Phase-3

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

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Github Repository Link : https://github.com/Gobika29/Gobika-k-Naan-Mudhalvan-Project-.git

1.Problem Statement

The stock market is influenced by a multitude of dynamic factors, making price prediction a highly complex task. This project aims to develop an AI-powered system that accurately forecasts stock prices using time series analysis and machine learning models.

2.Abstract

This project explores the application of AI and machine learning in predicting stock prices based on historical data. Using time series analysis techniques, the system will process and analyze historical stock prices to uncover patterns and trends. The goal is to build and evaluate models capable of providing accurate future price predictions. The end product is a deployable web-based tool for investors and traders.

3.System Requirements

Hardware:

• Processor: Intel i5 or better

• RAM: 8 GB minimum

• Storage: 100 GB

Software:

• Python 3.9+

• Jupyter Notebook / VS Code

• Libraries: pandas, numpy, matplotlib, seaborn, scikit-learn, statsmodels, keras, tensorflow, flask/streamlit

• Git for version control.

4.Objectives

• Collect and preprocess stock market data.

• Perform exploratory data analysis to understand trends.

• Apply time series models and deep learning for price prediction.

• Evaluate model accuracy and performance.

• Deploy a web app to display predictions.

5.Flowchart of Project Workflow

Data Collection → Data Preprocessing → EDA → Feature Engineering →

Model Selection → Model Training → Model Evaluation →

Web Deployment → Future Enhancements.

6.Dataset Description

• **Source:**Yahoo Finance / Alpha Vantage / Kaggle

- **Attributes:** Date, Open, High, Low, Close, Volume

- **Frequency:** Daily data

- **Format:** CSV or API calls.

7.Data Preprocessing

- Handle missing values

- Convert date to datetime object

- Set datetime as index

- Normalize features

- Split data into train/test.

8.Exploratory Data Analysis (EDA)

- Line plots of closing price

- Moving average trends

- Correlation matrix

- Stationarity tests (ADF)

- Seasonality/Trend Decomposition.

9.Feature Engineering

- Create lag features

- Calculate moving averages

- RSI, MACD indicators

- Time-based features (day, month, week).

10.Model Building

• **Baseline models:** ARIMA, SARIMA

• **Machine Learning models:** Random Forest, XGBoost

• **Deep Learning models:**LSTM, GRU

• Cross-validation for hyperparameter tuning.

11.Model Evaluation

• **Metrics**: RMSE, MAE, MAPE, R^2

• **Visualization:** Predicted vs Actual plot

• Residual analysis.

12.Deployment

• Flask or Streamlit app

• Docker container

• **Hosted on**: Heroku / Render / AWS

• **Input:** Stock ticker and prediction period

• **Output:** Future price trend graph.

13.Source Code

Organized in GitHub Repository:

/data

/models

/src

  - preprocessing.py

- modeling.py

- evaluation.py

- app.py

/notebooks

README.md

requirements.txt

14.Future Scope

• Incorporate sentiment analysis from news & social media

• Real-time data streaming and live predictions

• Portfolio optimization features

• Multivariate forecasting with macroeconomic indicators.

15.Team Members and Roles

1) Dharshini.K - Data Collection & Preprocessing

2) Gobika.K - EDA & Feature Engineering

3) Dharshini.S - Model Development

4) Gowthami.E - Deployment & UI