanced Model Architectures**: Future studies could investigate more advanced architectures beyond recurrent neural networks (RNNs), such as transformers or hybrid models that combine different deep learning techniques. This could improve the accuracy of stock price predictions by capturing complex patterns in the data more effectively.[22]
- **Real-Time Data Processing**: As the financial markets evolve, the ability to process and analyze real-time data will become increasingly important. Future systems could focus on improving the speed and efficiency of data collection and analysis, allowing for quicker decision-making in trading strategies.
- **User-Friendly Interfaces**: As machine learning models become more sophisticated, there is a need for user-friendly interfaces that allow traders and investors to easily interpret predictions and insights. Future developments could focus on creating intuitive dashboards that visualize data and predictions effectively
- **Risk Management Strategies**: The proposed system aims to help quant traders maximize profits while minimizing risks associated with unforeseen news events. Future work could focus on developing robust risk management frameworks that utilize predictive analytics to safeguard investments against market volatility .[23]

VI. CONCLUSION

"Real-Time Future Stock Price Prediction Using Machine Learning Algorithms" presents significant findings and insights into the application of machine learning for predicting stock prices. The research highlights the critical role of real-time data in enhancing the accuracy of stock price predictions. By utilizing real-time data from the yfinance API, the study demonstrates how timely information can improve forecasting outcomes, making it a valuable approach for investors and analysts alike. The findings of this research have practical implications for investors, suggesting that simpler models can be effective tools for stock price prediction, especially in environments with limited data. This insight can help investors make more informed decisions based on predictive analytics. The paper highlights that models built on historical data

can be continuously refined. As new data becomes available, the models can be updated to improve their predictive accuracy, making them more reliable over time. The findings suggest that financial institutions and investors can leverage these machine learning models to enhance their decision-making processes. By utilizing real-time data and advanced algorithms, stakeholders can better anticipate market movements and make strategic investments.

REFERENCES

[1]. Ahmed, Khalifa., Gowtham, Ramesh., R, Deekshith., K, Harsha., J., Shreyas. (2024). Forecasting Financial Frontiers: Real-time Insights in Stock Price Prediction through LSTM, Linear Regression, and Sentiment Analysis. doi: 10.1109/hora61326.2024.10550829.

[2]. Nidhi Poddar, Chaitrali Kale, Shravani Mahabdi, Venkatesh Puri, Prof Sagar Dhanak, Stock Market Prediction Using Machine Learning, International Journal of Advanced Research in Science, Communication and Technology, Volume 2, Issue 5, PP 672-879.

[3]. Manazhy, Rashmi. (2023). Stock Market Price Prediction Using Machine Learning Techniques. 1-6. doi:10.1109/INCET57972.2023.10170222 (2023) ,Real-Time Future Stock Price Prediction Using Machine Learning ,Algorithms Ahmed Khalifa, Gowtham Ramesh, R Deekshith, K Harsha, J. ShreyasIEEE, Xplore Linear regression outperforms LSTM in stock price prediction.Real-time data enhances accuracy of stock value forecasts

[4]. Masimba, E., Sonono., Hopolang, Phillip, Mashele. (2015). Prediction of Stock Price Movement Using Continuous Time Models. Journal of Mathematical Finance, 5(2):178-191. doi: 10.4236/JMF.2015.52017

[5]. Vijayalakshmi, Saravanan., Acharya, Pramod., Laxman, Poudel., Praveen, Paramasivam. (2023). Predictive Precision: LSTM-Based Analytics for Real-time Stock Market Visualization. 1-6. doi: 10.1109/bigdata59044.2023.10443091R. E. Sorace, V. S. Reinhardt, and S. A. Vaughn, "High-speed digital-to- RF converter," U.S. Patent 5 668 842, Sept. 16, 1997.

[6]. J, Li. (2024). Comparison of Different Machine Learning Approaches for Forecasting Stock Prices. Highlights in Science Engineering and Technology, 94:17-23. doi: 10.54097/2re5n809

[7]. Prasanna, H., Gowda., Surya, Prakash, -., A, Lavanya., Prof., Ashwini, Tuppad, -. (2024). Stock Price Trend Analysis and Prediction using Machine Learning. International Journal For

[8]. Aisulu, Ismailova., Zhanar, Beldeubayeva., Kuanysh, Kadirkulov., Zhanagul, Doumcharieva., Assem, Konyrkhanova., Dinara, Ussipbekova., Ainura, Aripbayeva., Dariga, Yesmukhanova. (2024). Forecasting stock market prices using deep learning methods. International Journal of Power Electronics and Drive Systems, 14(5):5601-5601. doi: 10.11591/ijece.v14i5.pp5601-5611

[9]. Thejaswini, Kishore., J., Praveenchandar. (2024). An Effective Stock Market Prediction using an Advanced Machine Learning Algorithm and Emotional Analysis. doi: 10.1109/icaaic60222.2024.10575869

[10]. Yuqi, Ding. (2023). 7. Enhancing Stock Price Prediction Method Based on CNN-LSTM hybrid model.
Highlights in business, economics and management, doi: 10.54097/hbem.v21i.14760.

[11]. Shraddha, R., Khonde., Shyamal, S., Virnodkar., Sangita, B., Nemade.,Manisha, A., Dudhedia.,
Bhavana, Kanawade., S., H., Gawande. (2024). Sentiment Analysis and Stock Data Prediction Using Financial [12]. News Headlines Approach. Revue Dintelligence Artificielle, 38(3):999-1008. doi: 10.18280/ria.380325 [13]. Monalisa, Jena., Ranjan, Kumar, Behera., Santanu, Kumar, Rath. (2019). Machine Learning Models for
Stock Prediction Using Real-Time Streaming Data. 101-108. doi: 10.1007/978-3-030-39033-4_10

[14]. Sahith, Addagalla., Surya, Koppuravuri., Rithvik, Krosuri., Mohan, Sai, Kunapareddy., Srihith, Reddy, Mallu., Manazhy, Rashmi. (2023). Stock Market Price Prediction Using Machine Learning Techniques. 1-6. doi: 10.1109/incet57972.2023.10170222.

[15]. Nashaat, Jaisam, Al-Anber., Hayfaa, Abdulzahra, Atee. (2022). Iraqi Stock Market Prediction Using Hybrid LSTM and CNN Algorithm. 86-92. doi: 10.1109/CSCTIT56299.2022.10145669

[16]. Putra, D. T., & Setiawan, E. B. (2023). Sentiment Analysis on Social Media with Glove Using Combination CNN and RoBERTa. Jurnal RESTI (Rekayasa Sistem Dan Teknologi Informasi), 7(3), 457–563. doi:10.29207/resti.v7i3.4892.

[17]. H., Peng., K., Dong., Jie, Yang. (2023). Stock Price Movement Prediction based on Relation Type guided Graph Convolutional Network. Engineering Applications of Artificial Intelligence, doi: 10.1016/j.engappai.2023.106948

[18]. Tinku, Singh., Riya, Kalra., Suryanshi, Mishra., Satakshi., Manish, Kumar. (2022). An efficient real- time stock prediction exploiting incremental learning and deep learning. Evolving Systems, 1-19. doi: 10.1007/s12530-022-09481-x

[19]. A.Sai, Kumar. (2023). Stock Price Prediction Using Time Series Forecasting. International Journal For Science Technology And Engineering, 11(5):6897-6901. doi: 10.22214/ijraset.2023.53255

[20]. (2022). Stock Price Prediction: A Time Series Analysis. doi: 10.1109/iccit57492.2022.10056009

[21]. Ambati, Venkata, Malla, Reddy., Y, Dinesh., Vamsi, Krishna., Soundarya, Miranam. (2019). Stock market prediction using RNN and sentiment analysis. International Journal of Advance Research, Ideas and Innovations in Technology, 5(3):5-9.

[22]. Anagha, Patil., Kedar, Malap., Himadri, Manna., Suraj, Mahto., Yash, Raut. (2023). Real-Time Future Stock Price Prediction Using Machine Learning Algorithms. 1-5. doi: 10.1109/icacta58201.2023.10392476

[23]. Shweta, Roy., Safdar, Tanveer. (2023). Stock Price Forcasting using DeepNet. 418-420. doi: 10.1109/CICTN57981.2023.10141100

[24]. Sumeet, Sarode., Harsha, G., Tolani., Prateek, Kak., C, S, Lifna. (2019). Stock Price Prediction Using Machine Learning Techniques. doi: 10.1109/ISS1.2019.8907958