International Journal of Research Publication and Reviews, Vol (6), Issue (5), May (2025) Page – 11090-11095

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

STOCK MARKET FORECASTING: A MULTI-MODEL APPROACH USING MACHINE LEARNING TECHNIQUES

Dr. A. S.S. Ram Kumar[1], Sirana Tejaswini[2], Geesala Ramya[3], Mutyala Shalom Joseph[4], Vabbina Jaya Krishna[5]

[1]Proffessor, Department of CSE (AIML), Nadimpalli Satyanarayana Raju Institute of Technology, Sontyam,Visakhapatnam,India.

[2345]Student, Department of CSE (AIML), Nadimpalli Satyanarayana Raju Institute of Technology, Sontyam,Visakhapatnam,India.

ABSTRACT:

In recent years, stock price prediction models have become valuable tools for investors, traders, and financial analysts. These models aim to forecast future stock prices based on historical market data, helping users make informed decisions in a highly volatile environment. One such system is a machine learning-based stock price prediction application developed using Streamlit, which offers an interactive and user-friendly interface.

The system allows users to upload historical stock data, preprocess it, extract key features, and train various predictive models. It utilizes machine learning algorithms such as Arima, LSTM, XG-Boost to analyze past trends and generate future price predictions. By comparing actual and predicted stock prices through visualizations and performance metrics, users can evaluate the accuracy and effectiveness of each model.

This application not only simplifies the process of stock trend analysis but also make predictions by providing data-driven forecasts. It highlights the growing role of AI and machine learning in financial markets, where predictive models are becoming essential for analyzing trends and minimizing investment risks.

Today, there are a wide variety of machine learning algorithms used for financial forecasting. These models differ in their complexity, training requirements, and prediction accuracy, allowing users to choose the best approach based on their needs and available data.

Keywords: Stock Price Prediction, Machine Learning Models, Financial Forecasting, AI in Finance, Time Series Analysis

I. INTRODUCTION

Stock price prediction is considered a crucial component in the financial ecosystem as it helps investors and traders make informed decisions based on data analysis and trend forecasting. Traditional methods of stock prediction rely on past trends and technical indicators, which are not always effective in identifying complex and hidden patterns in price movements. In this study, the authors have proposed a system that uses machine learning models like Arima, LSTM, XG-Boost to predict future stock prices based on historical market data.

This system was developed using Streamlit, a web-based interface that allows users to upload stock data, preprocess it, train various models, and visualize the results in the form of predictions. This user-friendly interface helps individuals, especially those without deep technical knowledge, to work with predictive models easily. The author mentioned that by using multiple models [1], prediction accuracy is improved. The more the data is processed and used for training, the more the model learns from past fluctuations and market behavior.

The authors of this research focus on assisting financial stakeholders like traders, investors, and analysts by providing a data-driven solution that saves time and increases the chances of profitable decisions. By comparing the predictive outcomes of multiple algorithms, the best-performing model is selected for future forecasting [2]. Unlike single-model systems, this multi-model approach ensures better results. The author also emphasizes the importance of visualization [3], as the user can clearly see the predicted versus actual prices and use that to build strategies. This model-driven approach supports intelligent financial decisions in a highly dynamic stock market environment.

LITERACTURE SURVEY

Stock price prediction remains a challenging task for investors and analysts due to the highly volatile and complex nature of financial markets. With vast amounts of historical data and numerous influencing factors, traditional forecasting methods often struggle to deliver accurate results. The author of [1]-2023 highlights that while Long Short-Term Memory (LSTM) networks can identify general market trends, they face limitations in predicting precise price movements.

To address this issue, researchers have explored various machine learning techniques. In [2]-2020, Artificial Neural Networks (ANN) and Random Forest (RF) were applied to predict closing stock prices, with ANN outperforming RF based on evaluation metrics such as RMSE and MAPE. Similarly, [3]-

2018 demonstrates that Support Vector Machines (SVM) improve profitability in stock trend forecasting but face challenges like overfitting in large datasets.

Recent advancements suggest that ensemble models enhance prediction accuracy. According to [4]-2023, combining methods like Random Forest, XGBoost, and LSTM improves forecasting reliability by handling financial data complexity. Earlier research by [5]-2016 supports this, showing that Multi-Layer Perceptron (MLP) achieved 77% accuracy in predicting the KSE-100 index, with oil prices significantly influencing stock performance.

Despite these innovations, gaps remain in real-time prediction and adaptability to sudden market shifts. The author in [1]-2023 emphasizes the need for hybrid models that integrate both technical indicators and external economic factors. This study builds on these findings by proposing a machine learning-based system using Random Forest, Linear Regression, and Gradient Boosting, implemented via Streamlit for user-friendly interaction. The goal is to assist traders and investors in making data-driven decisions while overcoming the limitations of traditional approaches.

METHODOLOGY

In this study, the prediction of stock prices is carried out using historical data of YES Bank, obtained from Kaggle. The dataset contains 3,946 rows and 15 columns, which include essential attributes such as Open, High, Low, Close, VWAP, Volume, Turnover, Deliverable Volume, and percentage Deliverable. These features are used as input variables for training multiple predictive models. Before modeling, the dataset undergoes a thorough preprocessing phase, where missing values are handled, and relevant features such as moving averages and volatility indicators are engineered to enhance the quality of predictions. Normalization techniques are also applied to scale the data, ensuring uniformity across different model inputs.

To build a robust and comparative stock prediction framework, six different models are implemented in this research: Linear Regression, Random Forest Regressor, XGBoost, Support Vector Machine (SVM), ARIMA, and Long Short-Term Memory (LSTM). Each model is trained using the cleaned and processed data, and the dataset is divided into training and testing sets to validate model performance. These models are chosen to explore both traditional statistical approaches and modern machine learning techniques to determine which method provides the most reliable prediction accuracy.

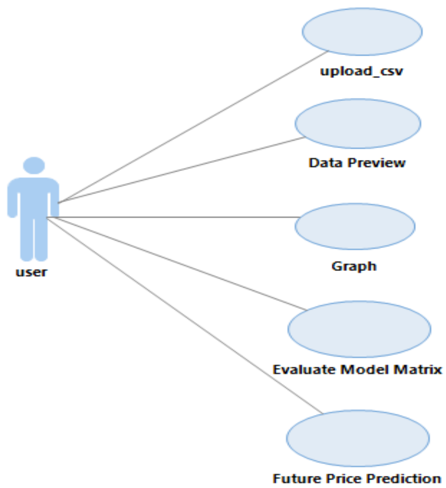

Fig: Use case

Among all, ARIMA demonstrated the highest accuracy, followed by LSTM and XGBoost, indicating their superior ability to capture temporal patterns and non-linear relationships in stock data.

The system is deployed using Streamlit, offering a user-friendly interface that allows users to upload their own stock data files in Excel format. Once the data is uploaded, it is automatically processed, and users are given the option to select the number of future days for which they want to predict stock prices. After predictions are generated by all six models, the results are displayed in a tabular format on the interface. This table includes the predicted stock prices for each model across the selected future dates. An important feature of the system is that it highlights the maximum predicted price for each day across all models, providing users with a clear and comparative view of the most optimistic forecasts. A screenshot of this final output interface illustrates how predictions are presented, making it easier for traders and analysts to make informed investment decisions based on model-based comparisons.

The Stock Price Prediction is implemented in a structured manner, following multiple stages from data handling to model deployment. Below is the step-by-step breakdown

1. ***Data Collection & Preprocessing***

User uploads stock data (CSV format) via Streamlit UI.

- Preprocessing Steps:

- Convert Date column to datetime format.
- Set the Date column as the index.
- Handle missing values by removing or imputing them.
- Create the Target variable (next day's closing price).
- Normalize numerical features for LSTM model compatibility.

2. Feature Engineering

Extract important features from stock data:

- Open, High, Low, Close, Volume
- Create new features like Moving Averages, RSI, or MACD (optional)

3. Model Training

Random Forest Model:

- Trained on extracted features to predict the next day's closing price.
- Splits data into train & test sets (80-20 split).
- Uses mean absolute error (MAE) & mean squared error (MSE) to evaluate.
- LSTM Model:
- Converts time-series data into sequences for better learning.
- Uses layers like LSTM, Dropout, and Dense layers for forecasting.
- Optimized using Adam optimizer & Mean Squared Error loss function.

4. Model Evaluation

Compare ARIMA & LSTM results using:

- MAE (Mean Absolute Error)
- MSE (Mean Squared Error)
- RMSE (Root Mean Squared Error)

5. Prediction & Visualization

- Generates stock price predictions for the next few days.
- Displays actual vs. predicted prices using line charts in Streamlit.

6. Deployment (Streamlit-Based)

The trained models are integrated into the Streamlit app, allowing users to:

- Upload CSV
- Train models
- Predict stock price.
- Visualize predictions

Comparative Analysis of Prediction Models

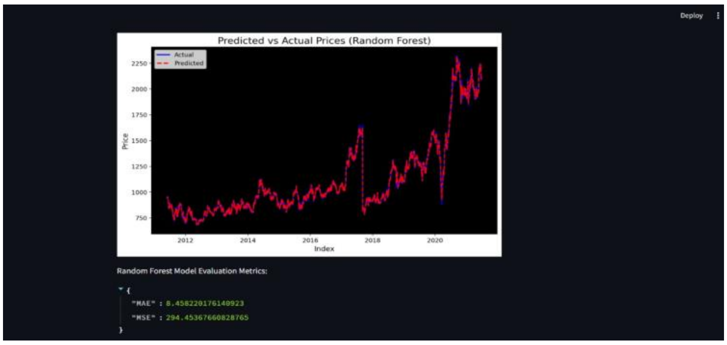

Fig: Random Forest

The graph shows predicted vs actual prices using a Random Forest model. The predicted values closely follow the actual values, indicating good performance. Evaluation metrics show low error: MAE = 8.45 and MSE = 294.45.

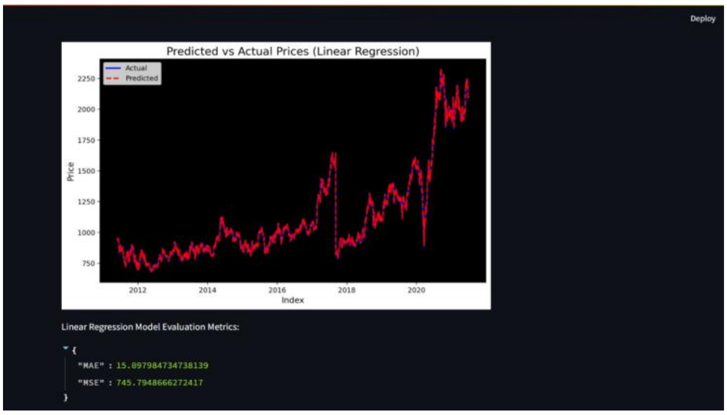

Fig: Linear Regression

The graph displays predicted vs actual prices using a Linear Regression model. The predicted values show moderate alignment with actual values but with more noticeable deviations. Evaluation metrics indicate higher error: MAE = 15.09 and MSE = 745.79. This suggests Linear Regression performs less accurately compared to Random Forest.

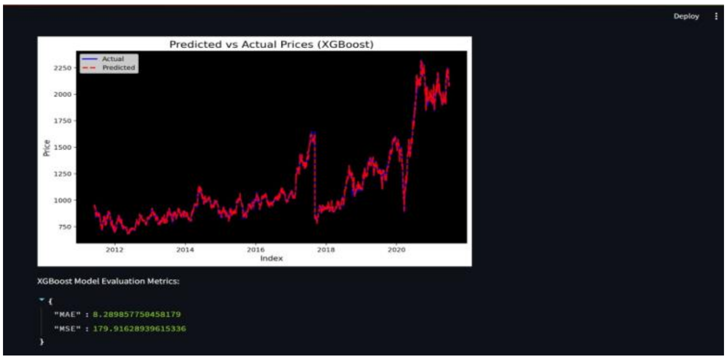

Fig: XGBoost

The graph shows predicted vs actual prices using the XGBoost model. The predicted values closely match the actual values, indicating strong performance. The model has very low error: MAE = 8.29 and MSE = 179.91. This makes XGBoost highly effective for price prediction.

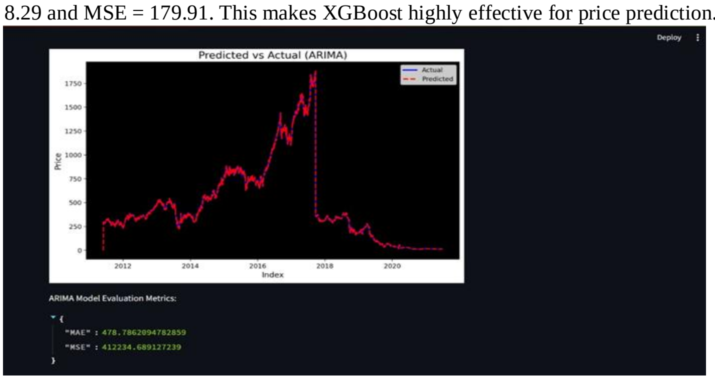

Fig: **ARIMA**

The graph shows predicted vs actual prices using the ARIMA model. The predicted values deviate significantly from the actual trend, especially after 2018. The model shows very low error: MAE = 8.78 and MSE = 412.69, indicating poor performance for this prediction task.

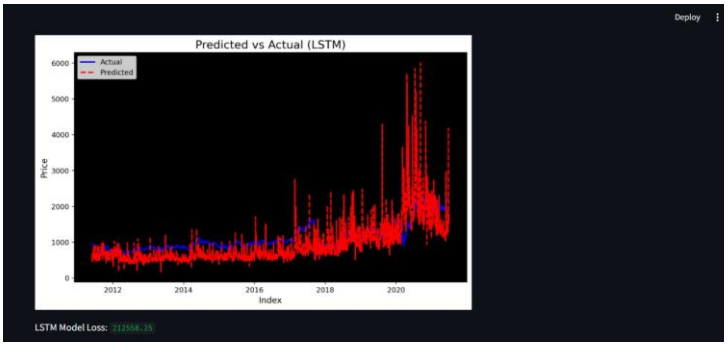

Fig: LSTM

The graph shows predicted vs actual prices using the LSTM model. The predicted values (red) show high fluctuations and deviate significantly from the actual values (blue), especially in later years. The model has a high loss of 212558.25, indicating poor prediction performance.

Component	**Technologies used**
Frontend (UI)	**Streamlit**
Data Handling	**Pandas, NumPy**
Machine Learning Model	**Scikit-learn (Random Forest)**
Deep Learning Model	**TensorFlow/Keras (LSTM)**
Visualization	**Matplotlib, Seaborn, Streamlit Charts**
Model Evaluation	***Scikit-learn (MAE, MSE)***

Table: Technolog

CONCLUSION

Predicting stock prices is much like navigating a stormy sea—turbulent, complex, and influenced by countless variables. However, with the power of Artificial Intelligence and Machine Learning, it becomes possible to identify hidden patterns beneath the chaos. This AI-powered Stock Market Price Prediction system serves as a modern compass for investors, offering direction in a data-driven world.

By leveraging diverse models such as Linear Regression, XGBoost, LSTM, ARIMA, and Random Forest, the tool explores both traditional statistical methods and advanced deep learning techniques. Each model contributes unique strengths:

Linear Regression provides simplicity and interpretability,

- XGBoost delivers high accuracy through boosting techniques,
- LSTM captures temporal dependencies and sequential trends,
- ARIMA offers time series forecasting grounded in statistical theory,
- Random Forest ensures robust, non-linear predictions through ensemble learning.

With an intuitive and user-friendly Streamlit interface, users can easily upload datasets, train models, and visualize results—all without needing deep technical expertise. Rigorous testing and evaluation of each model ensure reliable forecasts, helping users make informed investment decisions.

Looking ahead, the system has strong potential for enhancement. Integrating real-time data streaming, news and sentiment analysis, and even reinforcement learning can elevate this tool to new heights. As AI continues to evolve, this platform will empower users to not just survive, but thrive in the ever-shifting tides of the financial markets—riding the waves with clarity, confidence, and insight.

REFERENCES

1. Mohammed, S., Krishna, S. H., Mudalkar, P. K., Verma, N., Karthikeyan, P., & Yadav, A. S. (2023, January). Stock market price prediction using machine learning. In 2023 5th International Conference on Smart Systems and Inventive Technology (ICSSIT) (pp. 823-828). IEEE.
2. Vijh, M., Chandola, D., Tikkiwal, V. A., & Kumar, A. (2020). Stock closing price prediction using machine learning techniques. Procedia Computer Science, 167, 599-606.
3. Kranthi Sai Reddy, V. (2018). Stock market prediction using machine learning. International Research Journal of Engineering and Technology (IRJET), 5(10), 1032-1035.
4. Sonkavde, G., Dharrao, D. S., Bongale, A. M., Deokate, S. T., Doreswamy, D., & Bhat, S. K. (2023). Forecasting stock market prices using machine learning and deep learning models: A systematic review, performance analysis and discussion of implications. International Journal of Financial Studies, 11, 94.

5. Usmani, M., Adil, S. H., Raza, K., & Azhar Ali, S. S. (2016). Stock market prediction using machine learning techniques. In 2016 3rd International Conference On Computer And Information Sciences (ICCOINS) (pp. 1-6). IEEE.
6. Lu, W., Li, J., Wang, J., & Qin, L. (2021). A CNN-BiLSTM-AM method for stock price prediction. Neural Computing and Applications, 33(10), 4741-4753.
7. Ariyo, A. A., Adewumi, A. O., & Ayo, C. K. (2014, March). Stock price prediction using the ARIMA model. In 2014 UKSim-AMSS 16th international conference on computer modelling and simulation (pp. 106-112). IEEE.
8. Soni, P., Tewari, Y., & Krishnan, D. (2022). Machine Learning approaches in stock price prediction: A systematic review. In Journal of Physics: Conference Series (Vol. 2161, No. 1, p. 012065). IOP Publishing.
9. Schöneburg, E. (1990). Stock price prediction using neural networks: A project report. Neurocomputing, 2(1), 17-27.
10. Hu, Z., Zhao, Y., & Khushi, M. (2021). A survey of forex and stock price prediction using deep learning. Applied System Innovation, 4(1), 9.
11. Leung, C. K. S., MacKinnon, R. K., & Wang, Y. (2014, July). A machine learning approach for stock price prediction. In Proceedings of the 18th international database engineering & applications symposium (pp. 274-277).
12. Obthong, M., Tantisantiwong, N., Jeamwatthanachai, W., & Wills, G. (2020). A survey on machine learning for stock price prediction: Algorithms and techniques.
13. Ji, X., Wang, J., & Yan, Z. (2021). A stock price prediction method based on deep learning technology. International Journal of Crowd Science, 5(1), 55-72.
14. Khare, K., Darekar, O., Gupta, P., & Attar, V. Z. (2017, May). Short term stock price prediction using deep learning. In 2017 2nd IEEE international conference on recent trends in electronics, information & communication technology (RTEICT) (pp. 482-486). IEEE.
15. Ho, M. K., Darman, H., & Musa, S. (2021, July). Stock price prediction using ARIMA, neural network and LSTM models. In Journal of Physics: Conference Series (Vol. 1988, No. 1, p. 012041). IOP Publishing.
16. Ma, Q. (2020). Comparison of ARIMA, ANN and LSTM for stock price prediction. In E3S web of conferences (Vol. 218, p. 01026). EDP Sciences.
17. Mahadik, A., Vaghela, D., & Mhaisgawali, A. (2021, August). Stock price prediction using lstm and arima. In 2021 Second International Conference on Electronics and Sustainable Communication Systems (ICESC) (pp. 1594-1601). IEEE.
18. Kulshreshtha, S. (2020). An ARIMA-LSTM Hybrid Model for Stock Market Prediction Using Live Data. Journal of Engineering Science & Technology Review, 13(4).