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DIGITAL ASSISTANCE FOR STOCK PRICE PREDICTION

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Abstract

Our Objective is to project the future values of financial institutions. Understanding the best and least expensive options for data recovery and stock market prediction that also have the lowest mistake rates and maximum accuracy is the main objective of scientific research. A financial planning initiative that serves as a one stop shop for financial information and analysis by enabling risk assessment and product prediction on a single platform. Script Box, a prominent asset management firm and online job sharing platform, performed a survey recently and found that around 72% of Indians lack the knowledge necessary to invest for financial independence. This includes those with no knowledge of risk analysis or personal finance in general.

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Keywords

(Financial Forecasting, Risk Assessment, Stock Market Prediction, Personal Finance)

I INTRODUCTION

The stock market is a complicated and dynamic system that is frequently difficult to forecast because of its intricacy. Making educated selections is extremely challenging for investors, particularly those without financial knowledge or experience. They frequently suffer from a lack of understanding of investing tools, information overload, and risk profiling. Notwithstanding these obstacles, investing in the stock market is still one of the most promising ways to become financially independent because, when done properly, it can lead to wealth accumulation. Our project's main goal is to combine cutting edge technology like machine learning and natural language processing to improve and streamline the investing experience.

We place a strong emphasis on fundamental analysis as opposed to standard technical analysis, which only uses historic al data, such as past closing values. This method provides a thorough grasp of a company's growth potential by taking into account its market position, financial health, and external economic conditions. It guarantees that investments are informed by significant insights into the business's operations and future prospects in addition to trends in stock prices. Because it makes risk profiling possible, finds patterns in financial data, and offers predictive analytics for stock performance, machine learning is essential to our endeavour. These features enable investors to make more certain and knowledgeable judgments by providing them with data-driven insights. This framework is further improved by natural language processing, which analyses market sentiment, extracts useful information from financial papers, and keeps an eye On world news for patterns that can affect stock.

II LITERATURE SURVEY

Zhaoxia Wang, Zhiping Li, [1] Stock Market Prediction Analysis by Incorporating Social and News Opinion and Sentiment: Through data mining of these outliers, an algorithm for forecasting stock market volatility has been created in this research. Anomalies can be used to forecast the stock trend. The effectiveness of method- based learning for share market price prediction when driving data, such news, is added. By taking into effect driving data, such as news, that were correlated with the share market, an optimal methodbased learning was developed.

Meghna Mishra, Ajay Prakash Yadav, [2] Stock Price Prediction using Machine Learning Algorithms: This research has focused on classifying various techniques utilized in the analysis through predictive approaches in various sectors to various dates, as well as their shortcomings.

Here, the primary goal is to highlight concepts associated with the current solution while achieving the highest accuracy and minimum error with suitable parameters for share market forecasting.

For this reason, a number of algorithms have been studied.

P Sukhman Singh et al, [3] Stock Market Forecasting Using Machine Learning: Today and Tomorrow. In order to create prediction models and stock prices for several stock exchanges, the researchers in this study depicted distant Machine learning strategies, including support vector machines, deep learning, random forests, ensemble methods, and a few hybrid approaches. Using machine learning and artificial intelligence algorithms, they have forecasted the stock market's trend and pricing using a few machine learning techniques.

Deepak Kumar, [4] A systematic review of stock market prediction using machine learning and statistical techniques; Thirty research papers on stock market prediction are carefully examined in this paper. Finding common machine learning methods and datasets utilized in these investigations is its main goal. The study notes the broad use of artificial neural networks but also the difficulties in making precise forecasts because of the stock market's complexity and volatility. The study highlights the necessity of a more comprehensive strategy that takes into account a variety of variables in order to create better forecasting models.

Troy J. Strader, [5] Machine Learning Stock Market Prediction Studies: Review and Research Directions: The use of machine learning techniques to forecast stock market movements is examined in this study. It employs genetic algorithms, support vector machines, artificial neural networks, and hybrid techniques to methodically evaluate and classify the body of existing research. In order to improve the precision and dependability of stock market forecasts, the authors analyze these studies to find similarities, constraints, and possible directions for further study in this area.

Ummara Mumtaz & Summaya Mumtaz,[6] Potential of ChatGPT in predicting stock market trends based on Twitter Sentiment Analysis: By examining Twitter sentiment, the study investigates ChatGPT's potential for stock market trend prediction. It looks into ChatGPT's capacity to evaluate the sentiment of tweets about two significant tech firms, Google and Microsoft, and link these sentiments to later changes in stock prices. The study highligh ts the increasing importance of AI in financial forecasting by showcasing ChatG PT's ability to offer insightful information about market movements.

Nusrat Rouf , [7] Stock Market Prediction Using Machine Learning Techniques: A Decade Survey on Methodologies, Recent Developments, and Future Directions: This study offers a thorough analysis of machine learning methods used in stock market forecasting during the previous ten years. By methodically examining different approaches, the writers pinpoint their advantages, disadvantages, and new trends. They provide important insights into the development of stock market prediction models and indicate possible directions for further research by looking at

a sizable collection of research publications.

Wang et al.,[8] Stock Market Eassistance on Platform-as-Service (Paas): Investors have been paying close attention to the stock market. Investors and experts have long been interested in how to understand the shifting regularity of the stock market and forecast the trend of stock prices. Politics, the economy, society, and the market are only a few of the factors that influence stock price movements. The predictability of market trends has a direct impact on the capacity of stock investors to generate profit. The accuracy of the forecast increases with the likelihood of preventing dangers. In addition to reflecting the current state of operations and expected future growth of the company, the stock price of listed firms is also a key technical indicator for the company's study and research. Research on stock forecasting is also important to the study of a country's economic growth. As such, there are therefore numerous possible applications and considerable theoretical implications in the study of stock market prediction aintrinsic value.

Katoh, Hironobu,[9] Stock price prediction assistance system and method: By using historical performance and stock prices based on a user's own judgment of a company's success, the current innovation enables stock price prediction assistance. This system consists of a server with a processor, a client set up to send a userconfigured prediction value about a company's accomplishment to the server, and a database set up to hold stock prices and corporate accomplishments from the past and present so that the server can read them. When a gap between the current stock price read from the database and the theoretical stock price reaches a predetermined value or more, the server is set up to read from the database the previous company achievement and its stock price at that time within a predetermined range from the prediction value by the user received from the client. It then calculates a multiple using the read past achievement and stock price, calculate s a theoretical stock price using the user's prediction value and the multiple, and sends an alert to the client.

Shashankiyer, Bahar, Soparkar, [10]Stock Market Prediction using Digital Signal Processing Models: The goal of this study is to use two statistical processes— adaptive filters and signal modeling—to take advantage of the temporal correlation that exists between the different stock market data in order to forecast future trends and prices. For real-time prediction, the linear regression algorithm (Gradient Descent) has been employed. Iteratively, the Finite Impulse Response (FIR) adaptive filter reduces the mean square error. Using the least square estimation method, values have been predicted by extrapolating Prony's Normal Equation. Cross-section regression, or the relationship between variables at a certain moment in time, is modeled by this. Stocks listed on the NSADAQ were the subject of the analysis, and the mean square error was compared. The results of this study demonstrate that the DSP approaches are suitable for simulating stock price variation.

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III METHODOLOGY

The proposed stock market prediction system uses a diagrammatic view to describe its architecture and workflow in the Fig 1 which shows the diagrammatic representation of proposed system. Data Collection: The first step in building a stock prediction system is gathering historical and real-time data. Historical stock prices (open, close, high, low) are retrieved via the Yahoo Finance API and saved as a CSV file. Additional stock details (name, market cap, industry, symbol, risk level) are scraped from websites like Tickertape using the requests library and parsed with Beautiful Soup. The collected data is stored for further analysis.

Web scraping extracts data from web pages by analyzing their HTML structure, using tags, IDs, classes, and attributes. Tools like HTTP requests and Beautiful Soup navigate sites, filter irrelevant content, and collect relevant data. It scales from small tasks to enterprise level operations, commonly used for tracking trends, gathering reviews, compiling news, and monitoring prices. By structuring unorganized web data.

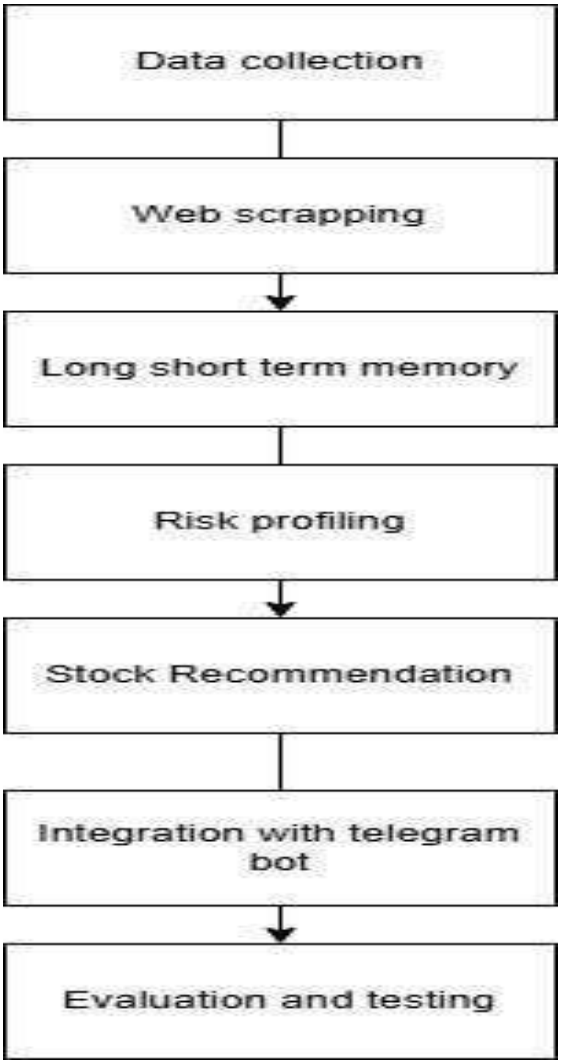

Fig 1: Diagrammatic repre sentation of proposed System

Long Short Term Memory:

The LSTM model consists of multiple layers with 50 units each, followed by a Dense layer predicting a single stock price. It uses the Adam optimizer and MSE loss to minimize error. Trained on six years of historical stock data (collected via nsepy and web scraping), the model learns to map past prices to future forecasts. Preprocessing retains only date and OHLC columns. After training with a batch size of 64, the model predicts future stock prices, which are rescaled for interpretation. Performance is visualized by comparing predicted and actual prices. Risk Profiling:

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The system analyzes stock volatility to assess risk levels. Volatility is calculated as the standard deviation of daily returns, annualized for classification: Low Risk: Volatility < 0.2, Medium Risk: 0.2 ≤ Volatility ≤ 0.4, High Risk: Volatility > 0.4 Stock Recommendation: Stock recommendations are based on Simple Moving Averages (SMA):Buy: 50day SMA > 200-day SMA (upward trend) Sell: 50-day SMA < 200-day SMA (downward trend)Hold: SMAs are nearly equal .

Integration with Telegram Bot:

For easy user interaction, the stock prediction system is integrated with a Telegram bot that can be contacted using the following basic text commands: Asking the bot about the predicted stock price, risk analysis, and stock recommendation for a particular stock.

Evaluation and Testing:

Evaluation Metrics: MSE & RMSE: Measure prediction accuracy; lower values indicate better performance. R^2 Score: Assesses how well the model explains price variance. Precision, Recall, & Accuracy Used for evaluating buy/sell signals: Precision: Correct buy/sell signals among total predictions. Recall: Actual buy/sell signals detected by the model. Precision Recall Curve: Shows trade-offs between precision and recall Model Performance Visualization Loss Curves: Track model convergence, detect verfitting/underfitting. Price Comparisons: Plot predicted vs. actual stock prices. Precision-Recall Curve: Evaluates categorical predictions like buy/sell signals. Cross-Validation & Hyperparameter Tuning. Cross-Validation: Splits data to improve generalization. Hyperparameter Tuning: Adjusts LSTM layers, units, batch size, and learning rate. Deployment & Real Time Testing The model is integrated into a Telegram bot for real-time predictions.

IV RESULTS

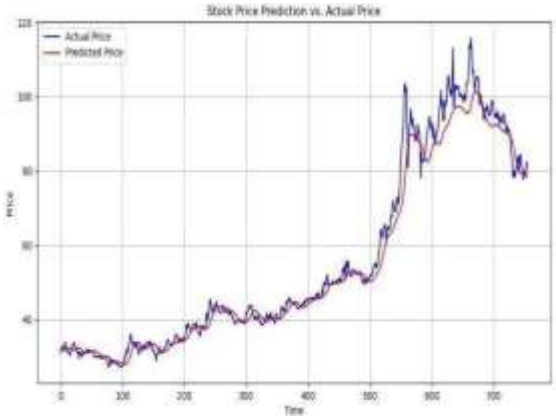

Fig 2 :Prediction vs Actual Price

In Fig 2 graph represents the comparison of actual stock prices (blue) and predicted stock prices (red) over a given time period. The predicted line closely follows the actual trend, which shows that the model is quite good at capturing market movements. It performs well during steady trends and adapts reasonably during sharp price fluctuations with minimal deviations. This indicates the reliability of the model in forecasting stock prices, making it a useful tool for informed investment decisions.

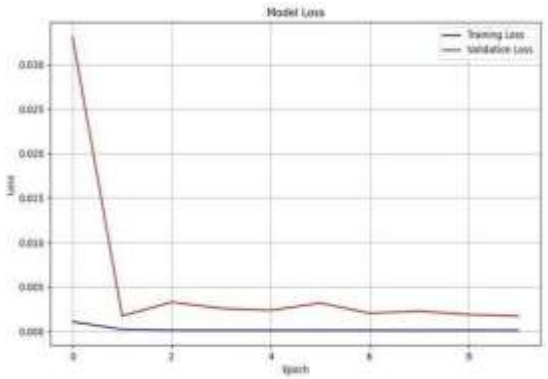

Fig 3: Training Loss and Validation Loss

In Fig 3 graph shows the training loss (blue) and validation loss (red) over epochs. The training loss goes down very quickly in the initial epochs, indicating that the model is Learning effectively from the data. Validation loss also decreases and stabilizes near the training loss, indicating that the model generalizes well to unseen data with minimal over fitting. This implies that the model is reliable for predicting stock prices.

V CONCLUSION

In the stock market A large portion of the audience struggles to understand their financial planning. Before working on the stock market and different stocks, many people have questions. These include how to learn about stocks, how to trust a particular stock, and whether I can take the risk. By providing the audience with this information in a conversational manner, a good chat bot can help people understand financial planning. Many subjects in the present Data Science entity are explored by extracting the dataset from the resources to anticipate stock prices. The process of developing a tool that can extract, parse, download, and synthesize valuable information from websites is known as web scraping. It can be used to produce particular information at any scale.

Furthermore, by employing those site specific traits, we may use this technique to extract the original data items from the webpage. The suggested research study highlights concepts associated with the current solution while achieving the highest accuracy and minimum error with suitable parameters for information retrieval and share market prediction. As a one-stop shop for financial data and analytics, the goal of offering a very accessible and reasonably priced system for financial planning, risk assessment, and stock forecasting on a single platform is accomplished. Future improvement: Instead of using Telegram, we would like to link the entire chat bot to an online server so that it may be used as a separate entity and application. In this manner, we are able to serve many clients at once.

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