Artificial Intelligence **Project Report**

Stock Price Prediction

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1. Introduction

Stock price prediction is a crucial task in financial analysis and investment decision-making. By analyzing historical stock market data, machine learning models can identify patterns and relationships that help estimate future prices. This project focuses on predicting the closing price of Apple Inc. (AAPL) stock using regression techniques.

The objective of this project is to build a reliable stock price prediction model using historical data and evaluate its performance through visualizations and statistical metrics.

2. Dataset Description

The dataset used in this project is sourced from Kaggle and contains historical stock market data for Apple Inc. covering multiple years.

Dataset Columns:

- **Date**: Trading date
- **Price**: Closing price of the stock (Target Variable)
- **Open**: Opening price of the stock
- **High**: Highest price during the trading day
- **Low**: Lowest price during the trading day
- **Vol.**: Trading volume (in K, M, B format)
- **Change %**: Percentage change in price

	Date	Price	Open	High	Low	Vol.	Change %
0	03/27/2024	173.31	170.30	173.58	170.14	59.11M	2.12%
1	03/26/2024	169.71	170.01	171.41	169.65	57.22M	-0.67%
2	03/25/2024	170.85	170.37	171.94	169.46	54.21M	-0.83%
3	03/22/2024	172.28	171.76	173.05	170.06	71.16M	0.53%
4	03/21/2024	171.37	177.05	177.49	170.84	106.18M	-4.09%

Figure 1: Data Description

The dataset provides sufficient numerical features to train a regression-based machine learning model.

3. Data Preprocessing

Before training the model, several preprocessing steps were applied to ensure data quality and consistency.

3.1 Date Conversion

The Date column was converted into date-time format and sorted to maintain chronological order.

3.2 Handling Missing Values

Rows containing missing or null values were removed to prevent errors during training.

3.3 Volume Conversion

The Vol. column was originally stored as strings such as K, M, and B. These values were converted into numeric format for use in regression modeling.

3.4 Feature Selection

The following independent variables were selected:

- Open
- High
- Low
- Vol.

The dependent variable (target) is:

- Price

4. Model Implementation

4.1 Train-Test Split

The dataset was divided into training and testing sets using an 80/20 split. This allows the model to be trained on historical data and evaluated on unseen data.

4.2 Linear Regression Model

A Linear Regression model was chosen due to its simplicity and effectiveness for numerical prediction tasks. The model learns the relationship between stock prices and the selected features.

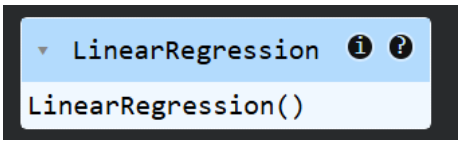

Figure 2: Regression Model

5. Model Evaluation

The model performance was evaluated using the following metrics:

5.1 Mean Squared Error (MSE)

IT Measures the average squared difference between actual and predicted prices.

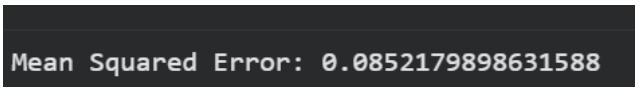

Figure 3: Mean Squared Error

5.1 R^2 Score

It indicates how well the model explains the variance in stock prices.

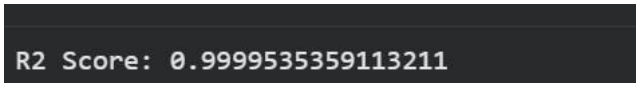

Figure 4: R^2 Score

Note: A higher R^2 score and lower MSE indicate better model performance.

6. Data Visualization

6.1 Actual vs Predicted Prices

A line graph was plotted to compare actual stock prices with predicted values, demonstrating how closely the model follows real market trends.

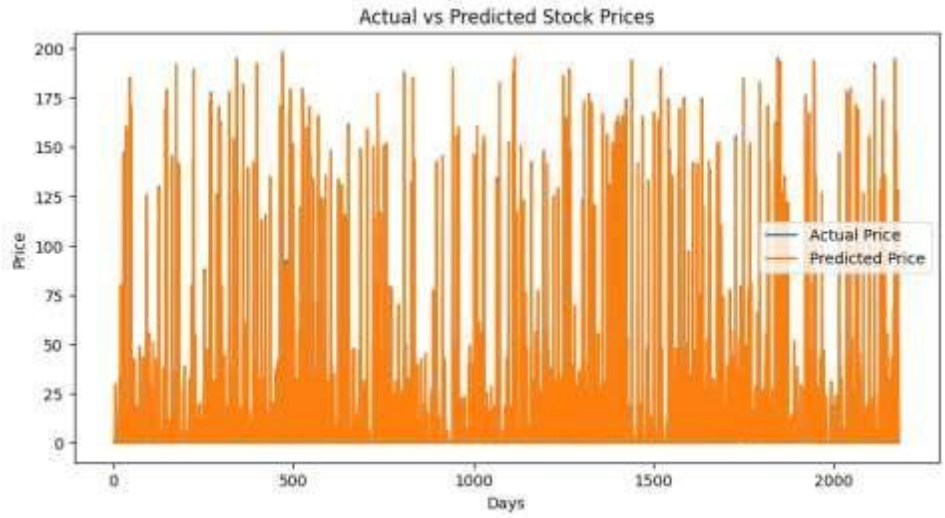

Figure 5: Actual vs Predicted Prices

6.2 Closing Price Over-Time

A time-series plot of stock prices was generated to visualize long-term price trends and fluctuations.

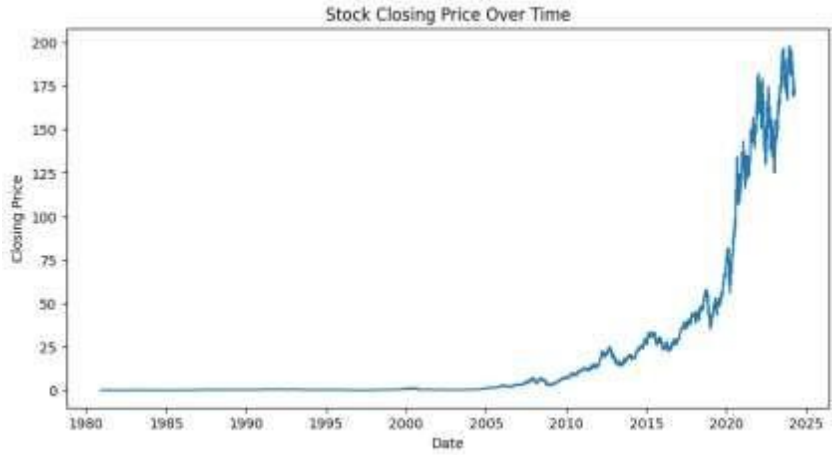

Figure 6: Closing Price Over-Time

These visualizations help validate the model's effectiveness and provide insights into stock behavior.

7. Results and Discussion

The Linear Regression model was able to capture the general trend of Apple stock prices. While the model performs well for short-term predictions, stock prices are influenced by external factors such as market news, economic indicators, and global events, which are not included in this dataset.

Despite these limitations, the model provides a strong baseline for stock price prediction.

8. Conclusion

This project successfully demonstrates how machine learning regression techniques can be applied to stock market data for price prediction. By performing proper data preprocessing, feature selection, and evaluation, a reliable predictive model was developed.

Future improvements may include using advanced models such as Random Forest, LSTM networks, or incorporating technical indicators for better accuracy.

9. Tools and Technologies Used

- Python
- Pandas
- NumPy
- Matplotlib
- Scikit-learn
- Google Colab / Jupyter Notebook

10. References

1. Kaggle Stock Market Datasets
2. Scikit-learn Documentation
3. Financial Data Analysis Resources

GIT HUB LINK: The complete source code and dataset used for this stock price prediction model can be found on my View Project on GitHub."