README: Apple Stock Analysis and Prediction

Introduction

This project focuses on analyzing and predicting Apple Inc.'s stock market performance using historical data. It incorporates data visualization, feature engineering, and predictive modeling. The visualizations explore trends and patterns in stock price, trading volume, and volatility, while predictive models forecast adjusted closing prices.

File Description

Code File

Apple Stock Analysis and Prediction

The code performs the following tasks:

1. "Data Upload and Extraction**: Handles ZIP or CSV input to read the dataset.

2. **Data Cleaning and Preparation*: Prepares the data by renaming columns, converting dates, and normalizing volume.

3. **Visualizations**:
   Adjusted Closing Price Over Time
   - Trading Volume Over Time
   - High, Low, and Close Price Comparison

4. **Predictive Modeling":
   - Linear Regression and Random Forest Regressor models.

5. "Model Evaluation**:
   - Mean Squared Error (MSE) and R-squared (R^2) metrics.

**Prediction Comparison*:
   - Visualizes actual vs predicted prices.

Dataset

The dataset used in this project is licensed under CC0: Public Domain and can be accessed using the URL (https://www.kaggle.com/datasets/umerhaddi/apple-stock-data-2025).

Setup Instructions

1. **Upload Data*: Providea ZIP or CSV file containing historical Apple stock data.

2. **Run the Code**: Execute the script in a Python environment (e.g., Google Colab or Jupyter Notebook).

3. **View Visualizations**: Examine trends and patterns in stock data.

4. **Model Evaluation**: Review MSE and R^2 scores for predictive models.

Visualizations

Adjusted Closing Price Over Time

This plot illustrates the trend of Apple's adjusted closing prices. The steady upward trend reflects Apple's strong market performance.

Trading Volume Over Time

The filled area chart highlights fluctuations in trading volume. Peaks correspond to significant events, such as product launches or earnings reports.

High, Low, and Close Price Comparison

This comparison provides insights into daily stock volatility and performance. It visualizes daily price ranges and closing values.

Actual vs Predicted Prices

This visualization compares actual adjusted closing prices with predictions from Linear Regression and Random Forest models. It demonstrates model performance and alignment with historical data.

Predictive Models

Linear Regression

**MSE*; Measures the average squared difference between actual and predicted values.

**R2*: Indicates how well the model explains variability in the data.

Advantages: Simplicity and efficiency for linear relationships.

Random Forest Regressor

**MSE*: Lower error compared to Linear Regression.

R2: Higher accuracy due to ensemble learning.

Advantages: Handles non-linear relationships and complex patterns.

Dependencies

Python libraries:
- pandas
- matplotlib
- Seaborn
- sklearn
- zipfile
- io

How to Use

1. Execute the code to load and analyze data.

2. Review visualizations to understand stock trends.

3. Evaluate model performance using MSE and R² metrics.

4. Interpret the predictions with the help of visual depictions.

Results

The analysis provides a detailed view of historical stock performance and the predictive models offer reliable forecasts. Random Forest outperformed Linear Regression with better accuracy and lower error.

Contact

For inquiries, reach out to "dharun652@gmail.com".