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Price Prediction and Recommendation Using Sentimental Analysis and Machine Learning

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Abstract: ***The stock market is influenced by both quantitative indicators and qualitative factors such as public sentiment reflected in financial news and media. Traditional prediction approaches mainly depend on historical price data and often fail to capture sudden market movements driven by external information. This paper presents a hybrid framework that integrates sentiment analysis with deep learning techniques for stock price prediction. Sentiment scores are extracted from news data using natural language processing methods and combined with historical stock prices to form a unified dataset. A hybrid Convolutional Neural Network–Long Short-Term Memory (CNN-LSTM) model is employed to capture both feature-level patterns and temporal dependencies. In addition, the system provides investment recommendations in the form of Buy, Sell, or Hold decisions based on predicted values. Experimental observations indicate that incorporating sentiment information enhances prediction accuracy and improves decision-making support for investors, as supported by recent studies [1], [2].***

I. INTRODUCTION

Stock price prediction is a challenging task due to the highly dynamic and uncertain nature of financial markets. Stock prices are influenced by multiple factors such as economic conditions, company performance, global events, and investor sentiment. Traditional approaches rely mainly on historical data and often fail to capture real-time market behavior.

Previous research has shown that public sentiment extracted from social media platforms can significantly influence stock market movements [1]. Furthermore, integrating sentiment analysis with machine learning techniques has been proven to improve prediction accuracy compared to traditional methods [2].

With advancements in deep learning, models such as Convolutional Neural Networks (CNN) and Long Short-Term Memory (LSTM) networks have been widely used for financial forecasting due to their ability to capture complex patterns and temporal dependencies [3], [4]. More recently, transformer-based models have been applied to sentiment analysis, further enhancing prediction capabilities [5].

This work proposes a hybrid CNN-LSTM model integrated with sentiment analysis to improve stock price prediction and provide actionable investment recommendations.

II. LITERATURE SURVEY

Stock market prediction has evolved from traditional statistical techniques to advanced machine learning and deep learning approaches. Early studies focused on understanding the relationship between public sentiment and stock price movements. Bollen et al. demonstrated that sentiment derived from Twitter data can predict stock market trends [1].

Mittal and Goel further explored sentiment-based prediction using machine learning models and showed improved performance over traditional techniques [2]. However, these approaches were limited in handling complex nonlinear relationships in financial data.

With the emergence of deep learning, researchers began using CNN and LSTM models for stock prediction. Chen et al. showed that deep learning models outperform traditional algorithms in capturing complex patterns [3]. Xing et al. highlighted the application of neural networks in financial forecasting [4].

More recent research has focused on transformer-based models such as BERT for sentiment analysis, which provide improved contextual understanding of textual data [5].

Research Gap:

Most existing approaches either rely solely on historical data or use sentiment analysis independently. There is a need for an integrated approach combining both techniques, which is addressed in this work.

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III. SYSTEM ANALYSIS

A. Existing System

Traditional stock prediction systems rely on statistical models and historical data analysis. These methods fail to capture real-time sentiment changes and external influences [2].

1) Limitations

Limited accuracy
No sentiment integration
Poor performance during volatilityB B.Proposed System

The proposed system integrates sentiment analysis with a CNN-LSTM model to improve prediction accuracy. This approach is inspired by recent advancements in deep learning and sentiment-based prediction [3], [4].

2) Advantages:

Higher accuracy
Real-time sentiment analysis Investment recommendations

IV. METHODOLOGY

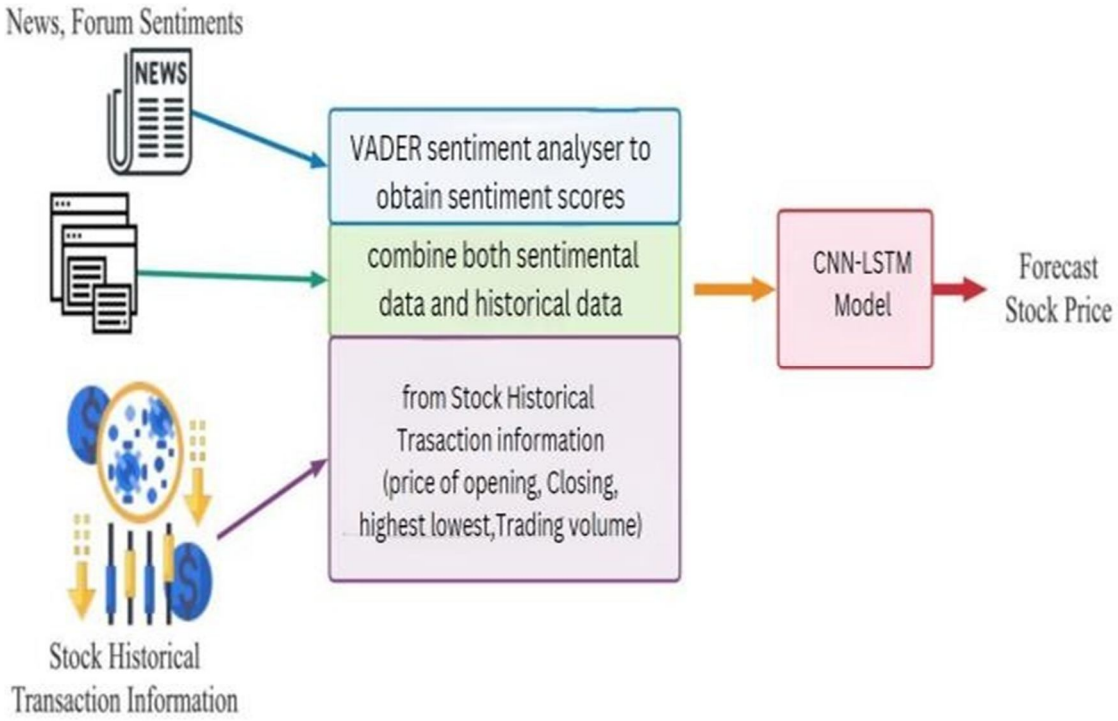
The proposed system follows a structured approach including data collection, sentiment analysis, preprocessing, model development, and prediction.

Sentiment scores are extracted from financial news using natural language processing techniques, as suggested in previous studies [1], [2]. The processed data is then fed into a hybrid CNN-LSTM model, which has been proven effective for time-series prediction tasks [3], [4].

The model predicts future stock prices and generates Buy, Sell, or Hold recommendations based on predicted trends.

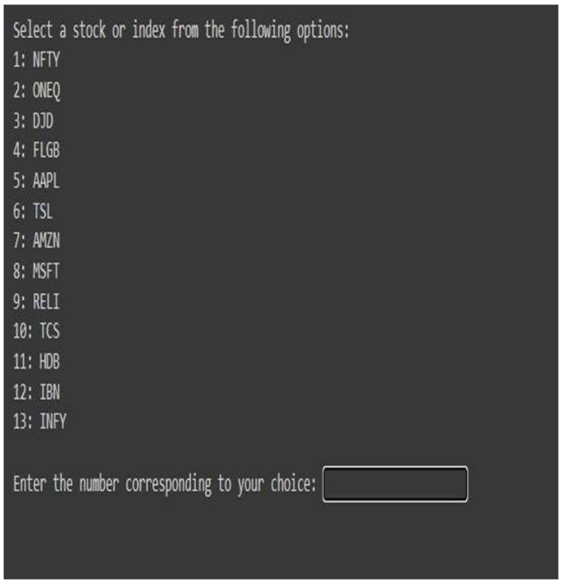
V. SYSTEM ARCHITECTURE

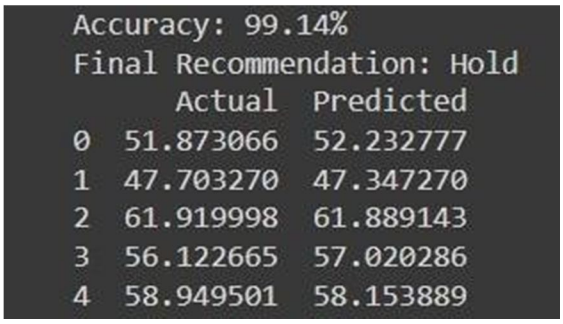
The system consists of modules for data collection, sentiment analysis, prediction, and recommendation.

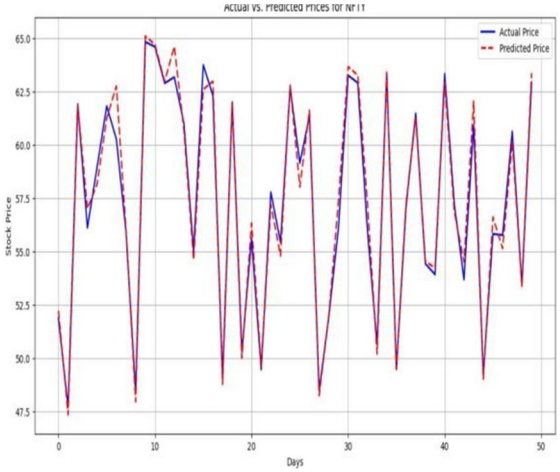


VI. RESULTS AND DISCUSSION

The results demonstrate that the proposed model effectively captures stock price trends. The predicted values closely follow actual values, indicating good model performance.







The integration of sentiment analysis improves prediction accuracy, which aligns with findings from previous studies [1], [2]. The use of deep learning models further enhances performance by capturing complex patterns in the data [3], [4].

VII. LITERATURE SURVEY

Stock market prediction has been an active research area for many years, evolving from traditional statistical techniques to advanced machine learning and deep learning approaches. Early studies focused on analyzing the relationship between public sentiment and stock market movements. Bollen et al. [1] demonstrated that collective mood states derived from social media platforms such as Twitter can be used to predict stock market behavior. Their work highlighted the importance of incorporating sentiment analysis into financial forecasting.

Mittal and Goel [2] extended this idea by applying sentiment analysis techniques to Twitter data for stock prediction. Their study showed that combining sentiment features with machine learning algorithms improves prediction accuracy compared to traditional methods that rely solely on historical data. However, these approaches were limited in handling complex and nonlinear relationships present in financial datasets.

With the advancement of deep learning, researchers began exploring models such as Convolutional Neural Networks (CNN) and Long Short-Term Memory (LSTM) networks for stock prediction. Chen et al.

[3] proposed an LSTM-based model for stock return prediction and demonstrated that deep learning techniques can effectively capture temporal dependencies in time-series data. Similarly, Xing et al. [4] provided a comprehensive survey on the application of deep learning in financial forecasting, emphasizing the ability of neural networks to model complex patterns and improve prediction performance.

More recent studies have focused on transformer-based models for sentiment analysis. Huang et al. [5] introduced FinBERT, a pretrained language model specifically designed for financial text analysis. Their work showed that transformer-based models provide better contextual understanding of financial news and significantly enhance sentiment classification accuracy.

A. Research Gap

Despite these advancements, many existing approaches either rely solely on historical numerical data or treat sentiment analysis as a separate component. There is a need for an integrated framework that effectively combines sentiment information with advanced hybrid deep learning models. The proposed system addresses this gap by integrating sentiment analysis with a CNN-LSTM model for improved stock price prediction.

VIII. CONCLUSION

This paper presents a hybrid approach for stock price prediction by integrating sentiment analysis with deep learning techniques. The CNN-LSTM model effectively captures both numerical and sentiment-based patterns, resulting in improved prediction accuracy.

The findings are consistent with previous research highlighting the importance of sentiment analysis and deep learning in financial forecasting [1]–[4].

IX. FUTURE WORK

Future work in this domain focuses on enhancing both the accuracy and applicability of stock market prediction systems by incorporating more advanced technologies and real-time capabilities. One key direction is the integration of real-time data streams, which enables models to process live financial data, news feeds, and social media sentiment dynamically, thereby improving the timeliness and relevance of predictions. Additionally, the adoption of advanced deep learning architectures such as Transformer-based models, particularly BERT [5], offers significant potential for better understanding contextual and semantic relationships in financial text data. These models can outperform traditional methods by capturing long-range dependencies and nuanced language patterns, ultimately leading to more robust and accurate financial forecasting systems.

Future work includes:

Real-time data integration Transformer models (BERT) [5] Larger datasets

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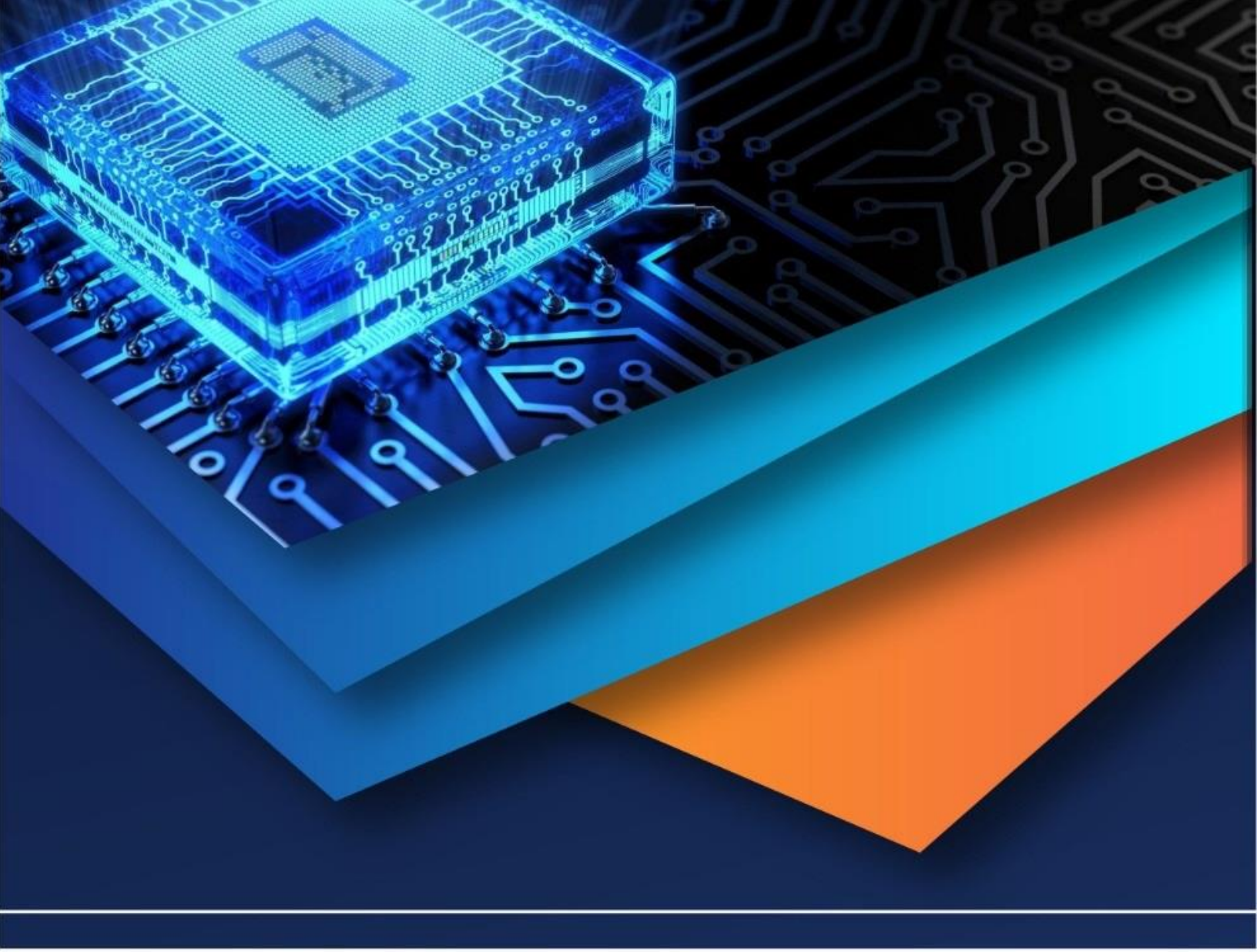

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