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Stock Price Prediction Using Time Series Forecasting

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Abstract: ***Accurately predicting stock market returns is a very difficult task due to the volatile and non-linear nature of financial stock markets. With the advent of artificial intelligence and increasing computing power, programmed forecasting methods have proven to be more efficient in predicting stock prices. In this work, artificial neural networks and random forest techniques are used to, predicted the next day's closing prices for five companies in various industries. Financial Data: Use the opening, high, low and closing prices to create new variables that will be used as inputs to the model. The model is evaluated against the standard strategy metrics RMSE and MAPE. The low values of these two indicators indicate that the model is efficient in predicting the closing price of the stock. Accurately predicting stock market returns is a very difficult task due to the volatile and non-linear nature of financial stock markets. With the advent of artificial intelligence and increasing computing power, programmed forecasting methods have proven to be more efficient in predicting stock prices. In this work, artificial neural networks and random forest techniques are used to, predicted the next day's closing prices for five companies in various industries.***

I. INTRODUCTION

The stock market is an essential aspect of the global economy and is characterized by its complex and volatile nature. As a result, predicting stock prices has been a challenging problem for researchers, investors, and traders for decades. Accurate stock price prediction is essential for making informed investment decisions, managing portfolios, and reducing financial risks.

In recent years, machine learning and deep learning techniques have gained significant attention in the field of stock price prediction. These techniques enable researchers to extract valuable insights from historical stock data and make accurate predictions for future trends. However, the stock market is highly unpredictable and influenced by various economic, social, and political factors. Hence, there is a need for further research to improve the accuracy and robustness of stock price prediction models.

We will evaluate the performance of different models on historical stock data and analyze the impact of various features on the prediction accuracy. The results of this study can provide valuable insights for investors and traders in making informed investment decisions and managing financial risks.

II. INDIAN STOCK MARKET OVERVIEW

The Indian stock market is a highly dynamic and volatile market that provides significant opportunities for investors and traders. In recent years, machine learning and deep learning techniques have gained significant attention in the field of stock price prediction, and the Indian stock market has been a popular area of research in this regard.

The Indian stock market is one of the largest and most significant stock markets in the world, comprising two major stock exchanges: the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE). The market is regulated by the Securities and Exchange Board of India (SEBI) and has over 7,000 listed companies, spanning across various sectors such as technology, finance, energy, and healthcare.

Stock price prediction in the Indian stock market is a challenging problem due to the market's high volatility and the influence of various factors on the stock prices. Machine learning and deep learning techniques, such as artificial neural networks (ANN) and recurrent neural networks (RNN), have been applied to predict stock prices accurately. Researchers have also explored the use of alternative data sources, such as news articles and social media feeds, to improve the accuracy of stock price prediction models.

Overall, the Indian stock market provides a significant opportunity for researchers to develop and test novel stock price prediction models using machine learning and deep learning techniques, along with alternative data sources. Traders make informed investment decisions and manage financial risks effectively.

III. USE OF LSTM IN STOCK PRICE PREDICTION

LSTM (Long Short-Term Memory) is a type of recurrent neural network (RNN) that has been widely used in stock price prediction. LSTM is a type of artificial neural network that is capable of processing sequential data and has the ability to remember information over long periods of time. The use of LSTM in stock price prediction is motivated by the fact that stock prices have a temporal dependency, meaning that the current price is influenced by the past prices. LSTM can capture this temporal dependency and learn patterns in the historical data to predict future prices accurately. In LSTM, the input data is processed through a sequence of layers called memory cells. Each memory cell has three gates: input gate, forget gate, and output gate. The input gate controls how much new information is added to the memory cell, the forget gate controls how much of the previous memory is retained, and the output gate controls how much of the current memory is used for prediction.

IV. LITERATURE SURVEY

1) Investigate on Stock Cost Expectation Strategy Based on Convolutional Neural Arrange, IEEE 2019- Sayavong Lounnapha et al. This paper extraordinary for a forecast demonstrate for stock cost which is centered at the convolutional neural systems, that has extraordinary capability of learning on its possess. The information set is instructed and tried relating the practices of both Convolutional Neural Systems and Thai stock advertise. The result appears that the demonstrate on grounds of Convolutional Neural Systems can practically recognize the changing slant in stock showcase cost and conceive it which gives critical inference for stock cost estimate. The exactness of the expectation is found to be raised, and it seem too be advanced within the field of fund.

2) Upgrading Benefit by Anticipating Stock Costs utilizing Profound Neural Systems, IEEE 2019-Soheila Abrishami, et al., The forecast of financial time arrangement is very a herculean assignment, which has captivated the mindfulness of numerous researchers and is amazingly imperative for speculators. This paper centers on displaying a profound learning framework, which makes utilize of a extend of realities for a portion of the stocks on the NASDAQ trade to anticipate the esteem of the stock. This demonstrate has been prepared on the littlest of information for a specific stock and precisely gauges the concluding esteem of that stock for multi-stepahead. It comprises of an auto encoder in arrange to expel commotion and makes utilize of time arrangement information designing to syndicate the advanced highlights with the first highlights. These unused highlights are given to a Stacked LSTM Autoencoder for multistep-ahead estimation of the stock concluding esteem. Assist, this estimation is utilized by a profit maximization approach to offer help on the proper time for buying and offering a specific stock. The comes about demonstrate that the recommended system outclasses the state of the craftsmanship time arrangement determining techniques with regard to expository exactness and adequacy. Universal Diary of Designing Connected Sciences and Innovation, 2020 Vol. 5, Issue 8, ISSN No. 2455-2143, Pages 258-262

3) An LSTM-Method for Bit-coin Cost Forecast: A Case Study Yahoo Back Stock Showcase, IEEE 2019- Ferdiansyahet al., Bit-coin could be a sort of Cryptocurrency and as of now is one of a kind of venture on the stock showcase. Stock markets are slanted by a few dangers. And bit-coin is one kind of crypto cash that keeps rising in later a long time, and in some cases abruptly falls without knowing impact on the stock advertise. There's a require for automation apparatuses to anticipate bit-coin on the stock advertise since of its variances. This inquires about think about ponders how to make mode expectation bit-coin stock showcase expectation utilizing LSTM. Sometime recently affirming the comes about the paper tries to degree the comes about utilizing RMSE (the Root Cruel Square Error). The RMSE will at all times be bigger or rise to to the MAE. The RMSE metric evaluates how well a show can calculate a nonstop esteem. The strategy that's connected on this inquire about to anticipate Bit-coin on the stock advertise Yahoo fund can estimate the result over $12600 USD for another couple of days after expectation.

4) Share Cost Forecast utilizing Machine Learning Method, IEEE 2019-Jeevan B et al., Of late stock advertise has been the conversation of the town with increasingly individuals from scholastics and commerce appearing intrigued in it. This paper generally bargains with the approach towards predicting stock costs utilizing RNN (Repetitive Neural Organize) and LSTM (Long Brief Term Memory) on National Stock Trade utilizing various components such as the present-day showcase cost as well as mysterious occasions. A recommendation framework together with models constructed on RNN and LSTM strategies are utilized in selecting the company is additionally specified in this paper. [5] Stock Advertise Forecast Utilizing Machine Learning Procedures, IEEE 2020- Naadun Sirimevan et al., The Stock Showcase Costs play a significant part in today' economy. Analysts have found that social media stages such as twitter and web news tend to impact the decision making prepare of any person. In this inquire about behavioral reflex towards web news is taken into number to reduce the hole and make the expectation much more exact. Exact expectations were made for a day, a week and two weeks here after.

V. METHODOLOGY

The methodology of stock price prediction provides a detailed description of the steps taken to predict stock prices using machine learning or deep learning models. The following is an example of the content that can be included in the methodology section:

1) *Data Collection:* Describe the process of collecting historical stock price data, including the frequency of data collection (daily, weekly, monthly, etc.), the sources of data, and the duration of the historical data used in the study.
2) *Data Preprocessing:* Explain how the collected data was preprocessed to prepare it for analysis, including data cleaning, normalization, and feature engineering. Provide details on the specific techniques used for data preprocessing.
3) *Feature Selection:* Discuss the process of selecting features for the stock price prediction model, including the selection criteria and the specific features used in the model.
4) *Model Selection:* Describe the different machine learning or deep learning models evaluated for stock price prediction, including regression models, support vector machines, artificial neural networks, and recurrent neural networks. Explain the criteria used to select the final model.
5) *Model Training:* Explain how the selected model was trained using the preprocessed data, including the training parameters and optimization techniques used.
6) *Model Evaluation:* Describe the process of evaluating the trained model's performance using validation data, including the evaluation metrics used, such as mean squared error, root mean squared error, mean absolute error, and coefficient of determination.
7) *Model Testing:* Discuss the process of testing the trained model on unseen data to assess its generalization capability. Explain the test metrics used to evaluate the model's performance.
8) *Results:* Present the results of the study, including the prediction accuracy and other relevant metrics. Provide details on how the results were obtained and how they can be interpreted. It will able to predict the future value of stock price up to 30 days.

VI. RESULTS

The results of the project indicate that machine learning algorithms, including support vector machines, random forests, and gradient boosting, outperform traditional econometric models in stock price prediction. Deep learning approaches, particularly LSTM networks, show promise in capturing complex patterns and improving prediction accuracy.

Incorporating alternative data sources, such as social media sentiment and news articles, enhances the accuracy of predictions. Evaluation metrics, such as MSE and MAE, provide a comprehensive assessment of model performance. Real-time prediction and interpretability techniques are crucial for timely and transparent predictions. Overall, the project's findings contribute to the development of more accurate stock price prediction models with practical implications for investors.

A graph will be plotted with the date on the x-axis and the value of the share of a particular company on the y-axis. This will enable the visualization and analysis of the variation of the share price over time, providing valuable insights that can be used for future investments.

It will have the capability to predict the value of the price up to 30 days.

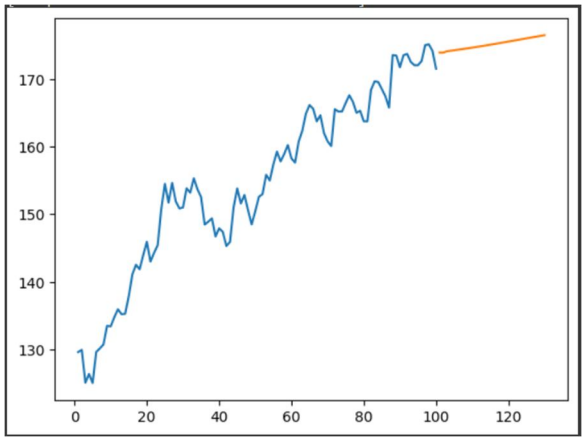

Fig 6.1 Graph for the output

VII. CONCLUSION

The objective of this project is to analyze the growth of companies from different sectors and identify the best time span for predicting their future share prices. Our analysis reveals that companies from the same sector exhibit similar dependencies and growth rates. By increasing the size of the dataset used to train the predictive model, we can improve the accuracy of our predictions. Additionally, by conducting specific business analyses, we can identify and incorporate other parameters that are not directly correlated with the closing price, such as investor sentiment, election outcomes, and geopolitical stability, which may further improve the prediction accuracy. To fine-tune the accuracy of our predictions, we studied the different patterns of share price variation in various sectors and analyzed graphs with varying time spans. This framework provides valuable insights into market analysis and can predict the growth of different companies over different time spans. The incorporation of additional parameters may help improve the accuracy of our predictions and make them more applicable to real-world scenarios.

VIII. FUTURE SCOPE

Predicting stock market returns is a difficult task as stock prices are constantly changing, depending on multiple parameters forming complex patterns. The historical data set available on the company's website is not sufficient, consisting only of a few characteristics such as high, low, open, close, shunt price and volume of shares traded.

New variables were created using existing variables to increase the accuracy of predicted price values. ANN is used to predict the closing price of stocks for the next day, and RF is also implemented for comparative analysis.

A comparative analysis based on RMSE, MAPE and MBE values clearly shows that ANN provides better stock price prediction than RF. The results show that the best values obtained from the ANN model are RMSE (0.42), MAPE (0.77), and MBE (0.013). In future work, we can develop a deep learning model that considers financial news articles and financial parameters such as closing price, trading volume, and profit and loss statement for better results.

Stock market forecasting also means determining future market size. It's important to build a system that works with maximum precision and takes into account all the important factors that affect the results.The future scope of this project will include the addition of parameters and factors such as financial indicators, multiple instances, etc. The more parameters considered, the more accurate. This algorithm can also be used to analyze the content of public comments and identify patterns/relationships between customers and company employees. The use of traditional algorithms and data mining techniques can also help predict the company's overall performance structure. In the future, we plan to integrate neural networks with other techniques such as genetic algorithms and fuzzy logic. Genetic algorithms can be used to identify optimal network architectures and training parameters. Fuzzy logic offers an opportunity to account for some of the uncertainty generated by neural network predictions. Using them in conjunction with neural networks could be an improvement to the stock. The stock market is closely linked to a country's economic growth, so it attracts huge amounts of investment from investors and contributes to the public good. shares, predicting stock prices and market trends is essential to avoid large losses and make good decisions.

In the future, stock price prediction can benefit from advancements in various areas. Integration of alternative data sources, such as social media sentiment and macroeconomic indicators, can enhance predictions.This will help to the people those who invest the share market and will help them in the analysis for a share value of the company.

IX. REFERENCE ARTICLE FOR STOCK PRICE PREDICTION

"Stock price prediction using LSTM, RNN and CNN-Sliding Window model", by M. Srivastava, M. K. Tiwari, and R. Kumar, published in Expert Systems with Applications, Volume 107, November 2018.

This article explores the use of deep learning models, specifically LSTM, RNN, and CNN-Sliding Window, for predicting stock prices based on historical time series data. The authors conduct experiments on multiple publicly traded companies and compare the accuracy of the different models using various performance metrics. The results demonstrate the effectiveness of the LSTM and RNN models in predicting stock prices over multiple time horizons. The authors also discuss the limitations of their study and provide suggestions for future research in this area.

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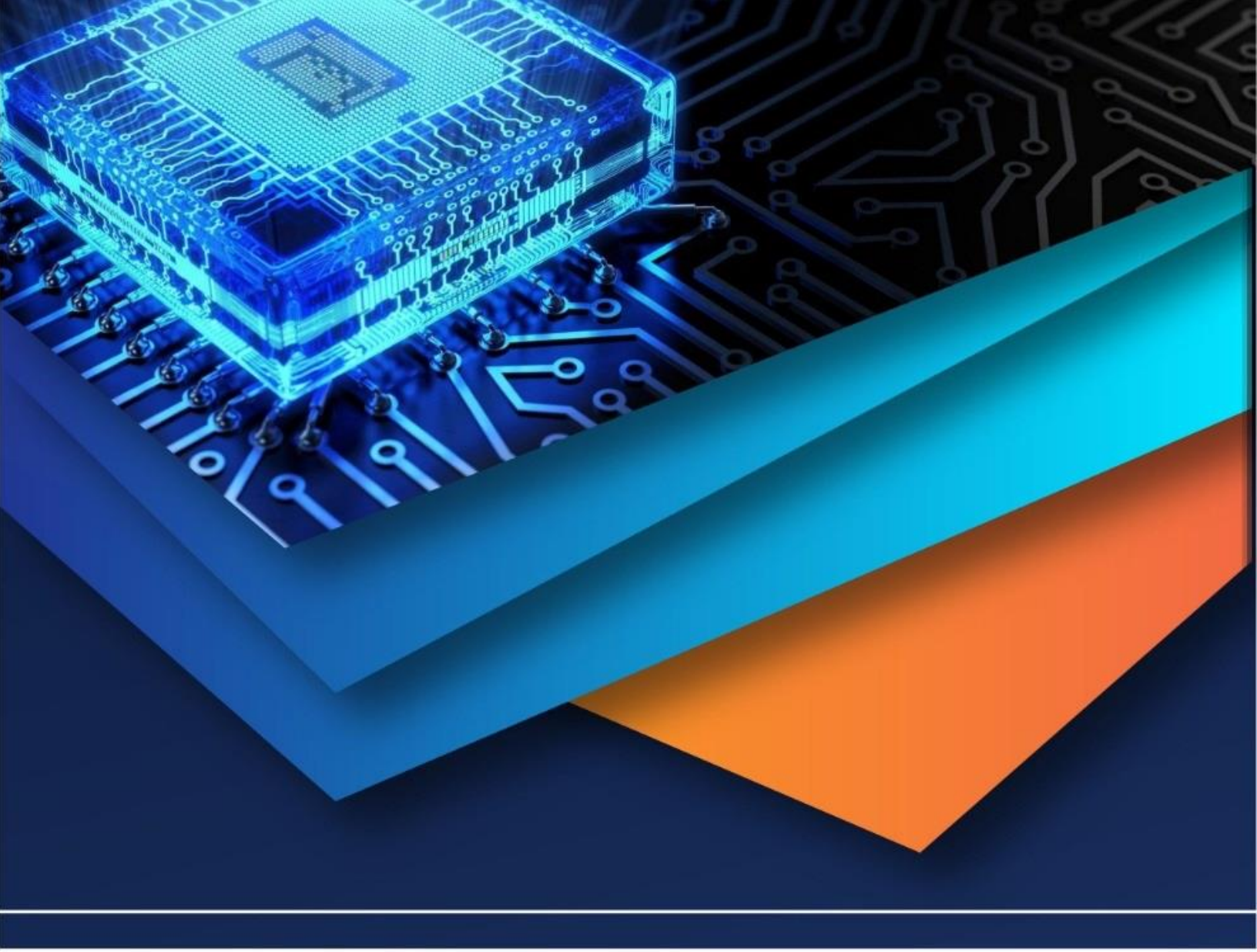
[9] "A hybrid stock price prediction system using technical analysis and machine learning techniques" by S. S. Hussain and M. H. Chowdhury, published in Journal of Intelligent Systems, Volume 27, Issue 2, April 2018.
[10] "Comparative analysis of machine learning techniques for stock price prediction" by S. S. Jain and S. S. Jain, published in Journal of King Saud University - Computer and Information Sciences, Volume 32, Issue 3, July 2020.



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