Stock Price Prediction Project Report

1. Introduction

Stock price prediction is one of the most challenging tasks in finance and data science. Accurately forecasting stock prices can help investors, traders, and financial analysts make informed decisions. This project focuses on predicting stock prices using machine learning techniques. The primary objective is to design and implement a model that uses historical stock data and technical indicators to predict future price movements.

2. Objective

The main objective of this project is to build a predictive model for stock prices using machine learning. The model should be able to analyze historical stock price data, generate useful features, and forecast future stock price trends with reasonable accuracy. Additionally, the project aims to visualize the predicted results and compare them against actual stock prices.

3. Methodology

The methodology followed in this project includes several steps:
1. Data Collection: Historical stock price data is obtained using Yahoo Finance API.
2. Preprocessing: The dataset is cleaned, and missing values are handled.
3. Feature Engineering: Technical indicators such as Simple Moving Average (SMA) and Relative Strength Index (RSI) are generated.
4. Data Scaling: Features are normalized using MinMaxScaler to improve model performance.
5. Model Training: A Linear Regression model is trained using the preprocessed features.
6. Evaluation: The model is evaluated using metrics like Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and R-squared (R^2).
7. Visualization: The actual and predicted stock prices are plotted to visually compare performance.

4. Code and Implementation Details

The implementation was done using Python. Key libraries used include Pandas, NumPy, Scikit-learn, Matplotlib, and YFinance. The code includes the following steps:
- Importing necessary libraries
- Downloading historical stock data
- Creating SMA and RSI features
- Normalizing the dataset
- Splitting data into training and testing sets

- Training a Linear Regression model
- Predicting future prices and evaluating model performance
- Visualizing the results with graphs

5. Results and Observations

The Linear Regression model was able to capture general stock price trends but had limitations in predicting sudden fluctuations caused by external market factors. The evaluation metrics showed moderate accuracy, with the RMSE indicating the average prediction error. The R^2 value suggested that the model explained a fair portion of the variance in stock prices. The comparison graph between actual and predicted values demonstrated the effectiveness of the model in capturing overall trends.

6. Conclusion

This project successfully demonstrated the application of machine learning in stock price prediction. By leveraging historical stock data and technical indicators, a Linear Regression model was trained and evaluated. Although the model performed reasonably well in capturing overall trends, it struggled with high volatility. For future improvements, more advanced models like LSTM (Long Short-Term Memory networks) or GRU could be implemented to better handle sequential dependencies in time-series data. Overall, this project aligns with the objectives and highlights the importance of data-driven techniques in finance.

6. Screeshot