



## Prediction Stock Movement by using Gradient Boosting

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**ABSTRACT:** This project presents a comprehensive study on the predictive analytics of Tesla and Google stock prices using advanced machine learning frameworks. Financial markets are highly dynamic and influenced by numerous factors, including historical performance, market sentiment, and external economic indicators. To address the complexity of stock price forecasting, this work utilizes data-driven modeling approaches capable of identifying hidden patterns and temporal trends within large volumes of historical data. The system collects and processes stock market data, followed by extensive preprocessing to ensure accuracy and consistency. Key financial indicators are extracted to enhance the quality of predictions. These features are then used to train robust machine learning models that learn from past behavior to provide future stock value estimates. A web-based interface, built using the Django framework, facilitates user interaction with the predictive system. Users can input parameters, view historical data, compare trends, and visualize predicted values through interactive graphs and charts. This interface bridges the gap between complex data science and practical financial analysis, making the system accessible to users with varying levels of technical expertise.

**KEYWORDS:** Stock Price Prediction, Financial Forecasting, Tesla, Google, Machine Learning, Predictive Modeling, Data Analytics, Django Web Application.

### I. INTRODUCTION

Market prediction has emerged as a significant area of research in financial analytics due to the rapid expansion of digital trading platforms and the widespread availability of historical market data. The behavior of stock prices is highly complex, as it is influenced by multiple interrelated factors such as past price trends, company financial performance, global economic conditions, geopolitical events, and investor sentiment. These factors introduce a high level of uncertainty and nonlinearity, making accurate forecasting a challenging task. Traditional statistical approaches often fail to effectively model such dynamic and nonlinear patterns in financial data. However, with the evolution of machine learning techniques, it has become possible to process large datasets and uncover hidden relationships that were previously difficult to detect. Machine learning models can adapt to changing patterns and improve prediction accuracy by learning from historical data, making them highly suitable for stock market analysis. Stock market prediction is challenging due to complex, dynamic, and nonlinear factors like economic conditions, trends, and investor behavior. Machine learning helps overcome these challenges by analyzing large datasets and learning patterns to improve prediction accuracy. Stock market prediction is difficult due to complex and unpredictable influencing factors. Machine learning models improve accuracy by learning patterns from historical data.

### II. LITERATURE SURVEY

This study highlights the significant impact of news events on stock price movements. Traditional approaches for stock prediction mainly rely on shallow textual features such as bag-of-words, named entities, and noun phrases. However, these methods fail to capture deeper semantic relationships and structured event information, limiting their predictive performance. To address this limitation, the authors introduced the concept of structured event extraction using Open Information Extraction (Open IE) techniques. This approach enables the automatic extraction of meaningful event representations from large-scale public news data without requiring manual intervention.[1]



Time series forecasting has been extensively studied using both statistical and machine learning approaches. Traditional models such as AutoRegressive Moving Average (ARMA) and AutoRegressive Integrated Moving Average (ARIMA) have been widely used due to their strong theoretical foundation. However, these models assume linear relationships and often fail to capture complex nonlinear patterns present in financial time series data. With the advancement of machine learning, various models have been introduced to improve prediction accuracy. Techniques such as Support Vector Machines (SVM), Random Forests, and Gradient Boosting Machines (GBM) have shown better performance compared to traditional statistical methods. [2]. The study titled “Evaluation of Development of Apple Inc. Stock Price Time Series” by Jakub Horák and Dominik Kaisler (2022) focuses on analyzing stock price movements using time series techniques. The primary objective of the research is to evaluate the historical performance of Apple Inc.’s stock prices through detailed time series analysis.

The authors utilized daily stock price data spanning from 2000 to 2020, including critical economic periods such as the global financial crisis (2007–2009) and the COVID-19 pandemic (2020). By incorporating these periods, the study provides a comprehensive understanding of how external economic shocks influence stock price behavior.[3].

Financial technology (FinTech) has gained significant attention among investors and organizations due to its potential to enhance decision-making in stock markets. Traditional stock analysis primarily focuses on price prediction, with limited emphasis on identifying profitable stock recommendations. Moreover, existing time-series approaches often overlook the complex relationships among stocks and sectors, or rely on predefined connections that fail to capture dynamic interactions..[4].

This study examines the long-term development of stock prices of Apple Inc. using time series analysis. The research focuses on daily stock price data from 2000 to 2020, including key periods such as the global financial crisis (2007–2009) and the COVID-19 pandemic (2020). The objective is to identify trends, growth patterns, and external factors influencing stock price movements..[5]

### III. RESEARCH METHODOLOGY

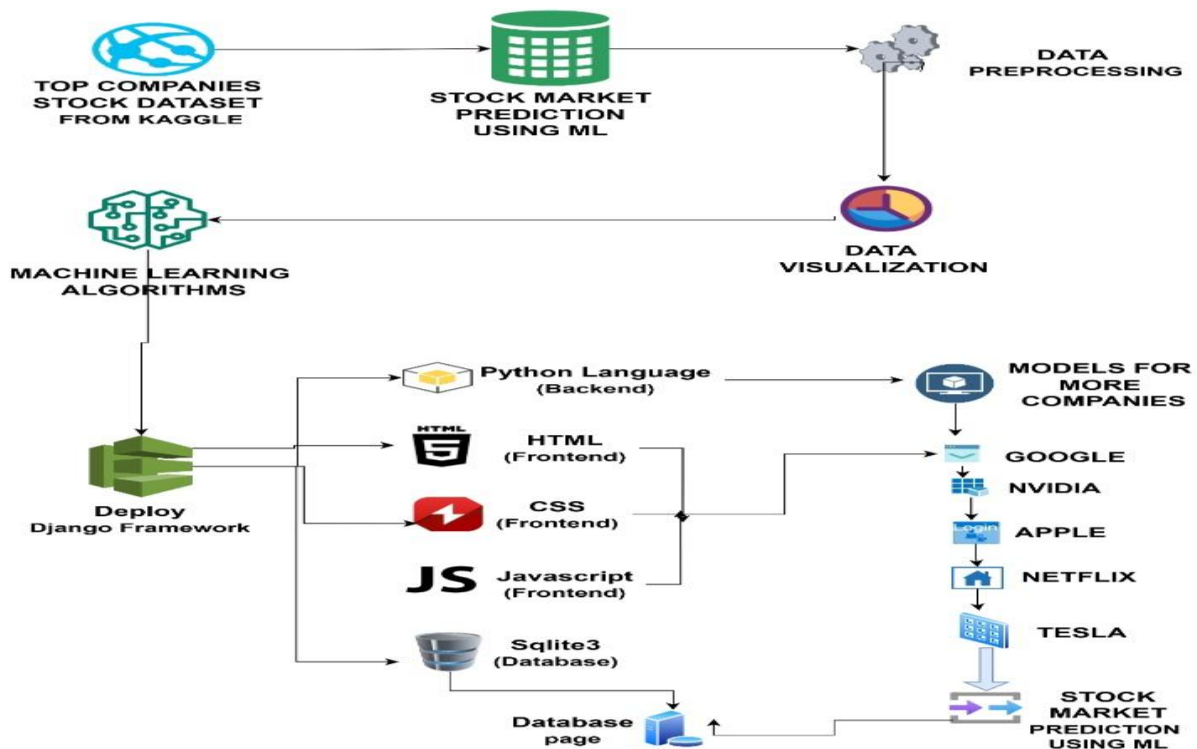


Fig.1 System Architecture for Prediction Stock Movement



This fig.1 shows The proposed system focuses on predicting stock market movement using the Gradient Boosting technique. Initially, historical stock data such as open price, close price, high, low, and trading volume are collected from reliable financial data sources like Yahoo Finance or Alpha Vantage. The collected dataset is then preprocessed to handle missing values, remove inconsistencies, and convert date-related information into meaningful features. The diagram illustrates the complete methodology for predicting stock market movement using the Gradient Boosting technique. Initially, historical stock data is collected from reliable sources such as Yahoo Finance and Alpha Vantage, which includes attributes like open, close, high, low prices, trading volume, and date.

## MODULES

- 1.Data pre-processing
- 2.Data Analysis & Visualization
- 3.Random Forest Regression
- 4.Deployment

### 1. Data pre-processing

- Data pre-processing involves cleaning, organizing, and transforming raw data into a usable format for machine learning models.
- Detects and extracts facial features, then compares them with stored face data in the database.
- Proper pre-processing ensures better accuracy, consistency, and efficiency in model training by reducing noise and improving data quality.

### 2. Data pre-processing

- This module focuses on exploring and understanding data using statistical methods and visual tools like graphs, charts, and plots.
- It helps identify patterns, trends, correlations, and anomalies in the data set. Visualization makes complex data easier to interpret, supporting informed decision-making and improving the overall performance of predictive models.
- Allow attendance marking only if the student is within the authorized location boundary.

### 3. Random Forest Regression

- The Decision Tree Algorithm is a supervised learning technique that splits data into smaller subsets based on feature conditions.
- It can be used for both classification and regression tasks but may be overfit if not properly controlled.

### 4. Deployment

- Deployment is the process of integrating a trained machine learning model into a real-world application, such as a web platform.
- It allows users to input data and receive predictions in real time.
- This step ensures the model is accessible, scalable, and usable in practical environments.

## IV. ALGORITHM

### Step 1: Start

**Step 2:** Import stock data from sources like Yahoo Finance or Alpha Vantage

Store the dataset in a structured format (CSV/Data Frame)

**Step 3:** Check for missing values

Fill or remove missing values

Fill or remove missing values

Remove duplicate records

Normalize/scale numerical data (if required)

**Step 4:** Calculate Moving Average (MA)

Compute Exponential Moving Average (EMA)

Calculate Relative Strength Index (RSI)

Create lag features (previous day prices)

**Step 5:** If classification:

- Set target = 1 (price goes UP)

- Set target = 0 (price goes DOWN)



If regression:

- Set target = next day closing price

**Step 6:** Select Gradient Boosting model

Use libraries like:

- XGBoost
- LightGBM
- Scikit-learn

**Step 7:** Train model using training data

Set hyperparameters:

- Learning rate
- Number of estimators (trees)
- Maximum depth

**Step 8:** Apply trained model on test data Generate predictions (Up/Down or price value)

**Step 9:** For classification:

- Calculate Accuracy
- Generate Confusion Matrix

For regression:

- Calculate Mean Squared Error (MSE)
- Calculate R<sup>2</sup> Score

**Step 10:** Plot Actual vs Predicted values Analyses trends using graphs

**Step 11:** Display predicted stock movement Store results for analysis

**Step 12:** End

## V. RESULTS

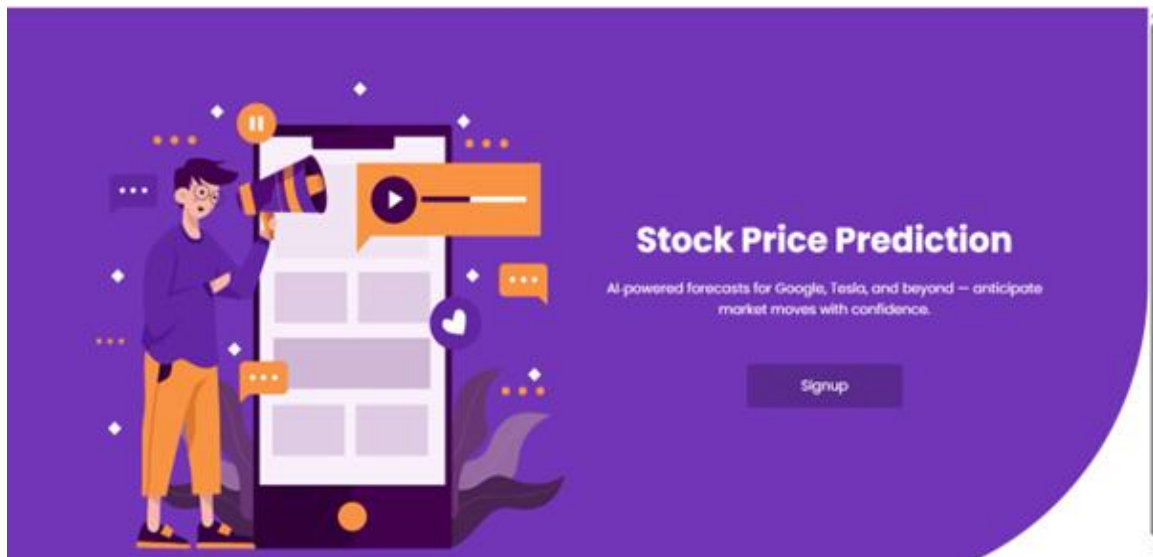


Fig 2 Landing Page

This Fig.2 shows is the main landing page of the stock price prediction system with a modern UI design.It introduces AI-powered forecasting and provides a signup option for new users.

A user registration form titled "Create account". It contains four input fields: "Username" with the placeholder "your username", "Email" with the placeholder "you@example.com", "Password" with a masked field of seven asterisks, and "Confirm password" with a masked field of seven asterisks. Below the fields is a blue "Sign up" button. At the bottom, there is a link that says "Already have an account? Log in".

Fig.3 User Login

This Fig.3 shows page allows users to register by entering username, email, and password details.It ensures secure access to the system with a simple and clean form interface.

A form titled "Tesla Stock Predictor". It features a blue "Home" button at the top left. Below it are four input fields: "Open price" with the value "3500" and a dollar sign icon, "High price" with the value "15000" and a line graph icon, "Low price" with the value "4000" and a line graph icon, and "Volume" with the value "12" and a bar chart icon. At the bottom, there is a blue button labeled "Predict Price" with a right-pointing arrow.

Fig.4 User Input

This Fig.4 shows Users input stock parameters like open, high, low prices, and volume for Tesla.The system processes these inputs to predict the closing stock price.

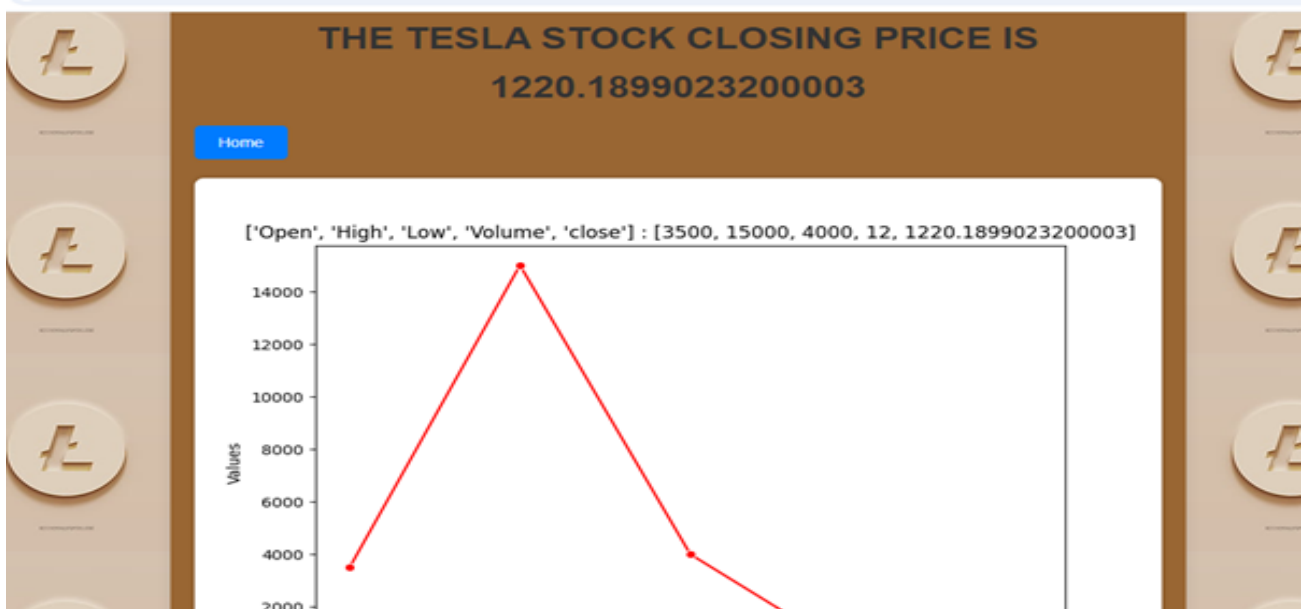


Fig .5 Prediction Output

This Fig.5 shows page displays the predicted Tesla stock closing price clearly at the top. It also shows a graphical representation of input values and prediction output.

The screenshot shows a web form titled "Google Stock Predictor". At the top, there is a blue "Home" button. Below it, the form contains four input fields, each with a label above it: "Open price", "High price", "Low price", and "Volume". The input fields are empty and have rounded rectangular borders. The form is set against a light blue background.

Fig.6 Google Predictor

This Fig.6 shows Similar to Tesla, this page allows users to enter stock details for Google. It enables prediction of Google's stock closing price using the same model.



Fig.7 Prediction Output

This Fig.7 shows prediction output displays the estimated closing stock price based on the input values provided by the user. It helps users understand market trends by presenting the result along with a visual graph for better analysis.

## VI. CONCLUSION & FUTURE ENHANCEMENT

In conclusion, our predictive modeling approach for network threat detection leverages advanced artificial intelligence techniques to enhance security measures. The integration of AI allows for real time analysis and swift identification of potential threats, significantly reducing response time. This system not only improves accuracy in threat detection but also adapts continuously to evolving cyber threats. Ultimately, it offers a robust solution for maintaining network integrity and safeguarding sensitive information.

Future enhancements of the stock price prediction system can significantly improve its accuracy, efficiency, and real-world applicability. Advanced deep learning models such as Long Short-Term Memory (LSTM) can be implemented to effectively capture long-term dependencies in time-series data, leading to more precise predictions. The integration of real-time data through APIs will enable the system to provide live market insights, making it more useful for traders and investors. Additionally, incorporating sentiment analysis from financial news and social media platforms can help the model understand market trends influenced by public opinion. A hybrid approach that combines machine learning and deep learning techniques can further enhance performance by leveraging the strengths of multiple algorithms. Moreover, optimizing hyperparameters using techniques like grid search or random search can improve model efficiency and accuracy, ensuring better prediction outcomes.

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