Cracking the Market Code with AI-Driven Stock Price Prediction

Github Link

https://github.com/Sachin-zoro

Project Title

Cracking the Market Code with AI-Driven Stock Price Prediction Using Time Series Analysis

Problem Statement

Stock price prediction is a central challenge in quantitative finance. This project aims to forecast future stock prices using AI and time series analysis. Given historical stock data (e.g., Open, Close, Volume), the objective is to predict the closing price for the next day or time interval. Accurate prediction empowers investors to make informed decisions, reduces financial risk, and enhances algorithmic trading systems.

Project Objectives

- Develop a time-series forecasting model to predict stock prices.
- Compare classical and deep learning-based approaches (ARIMA, LSTM).
- Analyze feature importance and time-based trends.
- Deploy an interactive Gradio interface for prediction and visualization.
- Ensure robustness through evaluation metrics and residual diagnostics.

Data Description

- Dataset Name: Historical Stock Market Data
- Source: Yahoo Finance / Alpha Vantage API
- Type of Data: Time series (structured)
- Records and Features: Daily data including Date, Open, High, Low, Close, Volume

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- Target Variable: Close price

- Static or Dynamic: Dynamic, updatable with new data

Data Preprocessing

- Filled missing values via forward-fill method.

- Converted Date to datetime format and set it as index.

- Scaled numerical features using MinMaxScaler.

- Removed holidays and non-trading days.

- Resampled for consistency if needed (e.g., weekly to daily).

Exploratory Data Analysis (EDA)

- Univariate Analysis: Time series plots of stock prices, Histogram of returns

- Bivariate & Multivariate Analysis: Correlation matrix among OHLCV, Rolling mean and volatility

- Key Insights: Seasonality and trend detected, Volume often spikes near large price changes

Feature Engineering

- Created lag features (e.g., Close(t-1), Close(t-5))

- Rolling statistics: moving average, standard deviation

- Technical indicators: RSI, MACD, Bollinger Bands

- Differencing for stationarity (for ARIMA)

- Train/test split on time-based index (no shuffling)

Model Building

- Algorithms Used: ARIMA, LSTM

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- Model Selection Rationale: ARIMA for linear trends, LSTM for nonlinear patterns

- Evaluation Metrics: MAE, RMSE, MAPE

Visualization of Results & Model Insights

- Forecast plots vs actual closing prices

- Feature importance visualization for LSTM (if SHAP used)

- Residuals plotted to check normality and autocorrelation

- Dashboard in Gradio with Ticker input, Forecast chart, Evaluation metric display

Tools and Technologies Used

- Python 3, Jupyter / Colab

- Libraries: pandas, numpy, matplotlib, seaborn, plotly, scikit-learn, statsmodels, tensorflow/keras, Gradio

Team Members and Contributions

- Data Collection& Cleaning: Sachin. S

-Data Building& Feature Engineering: Gopi.M

-Evaluation and EDA: Udhayachandar. H

- Visualization and Deployment: Aasaimani.T