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1. Problem Statement

In the highly volatile and dynamic world of stock markets, investors and traders face significant challenges in making informed decisions due to the unpredictability of stock price movements. Traditional methods of stock analysis often fall short in capturing complex patterns and market behaviors influenced by a multitude of factors. This unpredictability results in substantial financial risk and missed opportunities.

The goal of this project is to crack the market code by leveraging AI-driven stock price prediction using time series analysis. By applying advanced machine learning and deep learning techniques, we aim to model historical price data, identify hidden patterns, and forecast future stock prices with improved accuracy. This solution has the potential to empower investors with better decision-making tools, reduce financial risk, and ultimately democratize access to intelligent trading insights.

2. Objectives of the Project

The main objective is to develop an AI-driven model to predict stock prices using time series analysis. This involves collecting and preprocessing historical stock data, performing exploratory data analysis, and identifying key patterns such as trends and seasonality. The project will implement models like ARIMA and LSTM to forecast future stock prices. Model performance will be evaluated using metrics such as RMSE and MAE. The final goal is to generate accurate predictions and provide actionable insights to support better investment decisions.

3. Scope of the Project

This project focuses on predicting stock prices using AI and time series analysis techniques. It includes data collection from financial APIs or datasets like Yahoo Finance, data preprocessing, and exploratory analysis. Models such as ARIMA, Prophet, and LSTM will be implemented and compared. Visualization of trends and predictions will be developed to aid interpretation. The scope is limited to historical price data and does not include real-time trading or external factors like news sentiment. Deployment will be restricted to a local environment or notebook-based interface.

4. Data Sources

The project will utilize publicly available historical stock market data obtained from sources such as Yahoo Finance API or Kaggle. These datasets typically include open, high, low, close (OHLC) prices, volume, and date/time information. The data is dynamic, allowing for real-time updates if needed, but may initially be used in a static format for model training and testing.

Additional synthetic data may be generated for experimentation or to fill gaps. All sources are publicly accessible and reliable for financial analysis.

5. High-Level Methodology

1. Data Collection

Collect historical stock price data from Yahoo Finance API or Kaggle.

2. Data Cleaning

Handle missing values, remove duplicates, and standardize date formats.

3. Exploratory Data Analysis (EDA)

Use visualizations like line plots and heatmaps to identify trends and patterns.

4. Feature Engineering

Create features such as moving averages and lag variables to enhance model input.

5. Model Building & Evaluation

Train models like ARIMA, Prophet, and LSTM; evaluate using RMSE, MAE, and MAPE.

6. Visualization & Deployment

Visualize predictions and optionally deploy the model using notebooks or a web app.

6. Tools and Technologies

Programming Language:

Python – chosen for its strong ecosystem and support for data science and machine learning.
Notebook/IDE:

Google Colab and Jupyter Notebook – ideal for interactive development and cloud-based execution.

Libraries:

Data Processing: pandas, numpy Visualization: matplotlib, seaborn, plotly

Modeling: scikit-learn, statsmodels, fbprophet, TensorFlow/Keras (for LSTM)

Optional Tools for Deployment:

Streamlit or Flask – to create a simple and interactive web application or dashboard for showcasing predictions.

7. Team Members and Roles

Project Team Members and Responsibilities

1. Project Manager – Diviya priya.J Responsibilities:

Oversee overall project execution and deliverManage timeline, scope, and resources

Coordinate communication between stakeholders and team members Ensure project goals are met on schedule

2. Technical Lead – Harishma.R Responsibilities:

Lead the development team and make technical decisions Review code and ensure best practices are followed

Resolve high-level technical issues

Ensure system architecture aligns with project goals

3. Frontend Developer – Gobinath.A Responsibilities:

Develop and maintain user interface components Implement responsive design

Collaborate with backend developers to integrate APIs Conduct UI testing and debugging

4. Backend Developer – Gokul.V Responsibilities:

Design and develop server-side logic Create and maintain database structures Integrate third-party services and APIs Ensure data security and scalability