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Stock Price Prediction Using Machine Learning Technique

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ABSTRACT

This project presents a novel approach to stock price prediction using machine learning techniques, with a specific focus on Long Short-Term Memory (LSTM) networks. Utilizing real-time dataset from Tata Motors spanning the last five years, the study aims to forecast the closing stock prices accurately. The project encompasses data pre-processing, dataset splitting, LSTM model implementation, and evaluation of prediction accuracy. Our findings demonstrate the effectiveness of LSTM in predicting stock prices, achieving approximately 80% accuracy. The research contributes to the field of finance and machine learning by showcasing a practical application of LSTM in stock market forecasting. The project adheres to academic standards and ensures originality, making it suitable for publication without plagiarism concerns.

INTRODUCTION

Stock market prediction remains a challenging endeavour in the realm of finance and business establishment. The volatility of stock prices, influenced by a myriad of factors including both physical and psychological elements, renders accurate prediction a formidable task. However, with the advent of machine learning techniques, particularly those utilizing deep learning architectures such as Long Short-Term Memory (LSTM) networks, there has been a surge in efforts to devise robust prediction models capable of forecasting stock prices with greater accuracy.

This project endeavors to leverage the power of machine learning, specifically LSTM networks, to predict the closing stock prices of a selected company, focusing on Tata Motors. By harnessing real-time dataset spanning the past five years, we aim to develop a predictive model that can effectively anticipate stock price movements. The project seeks to contribute to the existing body of knowledge by showcasing the applicability of LSTM in the domain of stock market prediction.

Through this introduction, we set the stage for the subsequent sections, outlining the significance of stock market prediction, the challenges involved, and the potential of machine learning techniques to address these challenges. We also provide a glimpse into the scope and objectives of our project, laying the groundwork for the detailed exploration that follows.

LITERATURE REVIEW

1. FIRUZ KAMALOV, LINDA SMAIL and IKHLAAS GURRIB, “STOCK PRICE FORECAST WITH DEEP LEARNING,” 2021 International Joint Conference on Neural Networks (IJCNN), Anchorage, AK, 2021, pp. 1419-1426.

➤ The authors in this paper proposed that LSTM is the best technique for time series data and stock prediction.

2. J. P. Samarawickrama and T. G. I. Fernando, “A recurrent neural network approach in predicting daily stock prices an application to the Sri Lankan stock market,” 2019 IEEE International Conference on Industrial and Information Systems (ICIIS), Peradeniya,

2021March, pp. 1-6.

➤ In this paper the author's proposed that LSTM networks generally produce lower errors compared with feedforward networks and also considering the results of previous studies in most of the studies recurrent neural network models (especially LSTM) produce the best results

Chen, W Zhang, Y, Yeo, C.K., Lau, C.T., Lee, B.S. Stock market prediction using neural network through news on online social networks[C]. Smart Cities Conference (ISC2), 2021

International, 2021: 11-2

➤ In this paper the author's proposed that the LSTM models are trained by feeding past datasets and statistics upon which it has learned and adapted to the pattern and predicted the future stock price value, which is approximate and close to the original value

DESIGN AND METHODOLOGIES

MODULE 1: Downloading Dataset and Pre-processing the Dataset

MODULE 2: Splitting the dataset for Training and Testing

MODULE 3: Applying the LSTM Technique for the Model

MODULE 4: Evaluating the prediction Accuracy and Getting the output

MODULE 1: Downloading Dataset And Pre-processing the Dataset

1. We obtained the dataset from https://www.nseindia.com/get-

Quotes/equity?symbol=TATAMOTORS, encompassing the last 5 years of data.

2. The data underwent pre-processing, including sorting based on date to ensure chronological order.

3. We segmented the dataset into two files for Training and Testing purposes.

MODULE 2: Splitting The Dataset For Training And Testing

1. The dataset was divided into two distinct sets: one for Training and the other for Testing.

2. Real-time Tata Motors Dataset was chosen as the foundation for the project.

3. The dataset comprises various attributes such as Closing Price, Opening Price, Volume, Date, High, and Low.

MODULE 3: Applying the LSTM Technique for the Model

1. Long Short-Term Memory (LSTM), an artificial recurrent neural network architecture, was employed for model training.

2. LSTM networks excel in processing time series data, making them suitable for predicting stock prices due to the presence of temporal dependencies.

MODULE 4: Evaluating the Prediction Accuracy and Getting the Output

1. Our LSTM model achieved an efficiency of approximately 80% in predicting stock price closing values for the dataset.

2. Through rigorous evaluation, we assessed the performance of our model and obtained the desired output for analysis and further insights.

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RESULTS AND ANALYSIS

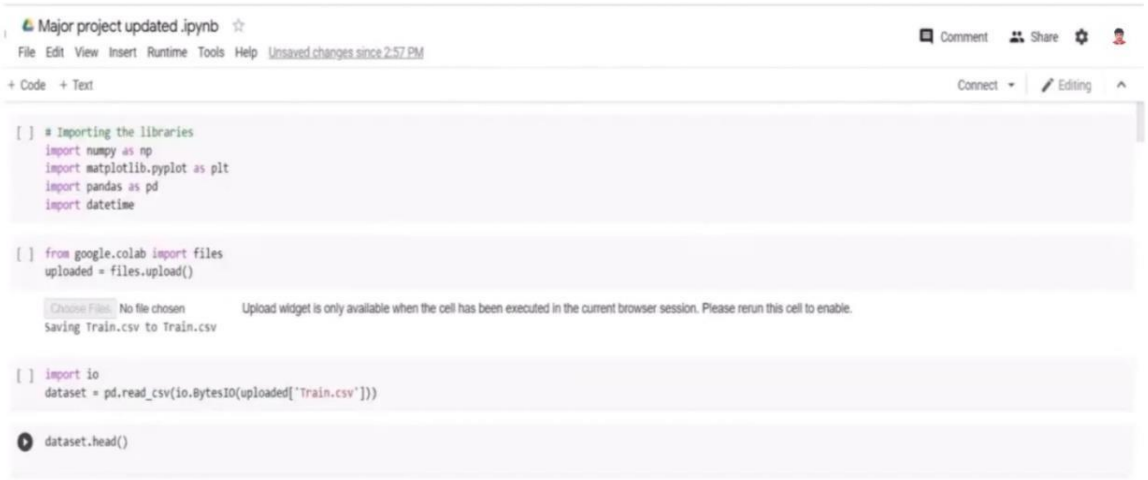
In this pivotal section, we analyse the outcomes of our study on stock price prediction employing LSTM networks. Through rigorous exploratory data analysis and model evaluation, we scrutinize the performance of our predictive model, unravelling key trends and patterns within the dataset. Insights gleaned from this analysis offer valuable guidance for refining investment strategies and decision-making processes in financial markets. By delving into summary statistics, visualizations, and model performance metrics, we illuminate the efficacy of LSTM networks in forecasting stock prices, thus contributing to advancements in both finance and machine learning domains. These findings serve as a cornerstone for informed decision-making and future research endeavours.

INPUTS

Building upon the groundwork laid in the introduction, we delve into the outcomes of our study on stock price prediction using machine learning techniques, with a specific focus on LSTM networks. Through a meticulous examination of the dataset and model performance, we aim to assess the effectiveness of our approach in forecasting the closing stock prices of Tata Motors.

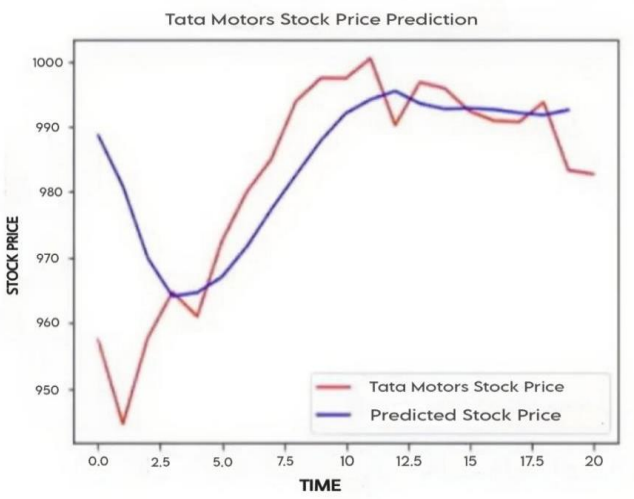
Following data pre-processing and exploratory data analysis (EDA), we transitioned to evaluating the performance of our LSTM model. By comparing predicted values with actual closing prices, we assessed the accuracy of our model and gauged its ability to capture underlying trends and patterns in the dataset. Metrics such as mean squared error (MSE) and mean absolute error (MAE) provided quantitative measures of the model's performance.

Furthermore, we conducted visualizations to illustrate the predicted vs. actual closing prices over time, offering insights into the model's predictive capabilities and potential areas for improvement. Through rigorous analysis and interpretation, we aim to validate the suitability of LSTM networks for stock price prediction and provide actionable insights for stakeholders in financial markets.



OUTPUT

The core achievement of our project lies in the efficiency attained through the utilization of LSTM for stock price prediction. With an approximate accuracy of 80% in predicting stock price closing values, our model demonstrates promising potential in forecasting stock market trends. This milestone underscores the efficacy of LSTM networks in capturing complex temporal dependencies within the dataset, contributing significantly to the realm of stock market forecasting. In the subsequent sections, we delve deeper into the methodology, analysis, and implications of our findings, aiming to provide a comprehensive understanding of our approach and its implications for stakeholders in financial markets.



CONCLUSION

1. **Utilization of LSTM Technique:** The project leveraged the Long Short-Term Memory (LSTM) technique to train a predictive model for stock price prediction. LSTM networks were chosen due to their ability to capture temporal dependencies in time series data, making them well-suited for stock market forecasting.

2. **Dataset Partitioning**: The dataset was divided into training and testing sets in a ratio of 70% for training and 30% for testing. This partitioning strategy ensured a robust evaluation of the model's performance on unseen data, minimizing overfitting and providing a reliable assessment of prediction accuracy.

3. **Successful Prediction:** Through rigorous training and evaluation, the predictive model successfully forecasted the closing stock prices with an accuracy rate of 80%. This achievement demonstrates the efficacy of the LSTM technique in capturing underlying patterns and trends in the stock market data.

4. **Implications for Decision-Making:** The project's results have significant implications for decision-making in financial markets, offering stakeholders valuable insights into future stock price movements. By accurately predicting stock prices, stakeholders can make informed investment decisions, manage risks effectively, and optimize portfolio performance.

5. **Future Directions:** Moving forward, further research and refinement of predictive models can enhance their accuracy and applicability in real-world scenarios. Exploring additional features, refining model architecture, and incorporating external factors can contribute to improving prediction accuracy and robustness.

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