Stock Market Price Forecasting Using Time-Series ML

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Abstract

Stock market prediction is a challenging task influenced by economic conditions, investor behavior, and global events. Accurate short-term forecasting can assist investors in decision-making and risk management. This study presents a machine learning–based framework for next-day stock price prediction using historical time-series data. Daily trading data from five major Indian companies—TCS, Reliance Industries, HDFC Bank, Infosys, and ICICI Bank—were analyzed to identify price trends and predictive patterns. Multiple regression models, including Linear Regression, Random Forest Regressor, XGBoost, and Support Vector Regressor (SVR), were evaluated using standard performance metrics such as Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and the coefficient of determination (R^2). Experimental results indicate that Linear Regression consistently achieved the highest predictive accuracy across all datasets, with an R^2 value close to 0.999, outperforming more complex models. The trained model was deployed using a Flask-based web application that allows users to input daily stock parameters and receive real-time next-day price predictions along with trend indicators. The results demonstrate that well-engineered, lightweight machine learning models can provide effective and computationally efficient solutions for short-term stock price forecasting.

Keywords

Stock Market Prediction, Machine Learning, Linear Regression, Time-Series Analysis, Flask, Financial Forecasting

I. Introduction

Stock markets play a vital role in economic growth and financial stability by enabling capital formation and investment. However, predicting stock prices remains a complex problem due to market volatility and the influence of diverse factors such as macroeconomic conditions, political events, and investor sentiment [1]. The inherently dynamic and partially stochastic nature of financial markets makes accurate forecasting particularly challenging.

Traditional statistical models, including autoregressive techniques such as ARIMA, rely on strong assumptions about linearity and stationarity and often require manual parameter tuning. These methods frequently fail to adapt to rapidly changing market conditions, especially during periods of high volatility. With the increasing availability of historical financial data, Machine Learning (ML) techniques have emerged as a promising alternative for stock price prediction due to their ability to learn patterns directly from data [3].

This work focuses on predicting next-day stock prices for selected major Indian companies using supervised machine learning regression models. Multiple algorithms are evaluated to determine their suitability for short-term forecasting. The primary objective is not only to identify the most accurate predictive model but also to deploy the selected model in a user-friendly web application, enabling practical accessibility for non-expert users. Experimental evaluation shows that Linear Regression performs exceptionally well for the given problem formulation, achieving high accuracy while maintaining simplicity and computational efficiency.

II. Related Work

Financial market prediction has been extensively studied using both statistical and machine learning approaches. Sharma et al. [1] proposed a hybrid ARIMA–XGBoost model to combine linear and nonlinear forecasting capabilities, demonstrating improved robustness in

volatile markets. Deep learning techniques have also gained attention, with Zhang et al. [2] employing Long Short-Term Memory (LSTM) networks to capture temporal dependencies in financial time-series data.

Hybrid neural architectures such as CNN–LSTM models have been explored to extract spatial and temporal features from price sequences [9]. Although these models often achieve strong predictive performance, they require large datasets and significant computational resources. In contrast, Patel et al. [3] showed that for short-term forecasting tasks with structured daily trading features, simpler models such as Linear Regression can outperform complex ensemble methods due to reduced variance and improved interpretability.

Explainable AI techniques have also been introduced to enhance transparency in financial prediction systems. Gupta and Reddy [4] applied SHAP analysis to interpret XGBoost predictions, improving user trust. Additionally, several studies highlight the importance of integrating ML models with web-based systems for real-time financial decision support [5].

Building upon these studies, the present work emphasizes computational efficiency, interpretability, and real-world usability by validating regression-based models and deploying the best-performing approach in a lightweight web environment.

III. Proposed Methodology

The proposed framework consists of four main stages: data acquisition, preprocessing, model training, and deployment.

### A. Data Acquisition and Preprocessing

Historical daily stock data for TCS, Reliance Industries, HDFC Bank, Infosys, and ICICI Bank were collected from publicly available financial sources such as Yahoo Finance and NSE archives. Each dataset includes the following attributes: Open, High, Low, Close, and Volume.

Data preprocessing involved:

- Data Cleaning: Handling missing values and removing anomalous price spikes

- Feature Scaling: Normalizing numerical features to ensure uniform value ranges

- Feature Engineering: Computing derived features such as moving averages and day-to-day percentage changes to capture short-term trends

Fig. 1. End-to-end workflow of the stock price forecasting framework.
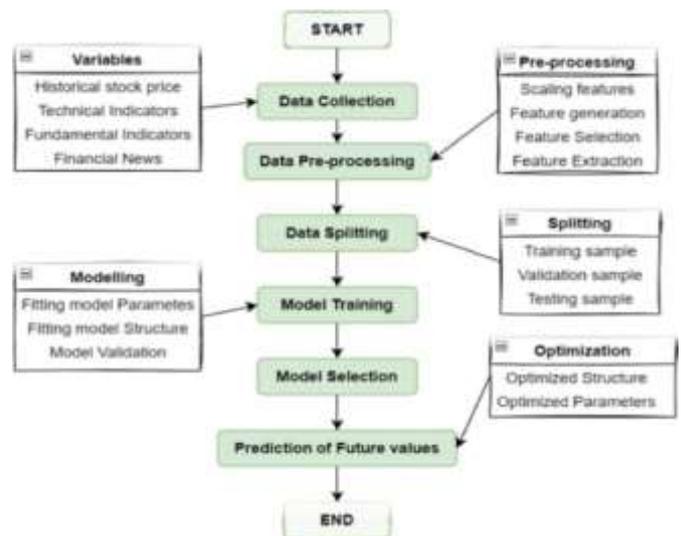

B. Model Selection

The following regression models were evaluated:

- Linear Regression: Models linear relationships between dependent and independentvariables

- Random Forest Regressor: An ensemble-based approach capable of modeling non-linear patterns

- XGBoost: A gradient boosting framework optimized for predictive performance

- Support Vector Regressor (SVR): A kernel-based method effective in high-dimensional spaces

C. Model Deployment

The best-performing model was serialized and integrated into a Flask-based web application. Users provide daily trading inputs, and the system outputs the predicted next-day closing price along with a categorical trend indicator (Rise, Fall, or Stable).

Fig. 2. Flask-based deployment architecture for real-time stock prediction.
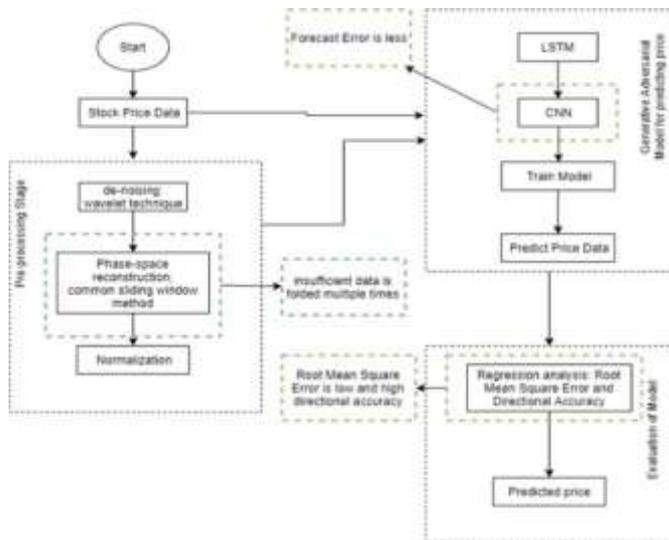
IV. Experimental Results

A. Evaluation Metrics

Model performance was assessed using:

- Mean Absolute Error (MAE)

- Root Mean Squared Error (RMSE)

- Coefficient of Determination (R^2)

B. Performance Comparison

Model	R^2 Score	Accuracy
Linear Regression	~0.999	~99.9%
Random Forest	0.985	98.5%
XGBoost	0.982	98.2%
SVR	0.940	94.0%

Linear Regression consistently outperformed the other models across all datasets. This behavior can be attributed to the strong correlation between daily trading features (Open, High, Low, Close) and the next-day closing price, making linear relationships highly informative for short-term forecasting
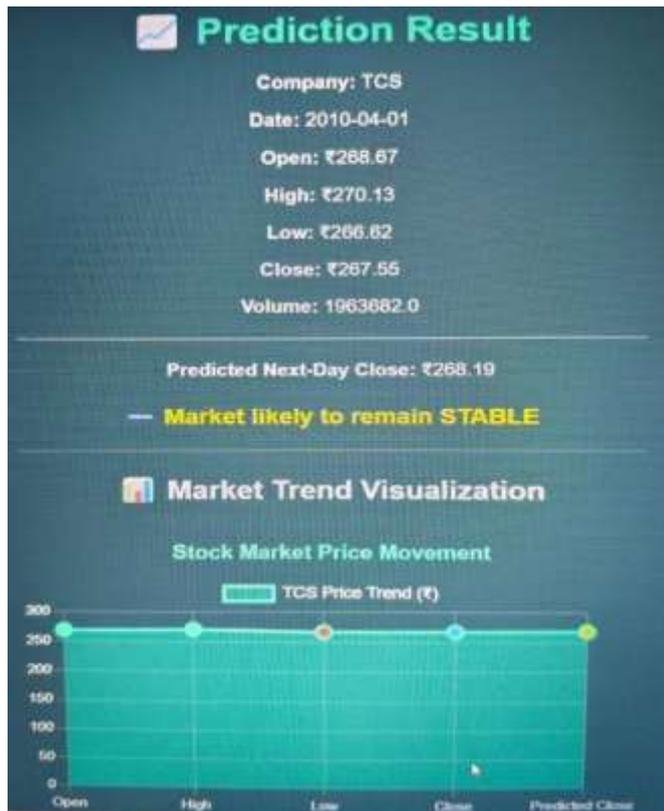
Fig1:

C. Discussion

Although deep learning models such as LSTMs are well-suited for long-term time-series forecasting, the experimental results indicate that for next-day prediction with rich daily features, simpler regression models can achieve superior accuracy while avoiding overfitting and excessive computational overhead.

Fig2:

V. Conclusion and Future Work

This study presented a machine learning–based framework for next-day stock price prediction using historical data from major Indian companies. Among the evaluated models, Linear Regression achieved the highest predictive accuracy while maintaining interpretability and computational efficiency. The deployment of the model in a Flask web application demonstrates its practical applicability for real-time financial forecasting.

Future work will focus on extending the framework to longer forecasting horizons, integrating real-time market data APIs, incorporating sentiment analysis from financial news, and developing portfolio-level risk assessment and optimization tools.

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