



Vivekanand Education Society's Institute of Technology

(Autonomous Institute Affiliated to University of Mumbai, Approved by AICTE & Recognised by Govt. of Maharashtra)
NAAC accredited with 'A' grade

Semester: VI AIDS Review:1

Stock Market Analysis

Domain:

Group Members:

Member 1:Roshan Bhagtani (4)

Member 2:Muskan Chandiramani (5)

Member 3:Aditya Dubey (10)

Member 4:Kaushal Galav (11)

Mentor Name: Dr.Ravita Mishra



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Introduction to Project

- The stock market represents the heartbeat of an economy, reacting dynamically to various political, economic, and global cues.
- With increasing data availability and computational power, stock market prediction has gained significant traction in both academic research and practical applications.
- This project focuses on analyzing stock data and forecasting future trends using machine learning and deep learning models.



Problem Statement

- Traditional statistical models fall short in capturing the nonlinear patterns in stock movements.
- With the growing complexity and volatility in the markets, investors and analysts seek intelligent systems that can provide accurate and timely predictions.
- Machine learning offers the ability to learn from historical patterns and adapt to new trends, making it a suitable tool for stock market analysis.



Objectives of the project

- To collect and preprocess stock market data from reliable sources.
- To apply machine learning and statistical models for price trend forecasting.
- To evaluate model performance using appropriate metrics.
- To visualize stock movements and predictions using technical charts.



Requirements of the system

Python installed (preferably 3.8+)

Jupyter Notebook / Google Colab / VSCode with Jupyter

Required libraries:

- `yfinance` – for downloading stock data
- `pandas` – for data handling
- `numpy` – for numerical operations
- `matplotlib` – for plotting
- `scikit-learn` – for preprocessing, training, and evaluating models



Dataset Description

When you use `yfinance.download()` (like in your code), the dataset typically contains the following **columns per trading day**:

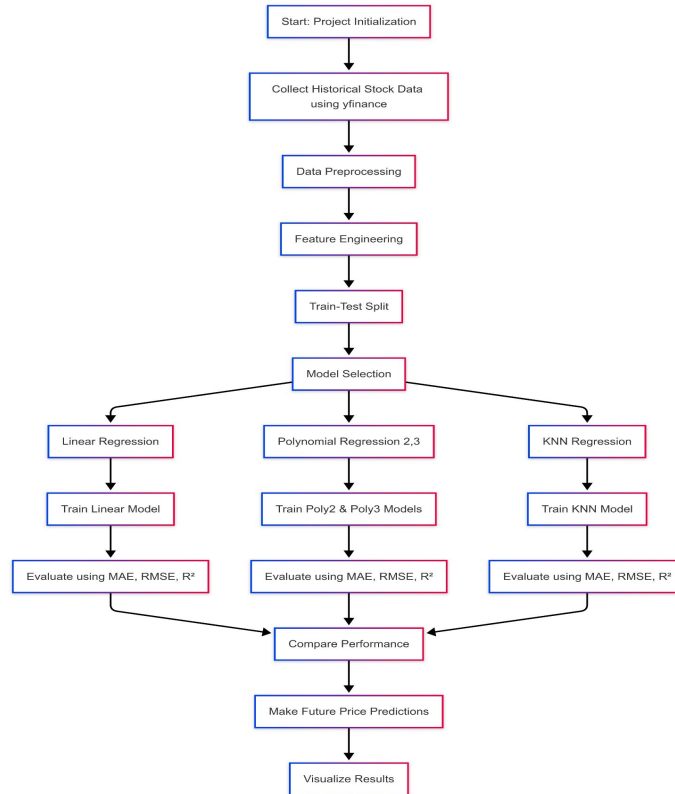
Column Name	Description
Open	Price at the beginning of the trading day
High	Highest price reached during the day
Low	Lowest price reached during the day
Close	Final price when the market closed
Adj Close	Adjusted close price (adjusts for splits/dividends) — better for modeling
Volume	Number of shares traded that day



Proposed System

- **Data Collection:** Historical data of selected stocks is collected from Yahoo Finance/Alpha Vantage.
- **Preprocessing:** Missing values are imputed and data is normalized.
- **Feature Engineering:** Creation of technical indicators like Moving Averages, RSI, Bollinger Bands.
- **Model Building:** Linear Regression
- **Model Evaluation:** Performance checked using MAE, RMSE, R^2 .
- **Visualization:** Price trends and predictions visualized using candlestick and line charts.

Implementation



Implementation

Predicted Adjusted Close for Tomorrow:

Linear Regression forecast: 196.66

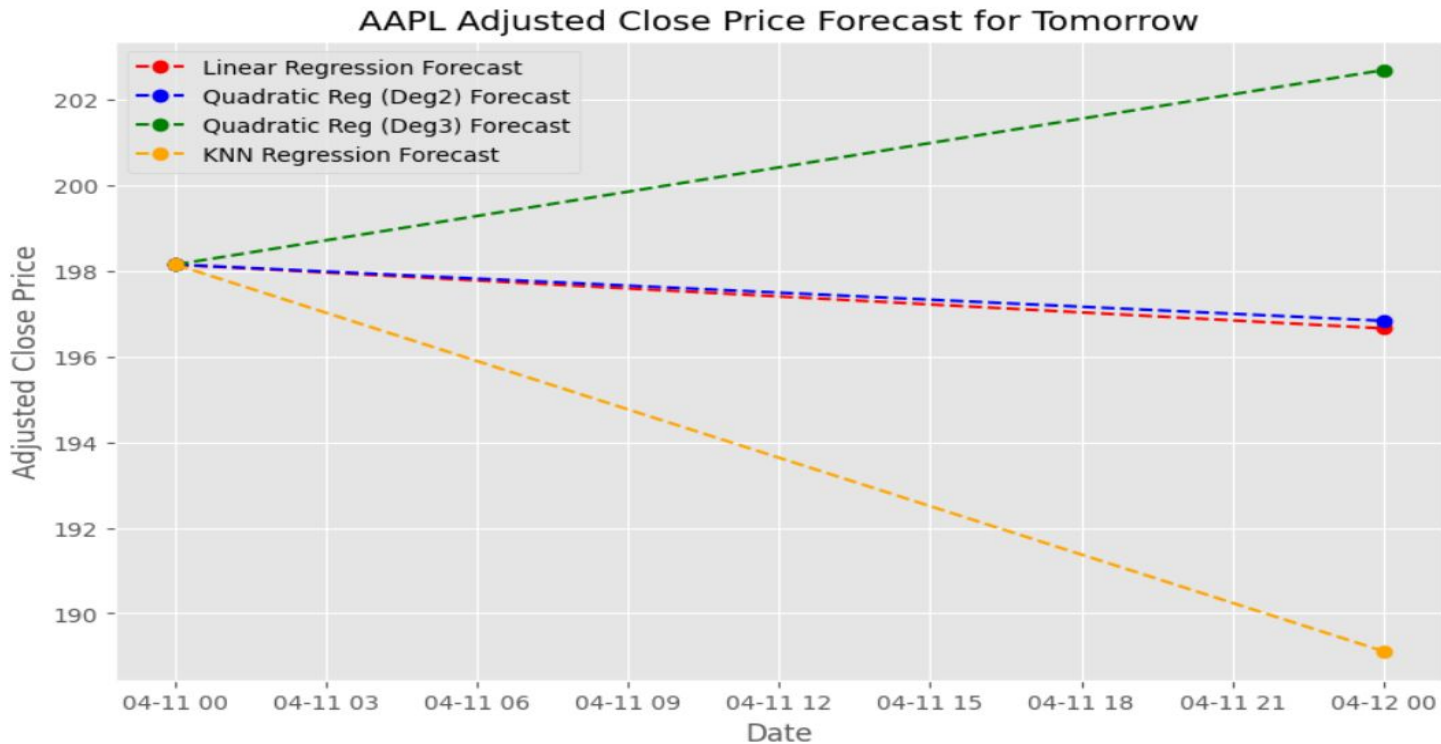
Quadratic Regression (Degree 2) forecast: 196.84

Quadratic Regression (Degree 3) forecast: 202.69

KNN Regression forecast: 189.12

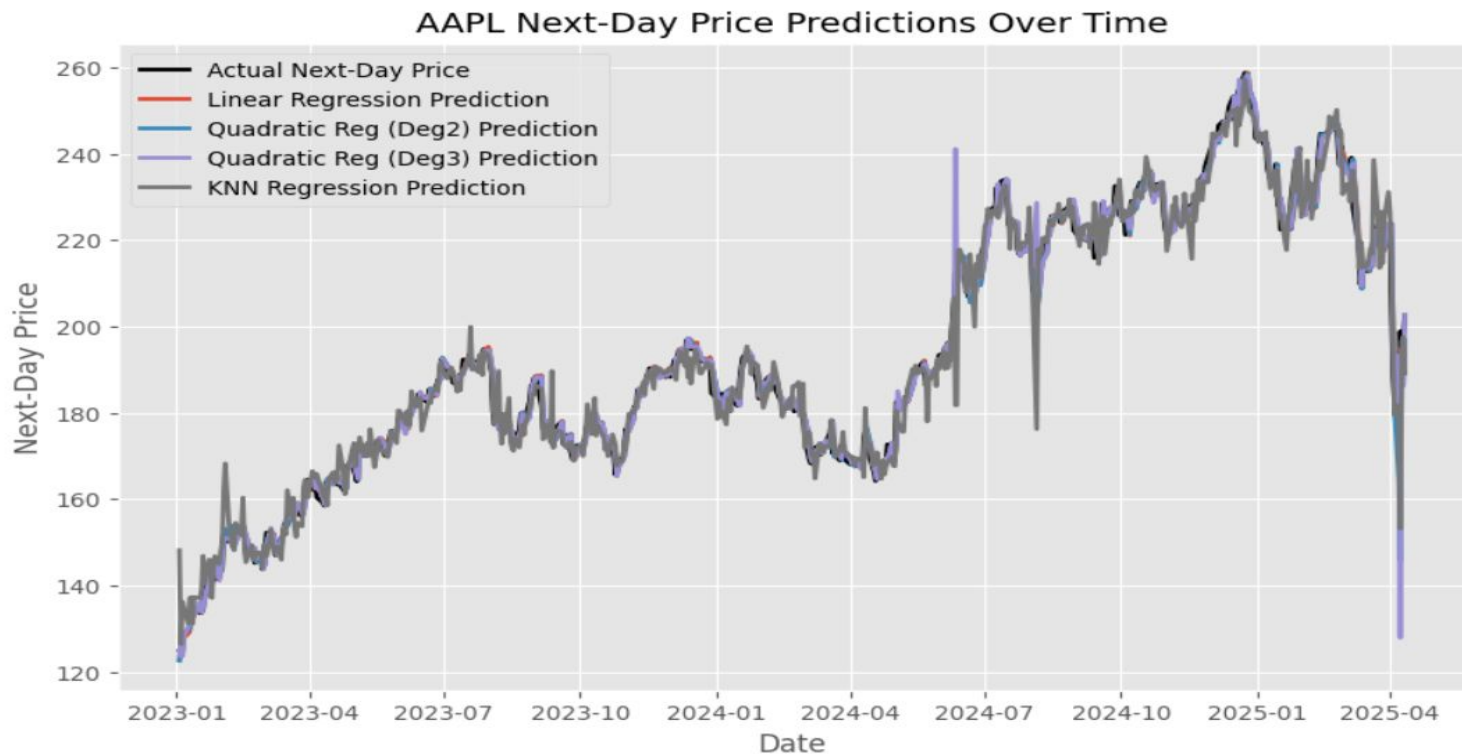


Data visualization





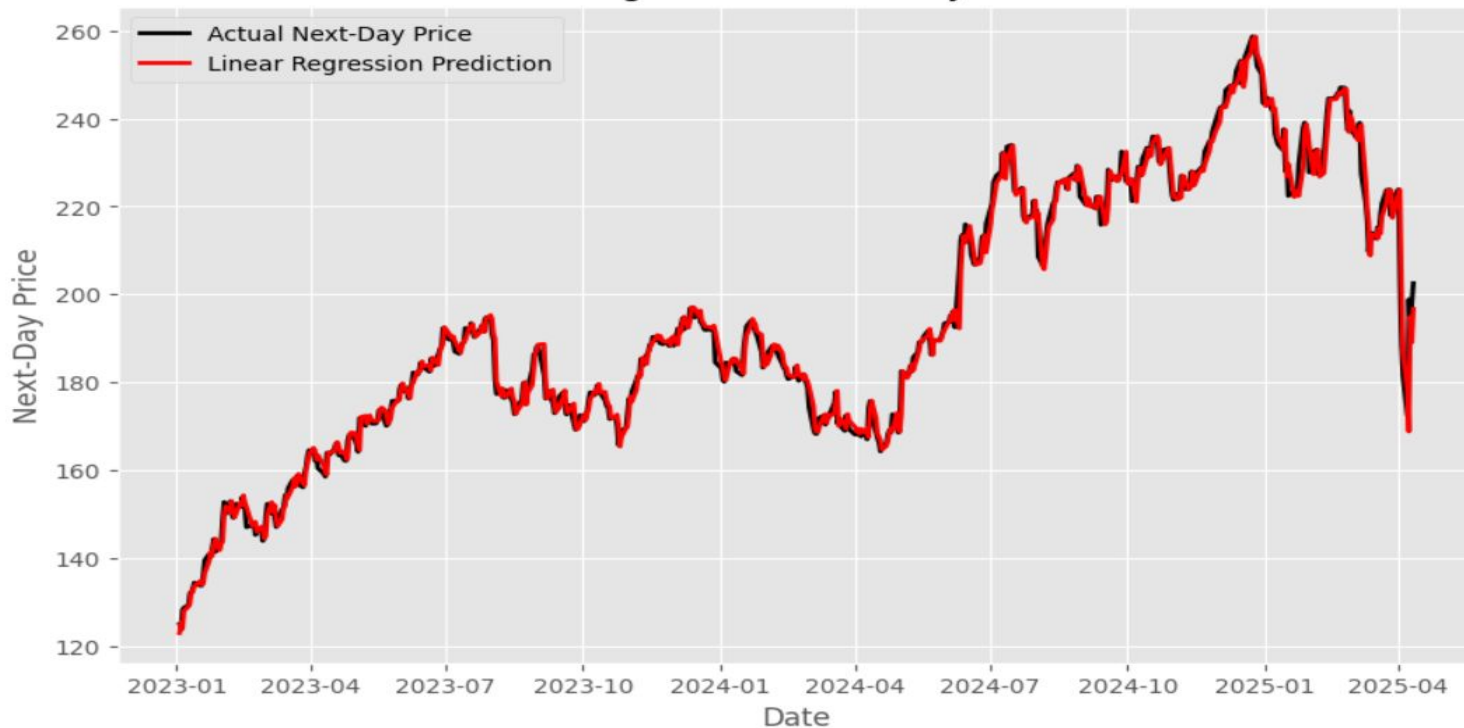
Data visualization





Data visualization

AAPL: Linear Regression - Next-Day Price Prediction





Conclusion

The project titled "**Stock Market Analysis Using Linear Regression**" successfully demonstrated the feasibility of applying machine learning techniques to forecast stock prices based on historical data. Through systematic data preprocessing, feature engineering, and careful model training, we built a Linear Regression model that could effectively predict stock trends under stable market conditions. The model's performance, measured using metrics such as Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and R^2 score, reflected its ability to track general upward or downward price movements. Visual comparison between actual and predicted prices further supported these findings.

Overall, this project not only achieved its technical goals but also provided valuable insights into the nature of financial data and the practical considerations involved in predictive modeling. It lays a strong foundation for future work in the field of algorithmic trading and financial analytics.

REFERENCES

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R. Singh and S. Srivastava, "Stock Market Prediction Using Machine Learning Algorithms," *2021 10th International Conference on System Modeling & Advancement in Research Trends (SMART)*, Moradabad, India, 2021, pp. 275-280, <https://www.semanticscholar.org/paper/4b8a0cf75a48be0da0ce2161bc8d4dac3199192d>

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