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Date of Submission:07.05.2025

Github Repository Link:sarmila2006/Cracking-the-market-code-with-AI—driven-stock-price-prediction-using-time-series-analysis

1.Problem Statement

The stock market is highly volatile and influenced by numerous factors, making it difficult to predict stock prices accurately. The goal is to leverage AI and machine learning techniques, specifically time series analysis, to build a predictive model that can forecast stock prices, aiding investors in making data-driven decisions.

2.Project Objectives

To collect historical stock price data from a reliable source.

To preprocess and clean the data for analysis.

To perform exploratory data analysis to uncover patterns and trends.

To engineer relevant features that improve predictive power.

To build and evaluate time series forecasting models (e.g., ARIMA, LSTM).

To visualize predictions and key insights for interpretation.

To deploy or present the model results in an interactive manner.

3.Flowchart of the Project Workflow

Data Collection → Data Preprocessing → EDA → Feature Engineering →

Model Selection → Model Training → Model Evaluation → Visualization → Interpretation

4.Data Description

Source: Yahoo Finance API

Data Type: Historical stock prices

Variables: Date, Open, High, Low, Close, Adj Close, Volume

Time Period: (e.g., Jan 2015 – Dec 2024)

5.Data Preprocessing

Handling missing values (e.g., forward/backward fill).

Removing outliers if necessary.

Converting date columns to datetime format.

Setting the date as the index for time series analysis.

Scaling/normalizing features (if required for model).

6.Exploratory Data Analysis (EDA)

Visualizing stock price trends over time.

Plotting moving averages (e.g., 50-day, 200-day).

Checking stationarity (using ADF test).

Analyzing volatility with rolling statistics.

Correlation analysis among variables.

7.Feature Engineering

Creating lag features (e.g., previous day's close).

Rolling mean and standard deviation features.

Momentum indicators (e.g., RSI, MACD).

Adding time-based features (e.g., day of week, month).

8.Model Building

Splitting data into train/test sets.

Baseline model: ARIMA/SARIMA.

Advanced models: LSTM, GRU, Prophet.

Model tuning (hyperparameter optimization).

Evaluation using metrics: RMSE, MAE, MAPE.

9.Visualization of Results & Model Insights

Plot actual vs. Predicted stock prices.

Plot residual errors over time.

Visualizing feature importance (if applicable).

Interactive dashboards (using Dash/Plotly).

10.Tools and Technologies Used

Programming Language: Python

Libraries: NumPy, Pandas, Matplotlib, Seaborn, Scikit-learn, TensorFlow/Keras, Statsmodels, Prophet, Plotly, Dash

Data Source: Yahoo Finance API (yfinance)

Environment: Google Colab / Jupyter Notebook