User Friendly Stock Market Analysis

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Abstract - - Stock market trend analysis is a complex and challenging problem because of its highly volatile and nonlinear nature. Traditional models sometime fail to capture intricate patterns present in financial time series data. In this paper, we present a deep learning approach by implementing Long Short-Term Memory (LSTM) networks to estimate future fluctuations in stock value of Adani Group companies listed on the National stock exchange. This study uses a Kaggle sourced dataset including features like company names, current prices, stock dates, stock volume and stock open close. The data were preprocessed and normalized to improve model convergence. An LSTM model was trained to forecast stock prices for the upcoming financial year, and its predictions were integrated into a user-friendly web application. The platform provides real-time visualization of stock trends, including line charts and company information, enabling users to interactively explore historical and predicted prices. Experimental results demonstrate that the LSTM model captures underlying stock trends effectively, providing accurate predictions despite market volatility. This work highlights the ability of deep learning models linked with interactive web applications in enhancing financial decision-making.

Keywords - LSTM (Long Short-Term Memory) ,Deep Learning ,Time-Series Forecasting ,Adani Group ,Machine Learning, Technical Indicators ,Web Application ,Stock Trend Visualization ,Financial Decision-Making, Sequential Data Modeling ,Data Preprocessing, Chart.js ,MACD (Moving Average Convergence Divergence),RSI (Relative Strength Index)

1. INTRODUCTION

The Indian stock market is notorious for its unpredictable and dynamic nature. In recent years, stock trading has gained a lot of attention, with more individuals seeking to profit from buying and selling shares. More trading activity has produced a lot of stock market data, which changes rapidly every second. As a result, making informed decisions in this dynamic environment has become increasingly challenging.

Developing accurate and efficient predictive models is a tough task due to the complicated nature of financial data and the requirement for high precision in forecasts. Earlier findings have analyzed traditional statistical approaches for price prediction, heuristic algorithms, and machine learning procedures. Most of these prototypes rely on four key attributes like open, close, high, and low. However, such models have typically achieved a maximum accuracy of only 73.78%, limiting their practical effectiveness and reliability. Some researchers have adopted advanced deep learning approaches, including LSTM models, to analyze financial sequential data. These models were utilized to estimate returns from stock indices of different market sizes, offering promising improvements in predictive performance [1].

With rapid advancements in machine learning and AI, Current technologies are now accessible to enhance stock market analysis. LSTM networks, a category of recurrent neural network (RNN) noted for its capability to model sequential data and capture time-dependent patterns, have emerged as powerful tools for stock price prediction.

This study intends to harness the capabilities of LSTM networks to predict market value for leading organization in the technology sector—Adani Energy Solutions Limited, Adani Ports, and Adani Power Limited.

The study has two main objectives: to perform an in-depth analysis of historical stock data to uncover patterns and trends, and to design and evaluate an LSTM-based model capable of forecasting reliable share price projection.

By fulfilling these objectives, the research aims to make meaningful contribution to financial analytics and uncover meaningful patterns that can guide investment decisions and policy formulation.

2. LITERATURE SURVEY

Recent advances in machine learning have dramatically altered financial forecasting. Fischer and Krauss [2,3] illustrated that LSTM models surpass traditional RNNs and random forests in predicting share price accurately for S&P 500 constituents. Patel et al. [4] highlighted the relevance of combining market metrics with machine learning approach like random forests, SVM, and ANN, noting improvements in forecast precision. Qin et al. [5] proposed a dual-stage attention-based LSTM that selectively focuses on significant historical information, outperforming standard LSTMs. Additionally, J. Zhao. [6] tested deep learning strategies for forex and stock prediction, emphasizing the benefits of using sequential models like LSTM over feed forward networks. In contrast, limited research has conducted focusing on Indian stocks, particularly on major conglomerates like the Adani Group

1.2. Existing system

Several deep learning-based systems have created for stock price prediction using LSTM networks. One such system leverages a combination of technical indicators, financial news sentiment analysis, and social media trends to provide daily stock price predictions, primarily targeting stocks listed on the NYSE and NASDAQ exchanges. Another notable approach focuses specifically on forecasting stock closing prices by training LSTM models on historical stock price data. These models often incorporate features including moving averages, Relative Strength Index (RSI), along with Moving Average Convergence Divergence (MACD) indicator to enhance predictive performance [7]. Similar methods are adopted across various studies, demonstrating that integrating technical indicators as input features significantly improves the accuracy of LSTM-based stock price predictions.

2. PROBLEM DEFINITION

The estimating of stock prices remains a highly challenging task because of market's inherent volatility, non-linearity, and sensitivity to a wide range of economic, political, and social factors. Conventional statistical models often find it difficult to capture these complex patterns and dynamic behaviors accurately. New developments in deep learning, particularly LSTM networks, have demonstrated the ability to model sequential dependencies in financial time series data. There is a limited body of research concentrating on the utilization of LSTM networks to the Indian share market, especially in the context of major conglomerates like the Adani Group. This research seeks to fill this gap by developing and evaluating an LSTM-based predictive model using previous years stock price data of Adani Group companies, with the idea of enhancing forecasting accuracy and contributing to more informed investment decisions.

3.1. Objectives

The main goals of this research include the following:

1. To develop an LSTM-based deep learning model capable of predicting the stock prices of Adani Group companies using historical market data.
2. To preprocess and engineer relevant features, including technical indicators like moving averages, RSI, and MACD, for improving model performance.
3. To evaluate the predictive performance of the model through experimental results and analyze its effectiveness within the model of the Indian stock market.

4. PROPOSED METHODOLOGY

This study follows a structured approach to develop an LSTM-based stock prediction system integrated into an interactive web application. The methodology is organized into the following stages:

4.1 Data Collection and Preprocessing

The dataset was taken from Kaggle and included key attributes like company names, current prices, stock dates, stock volume, stock open and close, detailed company information. Preliminary preprocessing steps involved cleaning the dataset to handle missing values and verifying data consistency. The stock price values were normalized using Min-Max scaling to facilitate efficient learning by the neural network.

4.2 Model Development Using LSTM

LSTM represents a form of RNN that is widely employed in stock market prediction. LSTM is capable of capturing long-term dependencies in sequential data, making it well-suited for time-series prediction tasks such as stock market forecasting.[8]

An LSTM model was designed for forecast the expected future stock values derived from past price patterns. The architecture consisted of multiple LSTM layers followed by dropout layers to mitigate over fitting, and a final dense layer for price prediction. Mean Squared Error (MSE) loss function was utilized, and the Adam optimizer was employed during model training. The model was developed to generate future stock price estimation for the next financial year based on historical trends.

4.3 Integration with Front-End Application

The platform is created to provide users with an interactive experience using Chart.js enabling them to explore both historical and predicted stock data in real-time. Upon accessing the application, displays a comprehensive list of Adani Group companies, each accompanied by key financial indicators such as the current stock price, the forecasted price for the next financial year, and the expected growth percentage.

Each company entry includes a dedicated "Details" button, which, when clicked, opens a detailed view presenting extensive information about the selected company, including its business profile, sectoral performance, and recent financial highlights. This feature enhances user understanding and supports informed decision-making.

Moreover, an interactive chart is incorporated for each company, allowing users to visually examine past stock price trends alongside predicted trends. The charts are dynamic, providing zoom-in and hover functionalities to inspect specific data points. The seamless integration between the LSTM model's output and the java script front-end ensures that all stock data visualizations are updated promptly, maintaining

consistency between prediction results and user displays. Overall, the application offers a holistic, user-friendly platform for monitoring, analyzing, and interpreting stock market trends for Adani Group companies.
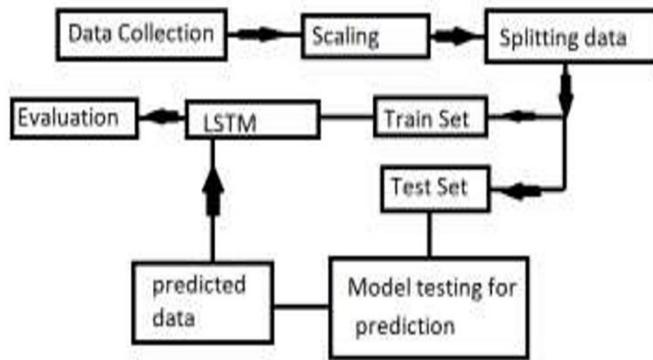

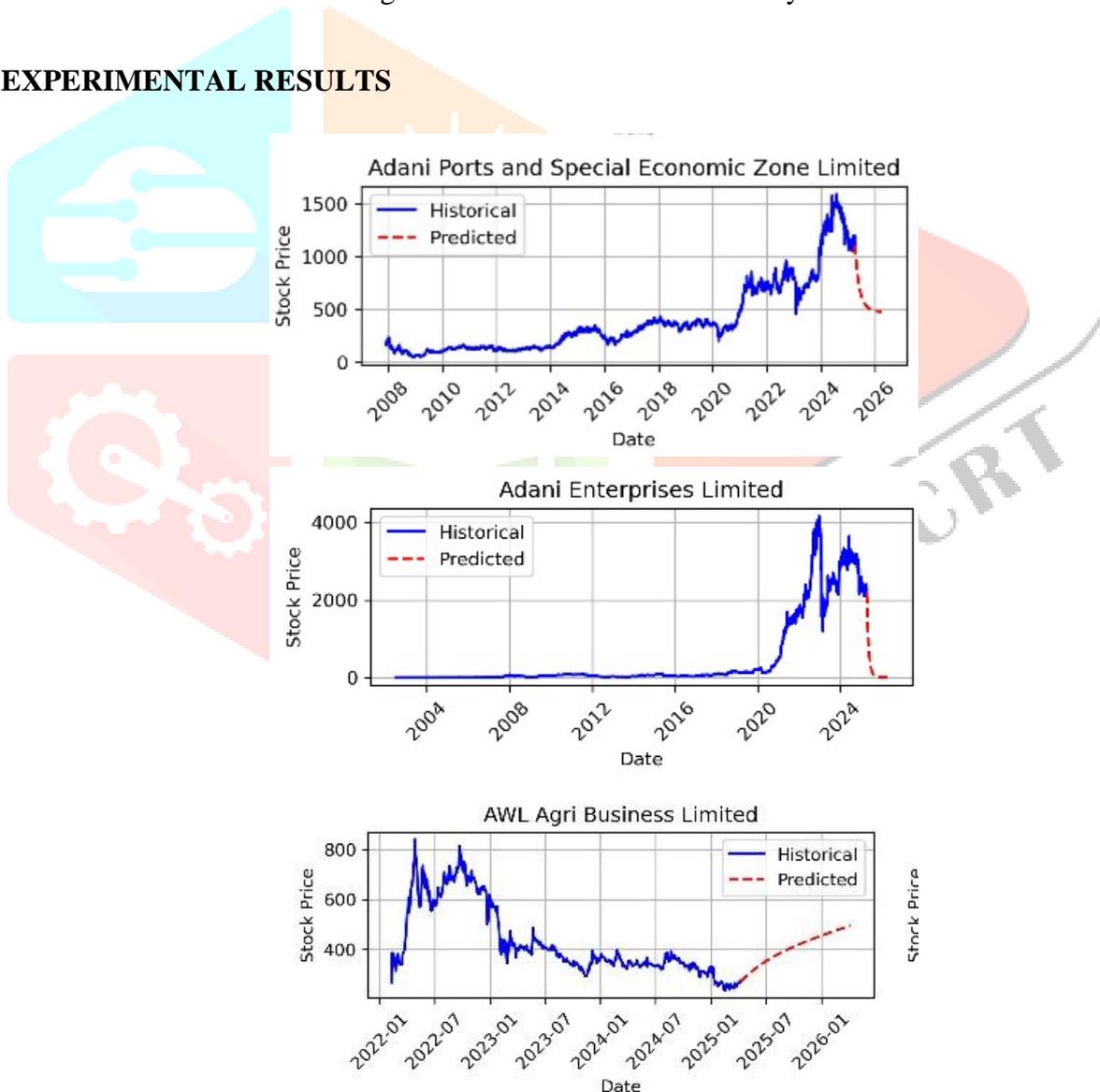Figure 1- Architecture of stock analysis

5. EXPERIMENTAL RESULTS

Figure 2 – Representation of company's prediction

6. CONCLUSION

This research presents, a deep learning-based approach utilizing LSTM networks was meant to analyze stock prices of Adani Group companies listed of Adani group stocks traded on Indian market. The model demonstrated the ability to understand complex temporal patterns from historical data and provided reasonably accurate future stock price estimations. The integration of the LSTM model with web application allowed for effective visualization of stock trends, offering users a real-time, interactive, and informative platform.

The system not only presented current and expected future stock prices but also included growth percentages and detailed company information, thereby enhancing the decision-making capabilities of users. Through the fusion of machine learning prediction and dynamic front-end visualization, the project successfully bridged the gap between complex model outputs and user accessibility.

Future work can focus on merging extra data sources such as financial news sentiment, macroeconomic indicators, and social media analytics to further improve accuracy. Moreover, testing hybrid models that combine LSTM combined with other advanced techniques, such as attention mechanisms or transformers, may yield even better forecasting performance.

7. REFERENCES

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