STOCK PRICE PREDICTION USING AI & ML

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Abstract-
In the financial sector, forecasting stock prices is a crucial responsibility as it helps traders and investors make well-informed decisions. The intricacy and fluctuations of financial markets provide formidable obstacles. For precisely capturing complex market dynamics conventional forecasting techniques like technical analysis and econometric models are inadequate. These traditional methods frequently depend on past price trends and oversimplified statistical correlations. Artificial intelligence has grown and computing power has expanded. Now Al based prediction techniques have become more effective at forecasting stock values. This study examines the artificial intelligence role in stock prices Prediction. We provide a thorough summary of the literature in this field classifying different types of prediction models and comparative analysis of previous work done.

INTRODUCTION

Advances in stock price prediction are now highly valued by investors and expert analysts. Stock market forecasting for trend analysis is difficult because of the intrinsic noise in the environment and the high volatility in connection to market trends. The complexities of stock prices account for a variety of factors, such as changing trends and market news quarterly earnings reports. In order to help investors make wise investment decisions, stock prediction seeks to anticipate a future trend in stock prices. It is difficult to foresee the price. which makes it difficult for investors to predict stocks due to their volatile values . The issue of stock market prediction has long piqued the interest of scholars from several disciplines. In particular, a lot of work has been done to predict stock market movements using machine learning algorithms. When making stock market moves to maximize profits and minimize losses, the techniques to predict the stock's value in advance by looking at the pattern over the last few years prove to be highly beneficial. Paststock returns, according to conventional methodologies. Stock market earnings are predicted using macroeconomics and additional financial factors.
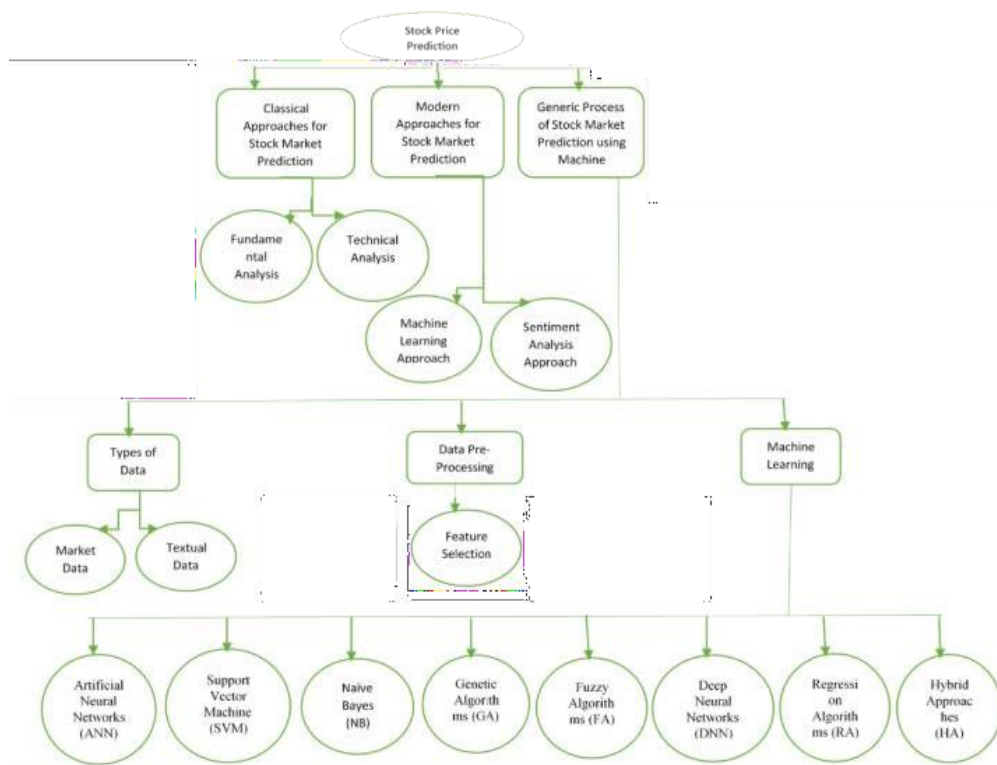

Figure 1: Overview of AI based Stock price prediction system

The Figure 1 presents an organized approach to stock market prediction. Here is a breakdown of each part of the figure: The anticipated stock market revenues prompted investors to look at the factors that contribute to predictability.. Stock trend forecasting is a challenging technique since it depends on a number of factors:

- Trader expectations
- Financial conditions
- Administrative happenings

I. RELATED WORK

Several machine learning and deep learning techniques have been investigated in recent stock price prediction research to increase the precision of financial forecasting.. Lee (2001) introduced a reinforcement learning approach to model stock price trends as a Markov process. Nikou et al. (2019) compart deep learning methods with other machine learning algorithms. Author concluded deep learning superior to handle the complexities of financial data. Mehtab et al. (2021) suggested a hybrid approach that combines LSTM networks with conventional machine learning.Using the NIFTY 50 index, the authors have shown how deep learning may be used to forecast stock price patterns.. Reddy and Sai (2018) focused on a Support Vector Machine(SVM) approach for different markets. highlighting Python-based predictions with technical and fundamental analyses. Mehtab and Sen (2020) and Sen and Chaudhuri (20|19) Both showed how well integrated statistical machine learning and deep learning models could capture stock price volatility and forecast short-term trends using detailed data from the NSE. Parmar et al. (2018) leveraged LSTM- based models to Gredict stock prices using various financial indicators and Rezaei et al. (2021) used frequency decomposition and deep learning to forecast stock prices.

Analyzing market fluctuations throughout the short and long terms. These studies underscore the effectiveness of advanced algorithms like LSTM and reinforcement learning in addressing the nonlinearity and nonstationarity inherent in stock price data. The challenges remain in selecting optimal variables and model architectures.

Table 1: Previous Research work done in domain of Stock Market Prediction

| Reference	objective	Methodology	Advantage	Disadvantage
[7] Lee, J.W. (2001)	**To develop a stock price prediction system using reinforcement learning**	**used artificial neural networks for function approximation and reinforcement learning with TD(0) for stock price trends.**	**Suitable for problems with delayed rewards and long-term goals**	**Limited to Korean stock market; requires extensive computational resources for training**
[8] Nikou, M. et al. (2019)	**To assess deep learning's predictive ability and contrast it with more conventional machine learning methods**	**utilized machine learning and deep learning models (SVR, neural network, and random forest) on daily close price data of the iShares 4/SCI UK ETF.**	**Deep learning showed higher prediction accuracy than other methods**	**Limited to a single ETF dataset; non-stationarity of financial data makes prediction challenging**
[10] Reddy, V. K. S. & Sai, K. (2018)	**To forecast stock prices with machine learning methods such as SVM**	**Applied SVM to predict prices for different market capitalizations using historical data**	**Effective for both large and small capitalization markets**	**Limited in scope with single ML model (SVM); lacks a comparison with deep learning models**
Mehtab, S. & Sen, J. (2020)	**To provide a robust framework for stock price prediction using machine learning and deep learning**	**Used time series data at five-minute intervals, aggregated for model building with ML and DL methods**	**Demonstrated accuracy in predicting stock price movements**	**Only tested on a single company's data; requires granular time series data**
[12] Sen, J. & Chaudhuri, T. D. (2018)	**To build a framework for stock price prediction with ML and DL models**	**Combined ML and DL models on high- frequency data from NSE to forecast stock prices**	**Accurate short-term forecasting by modeling price volatility**	**Limited to two stocks from the NSE; high frequency data reuirements may not be generalize**
[13] Parmar, I. et al. (2018)	**To predict future stock prices using regression and LSTM models**	**Used historical data(open, close, low, high, volume) with regression and LSTM for prediction**	**Simplified model using core price indicators; highlights LSTM's ability for time series**	**Limited features considered ; may not capture complex market sentiment factors**
[14] Rezaei, H. et al. (2021)	**To explore techniques for stock price prediction using deep learning and frequency decomposition**	**Applied deep learning and frequency decomposition on stock data**	**Provides comprehensive analysis of ML and DL techniques**	**Complex model setup; requires expertise in frequency decomposition and deep learning**

II. COMPARATIVE ANALYSIS

The comparative analysis of stock price prediction methodologies highlights the strengths and prediction limitations of traditional and advanced machine learning models. The evaluated research investigate cutting-edge machine learning techniques to improve the accuracy of stock price predictions.Lu et al(2021). introduce a CNN-BiLSTM- AM model combining feature extraction, time-series forecasting, and an attention mechanism, achieving top performance on Shanghai Composite Index data with minimal error rates. Bansal et al.(2022) compare five models, finding that LSTM outperforms other algorithms for Indian stock market data. Diqi et al. (2022) propose a GAN-based model, utilizing adversarial learning to enhance prediction accuracy especially under dynamic conditions. Agrawal et al. (2019)apply an optimized LSTM model with adaptive technical indicators, achieving 59.25% prediction accuracy and outperforming other benchmark classifiers. Finally, Diqi (2022) presents a standalone LSTM model demonstrating low error rates and robust prediction performance across volatile market conditions, showing promise for dynamic stock price prediction. Together, these studies highlight the effectiveness of hybrid and deep learning models, particularly CNN- BiLSTM-AM and GAN, improving predictive accuracy and reliability for stock price prediction.

Reference	Objective	Methodology	Result
Lu et al. (2021)	To improve accuracy in stock price prediction for investors	CNN-BiLSTM-AM model that combines an attention mechanism (AM) for weighting historical data, CNN for feature extraction, and BiLSTM for time series prediction.	Achieved accuracy with lowest MAE(21.952) and RMSE (31.694) , out performing seven other methods on the Shangai Composite Index.
Bansal et al. (2022)	To compare the predictive performance of five ML and DL algorithms for stock prices of 12 Indian companies	tested seven years' worth of data using KNN, linear regressions, support vector regression, decision tree regression, and LSTM.	Concluded that LSTM outperformed all other model in stock price predcion accuracy
Diqi et al. (2022)	To propose a robust stock price prediction model using GANs	Used Generative Advertisal Networks (GAN) with advertisal learning processes, considering features like open, close and volume prices	Achieved good accuracy for real predictions, MAE of 0.020665, and low MLRE, making it a promising approach for dynamic price prediction
Agrawal et al. (2019)	To predict stock price trends and support buy-sell decisions using optimal DL and technical indicators	Developed an O-LSTM model with adaptive stock Technical Indicators (STIs) and a Correlation-Tensor for improved prediction	Achieved a mean prediction accuracy of 59.25% surprising benchmark ML classifiers
Diqi (2022)	To enhance stock price prediction accuracy in volatile markets	utilized LSTM for feature extraction,model evaluation, and comprehensive dataset preprocessing.	Achieved good accuracy with low RMSE (EMA 10: 0.00714, EMA20: 0.00355) and MAPE (EMA 10: 0.07705, EMA20: 0.05273),indicating strong performance in dynamic conditions

Table 2: comparative analysis of previous workdone

Mo del	KN N	Decisi on Tree	Gaus sianN B	Ada Boost	Random Forest Classifier	MLP
acc ura cy	0.99 260 8	0.999 891	0.432 336	0.84 808 2	0.999891	0.95 753
MC C	0.98 777 8	0.999 82	0.305 668	0.73 584 6	0.99982	0.92 967 8
f1s	0.99 242 1	0.999 892	0.376 2	0.78 954	0.999891	0.95 797
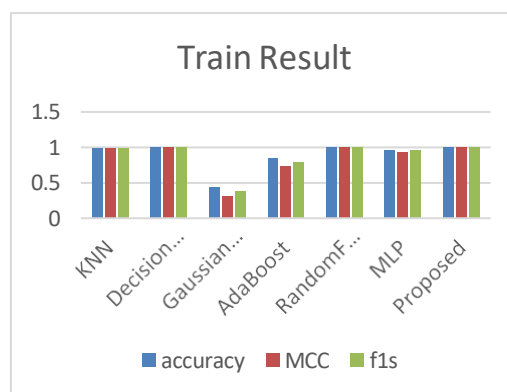
III.CONCLUSION AND FUTURE SCOPE

A review of several stock prediction methods has been provided in this study. It is reasonable to say that the current methods are ineffective for predicting stock market movements or the prices of various stocks based on the published

and accessible information. Technology and user needs for a reliable and secure stock prediction system are not aligned. Better results could be obtained if technical indicators are used as input variables along with other political and economic factors that affect the stock market. Additionally, adding domain knowledge particular to a market to the system may aid in improving performance.

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