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AI-Based Stock Market Forecasting Using Machine Learning and Deep Learning

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Abstract: *Stock market prediction is one of the most difficult problems in the field of finance since stocks are volatile and affected by many economic, political, and social factors. Conventional methods used for forecasting purposes have limitations to capture complex patterns in the data. Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) approaches improve forecasting accuracy by learning underlying patterns present in historical stock data.In this study, we review and implement AI-based stock market forecasting techniques with SVM, ANN, and LSTM algorithms. Historical stock market data of TCS company was obtained using Yahoo Finance website. Data preprocessing and normalization processes were performed on data before feeding it to the training process. MSE metrics were used to evaluate the models.Results showed that ANN model obtained the minimum prediction error compared to other models in our experiments. Therefore, it can be concluded that ANN outperformed other implemented models in forecasting stock market predictions.*

Keywords: Artificial Intelligence (AI), Machine Learning (ML),Deep Learning (DL), Stock Market Prediction, Support Vector Machine (SVM), Mean Squared Error (MSE),Efficient Market Hypothesis (EMH)

I. INTRODUCTION

The prediction of stock market prices poses a challenge owing to the dynamicity and unpredictability of financial markets. The conventional approach based on statistical models and Economic theories like EMH indicates that stock market prices are hard to predict accurately. However, with recent developments in Artificial Intelligence and increase in computing capacity, intelligent models have been developed that can find hidden patterns in stock market data.Machine Learning and Deep Learning algorithms have gained popularity in financial modeling because they can analyze vast amounts of historical data and predict stock market price movements with more accuracy. Some of the prominent models utilized for predicting stock prices include SVM, ANN, and LSTM.This project aims at implementing and comparing AI prediction models with actual stock market data. It also analyzes previous literature related to AI application in finance.

II. BACKGROUND AND MOTIVATION

The stock market is one of the essential components of the global economy. Investment firms and banks constantly search for precise predictive approaches that can help them maximize gains and minimize losses. Conventional stock prediction techniques are ineffective since they do not allow efficient data modeling of the stock market dynamics.
The advantages of Artificial Intelligence algorithms include the ability to learn from large amounts of data and find patterns based on:
•Historical stock prices
•Volume of trades
•Trend analysis
•Financial press releases
•Social media sentiments

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Modern studies indicate that AI-based predictions are more accurate compared to statistical ones. As a result, stock market prediction models powered by AI are becoming increasingly popular.

III. PROBLEM STATEMENT

Despite the numerous artificial intelligence models developed for predicting stock markets, there is variation in their prediction accuracy because of the use of different data sets, preprocessing procedures, features selection approaches, and assessment methods. Inconsistencies among previous studies make it impossible to pinpoint which AI model performs best.The present study seeks to evaluate the efficiency of three AI models (SVM, ANN, and LSTM) in predicting stock market prices using identical data sets and assessment metrics.

IV. OBJECTIVES

The primary objectives of this research include:

1. To analyze AI techniques applied in stock market forecasting.
2. To develop SVM, ANN, and LSTM models.
3. To evaluate the prediction ability of models based on Mean Squared Error (MSE).
4. To produce prediction graphs based on actual stock market data.
5. To determine the best model suitable for stock price prediction.

Table: Most Utilized Review Characteristics of Analyzed Articles
(Stock Analyses and Predictive Techniques for Each Reference)

Sr. No.	Reference	Prediction Technique	Informational Sources	Evaluation Metrics
1	Mehtab & Sen (2020)	CNN-LSTM Hybrid Model	Historical time-series stock data8	MSE, Prediction Accuracy
2	Chopra & Sharma (2021)	ANN, SVM, LSTM	Historical stock prices, financial indicators	Accuracy, RMSE, MSE
3	Mokhtar et al. (2021)	SVM, ANN, Decision Trees	Trading datasets	Accuracy, Precision
4	Sen et al. (2021)	LSTM Forecasting	NSE stock sector data	RMSE, MSE
5	Chandanshive &Ansurkar (2023)	ANN, SVM, Random Forest	Historical stock prices	Accuracy, RMSE
6	Moumita Barua et al. (2024)	LSTM, RNN, ANN	Indian stock market datasets	MAE, RMSE, MSE
7	Amalendu Bhunia (2024)	AI & ML Models	Indian stock data	Accuracy, MSE
8	Lin & Marques (2024)	ML, DL, CNN, LSTM	Financial datasets, stock records	Accuracy, Precision, Recall

The above-mentioned studies reveal the fact that Artificial Intelligence methods like ANN, SVM, CNN, and LSTM are extensively employed in stock market prediction studies. In most cases, past stock market datasets were employed by researchers while using metrics like accuracy, mean squared error (MSE), root mean squared error (RMSE), and mean absolute error (MAE) to test the effectiveness of different machine learning models.

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V. LITERATURE REVIEW

5.1 AI in Stock Market Forecasting

AI has become a critical tool in financial forecasting as researchers utilize AI techniques to understand past market trends and forecast future stock prices.In their review of AI applications in stock forecasting, Ritika Chopra and Gagan Deep Sharma (2021) established that AI techniques yield better results than conventional approaches in several situations. In their study of prediction of NIFTY 50 using CNN and LSTM models, Mehtab and Sen (2020) found that the AI techniques performed very well. Sen et al. (2021) also showed that LSTM models are capable of predicting stock prices in different sectors of the National Stock Exchange (NSE). Chandanshive and Ansurkar (2023) compared ANN, SVM, and random forest models, concluding that ANN is the most efficient technique for NIFTY 50 prediction.

VI. THEORETICAL FUNDAMENTALS

6.1 Machine Learning

Machine Learning helps computers learn patterns in data without being programmed. In stock prediction, ML systems learn patterns between past and future prices.

6.2 Deep Learning

Deep Learning is a subset of machine learning that uses multi-layered neural networks to learn complex patterns.

6.3 Support Vector Machine (SVM)

SVM is a supervised learning technique employed for regression and classification problems. SVM finds the best possible boundaries and patterns in the dataset.

6.4 Artificial Neural Network (ANN)

ANN is a computational model inspired by the human brain, which comprises interconnected nodes called neurons. ANN works on non-linear patterns and performs well in financial predictions.

6.5 Long Short-Term Memory (LSTM)

Long Short-Term Memory is a special type of RNN used for learning sequences and time series data. It remembers long-term dependencies and is very good at predicting stock prices.

VII. METHODOLOGY

7.1 Dataset Collection

Historical data from the stock market of Tata Consultancy Services (TCS) was collected by using **Yahoo Finance via the Python yfinance package.**

Dataset Attributes

Attributes	Value
Stock	TCS.NS
Source	Yahoo Finance
Start Date	2020-01-01
End Date	2024-01-01
Feature Used	Closing Price

7.2 Data Preprocessing

The following preprocessing operations have been carried out on the dataset:

1.Closing prices were extracted from stock data.
2.The irrelevant columns were removed.
3.Normalization of data was performed using the MinMaxScaler method.
4.Sequential data was created for a time-step of 10.
5.Training and testing data were separated.

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7.3 AI Models Used

7.3.1 Support Vector Machine (SVM)

The SVM was used with the RBF kernel.

7.3.2 Artificial Neural Network (ANN)

The ANN Model had:

•Input layer
•Hidden layers with ReLU activation function
•Output layer

The model was trained using the Adam optimizer and Mean Squared Error loss function.

7.3.3 Long Short-Term Memory (LSTM)

The LSTM model utilizes a sequential neural network architecture with:

•Two LSTM layers
•Dense output layer
•Adam optimizer
•Mean Squared Error loss function

7.4 Evaluation Metric

The models were assessed based on Mean Squared Error (MSE).

$$MSE = \frac{1}{n}\sum_{i=1}^{n}(y_i - \hat{y}_i)^2$$

Where:

•y = Actual stock price
•ŷ = Predicted stock price
•n = Number of total observations

Lower MSE values indicate better predictive ability.

VIII. SYSTEM ARCHITECTURE

Proposed System Workflow

1. Obtain stock market data from Yahoo Finance
2. Perform data preprocessing and normalization
3. Formulate the training and test sets
4. Train the SVM model
5. Train the ANN model
6. Train the LSTM model
7. Compare the models' prediction accuracies using MSE
8. Generate a stock prediction graph

IX. EXPERIMENTAL SETUP

Software Requirements

Software	Purpose
Python	Programming Language
VS Code	Programming Environment
TensorFlow	Deep Learning Platform
Scikit-learn	Machine Learning Platform

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Matplotlib	Visualization
Yfinance	Collect Stock Information

Hardware Requirements

Components	**Specifications**
CPU	Intel/AMD CPU
Memory	8 GB or Above
Hard Disk	20 GB Free Disk Space
OS	Windows 10/11

X. EXPERIMENTAL RESULTS

The AI models were trained and tested using TCS stock market data.

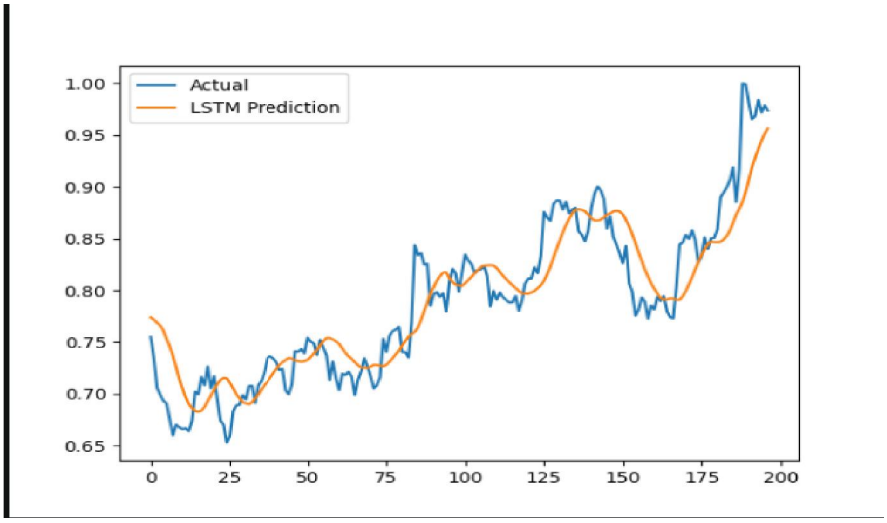

Figure 1: Stock Price Prediction Graph using LSTM

Mean Squared Error (MSE) Results

Model	MSE Value
SVM	0.001427
ANN	0.000490
LSTM	0.001117

Result Analysis

The obtained experimental results show that ANN yielded the lowest value of MSE, implying superior prediction performance when compared to SVM and LSTM on the chosen dataset.

Performance Rank

1. ANN – Top Performance
2. LSTM – Average Performance
3. SVM – Good Performance

The produced prediction chart indicates that the utilized AI models effectively learned the patterns of stock prices from the historical data.

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XI. BENEFITS OF APPLYING AI FOR STOCK PREDICTION

- Capacity to analyze complex and nonlinear data
- Fosters accurate prediction
- Efficient processing of large data sets
- Enables automated trading system implementation
- Supports investment decision making

XII. CHALLENGES AND LIMITATIONS

Although there have been advancements in predicting with AI, the following difficulties are faced:

- Fluctuations in the market make predictions less accurate
- Overfitting may occur during training
- Deep learning algorithms need more computing capacity
- Interpreting AI models is challenging
- Random events and news affect share prices

XIII. FUTURE SCOPE

For future research, the following can enhance stock market predictions:

- Employing real-time predictive systems
- Analyzing sentiments from social media and news sources
- Creating hybrid artificial intelligence models
- Employing financial language transformers
- Testing on other stock markets

XIV. CONCLUSION

In this paper, it is proved that artificial intelligence is essential for forecasting in the stock market. AI methods like SVM, ANN, and LSTM can learn market trends and improve forecast accuracy.Of all models used in this paper, ANN gave the best results because it had the lowest MSE value. Moreover, this paper shows that AI forecasting models can help investors and financial organizations make decisions based on data.

Despite the improved accuracy of forecasting with AI tools, there is no perfect model that can forecast the stock market. Therefore, future studies need to develop more hybrid models and other systems.

REFERENCES

[1]. Ritika Chopra, Gagan Deep Sharma (2021). "Application of Artificial Intelligence in Stock Market Forecasting: A Critique, Review, and Research Agenda". Journal of Risk and Financial Management.
[2]. Chin Yang Lin, João Alexandre Lobo Marques (2024). "Stock Market Prediction Using Artificial Intelligence: A Systematic Review of Systematic Reviews". Social Sciences & Humanities Open.
[3]. Mehtab and Sen (2020). "CNN anLSTM-Baseded Stock Market Prediction Models".
[4]. Sen et al. (2021). "LSTM-based Forecasting for National Stock Exchange Sectors".
[5]. Chandanshive and Ansurkar (2023). "Comparative Analysis of ANN, SVM, and Random Forest for Stock Prediction".
[6]. Moumita Barua et al. (2024). "Comparative Analysis of Deep Learning Models for Stock Price Prediction in the Indian Market".
[7]. Amalendu Bhunia (2024). "Impact of Artificial Intelligence on Stock Price Prediction in India".
[8]. Sohrab Mokhtar, Kang K. Yen, Jin Liu (2021). "Effectiveness of Artificial Intelligence in Stock Market Prediction Based on Machine Learning".