Phase - 1

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

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1.Problem Statement

Stock price prediction is challenging due to market volatility and complex patterns. This project aims to use AI and time series analysis to build a model that accurately forecasts stock prices, helping investors make better decisions.

2. Objectives of the Project

• Predict future stock prices accurately using historical data.

• Analyze stock trends and market behaviors.

• Build an automated AI system that continuously learns and improves.

3. Scope of the Project

• Focus on major stock indices (e.g., S&P 500, NASDAQ) or individual company stocks.

• Time horizon: short-term (days to weeks) predictions.

• Using AI/ML models like LSTM, ARIMA, Prophet, etc.

• Visualization dashboards for trends and predictions.

• Deploy as a simple web app.

4. Data Sources

• Yahoo Finance API (`yfinance` library)

• Google Finance (via APIs or web scraping)

• Alpha Vantage (free API)

• Quandl (for financial datasets)

5. High-Level Methodology

• **Data Collection:** Collect historical stock prices (Open, High, Low, Close, Volume) using APIs.

• **Data Cleaning:** Handle missing values, remove outliers, adjust for stock splits.

• **Exploratory Data Analysis (EDA):** Visualize price movements, moving averages, volatility.

• **Feature Engineering:** Create features like technical indicators (RSI, MACD), lag features, rolling means.

• **Model Building:** Build models like ARIMA, LSTM, GRU, XGBoost, Random Forest.

• **Model Evaluation:** Use metrics like RMSE, MAPE, R2 Score to evaluate performance.

• **Visualization & Interpretation:** Plot actual vs predicted prices, feature importance graphs.

• **Deployment:** Deploy a basic dashboard using Streamlit/Flask showing real-time predictions.

6. Tools and Technologies

• **Programming Language:**Python

• **Notebook/IDE:** Jupyter Notebook, VS Code, Google Colab

• **Libraries:**

- Data Handling: pandas, numpy

- Visualization: matplotlib, seaborn, plotly

- Machine Learning: scikit-learn, xgboost

- Deep Learning: TensorFlow, Keras, PyTorch

- Time Series: statsmodels, pmdarima, prophet

- Data Fetching: yfinance, alpha_vantage

• **Optional Tools for Deployment:**Streamlit, Flask/FastAPI, Heroku, Vercel, AWS

7. Team Members and Roles

1) Dharshini.K - Project Manager

Dharshini.K responsible for planning and managing the overall project. She assign tasks, monitor progress, and ensure that our team meets deadlines. She also facilitate communication among team members and make sure everyone stays aligned with our goals.

2) Gobika.K - Data Engineer

Gobika.K job is to collect and prepare the stock data. She work with APIs like Yahoo Finance and Alpha Vantage to get historical price data.She clean and format the data so that it's ready for analysis and modeling.

3) Dharshini.S - Software Developer

Dharshini.S develop the dashboard or web app that displays our stock predictions.She use tools like Streamlit or Flask to make sure our model is accessible and user-friendly. She also handle the deployment of the app.

4) Gowthami.E - Business Analyst

Gowthami.E help the team understand what the predictions mean in a real-world financial context.She interpret the model outputs and suggest how investors or businesses might use this information in decision-making.