Cracking the market code with AI-drive stock price prediction using time series analysis

Student Name:S.DHARSHINI

Register Number: 62123104010

Institution:IDHAYA ENGINEERING COLLEGE FOR WOMEN .

Department:COMPUTER SCIENCE AND ENGINEERING.

Date of Submission: 29.04.2025.

1.Problem Statement

Forecasting stock market prices is a complex problem due to the inherent volatility, randomness, and non-linear behavior of financial markets. Traditional statistical methods often fall short in capturing these dynamics, limiting their predictive capabilities. With advancements in Artificial Intelligence (AI), especially deep learning and time series forecasting, there is an opportunity to build intelligent models that can analyze historical data patterns and deliver more accurate stock price predictions. This project aims to "crack the market code" using AI-driven stock price prediction models with a focus on time series analysis.

2.Objectives of the Project

- To develop robust AI-based models for forecasting stock prices using historical data.

- To analyze and extract meaningful insights from time series stock data.

.

- To evaluate and compare the performance of models like LSTM, ARIMA, and Prophet.

- To understand market trends and seasonality to support better investment decisions.

3. Scope of the Project

- Analyze historical stock price data for selected stocks or indices.
- Apply time series forecasting models (statistical and AI-based).
- Focus on technical analysis without incorporating real-time news or financial fundamentals.

Limitations:

- Models may not account for real-world events (e.g., economic crises, political upheavals).
- Static dataset limits adaptability to rapidly changing market conditions.
- Focus is on price patterns; no sentiment or fundamental analysis included.

4. Data Sources

- **Source:** Yahoo Finance API, Kaggle Datasets (e.g., S&P 500 or Nifty 50 historical data)

- **Public/Private:** Public

- **Static or Dynamic:** Static (downloaded once and used locally)

- Optionally synthetic user profiles for matchmaking simulations.

5.High-Level Methodology

- ***Data Collection:*** *Download historical stock price data using Yahoo Finance API or from Kaggle.*

- ***Data Cleaning:*** Remove null values, handle duplicates, and standardize timestamps.

- ***EDA:*** Visualize stock price trends, autocorrelation, and seasonality.

   Feature Engineering: Generate technical indicators such as Moving Averages, RSI, and MACD.

- ***Model development:***

   ARIMA for linear forecasting.

   Facebook Prophet for trend and seasonality modeling.

   LSTM (Long Short-Term Memory) for deep learning-based forecastin

- ***Model Evaluation:*** Evaluate model accuracy using metrics such as RMSE, MAE, and MAPE.

- ***Visualization & Interpretation:*** Plot actual vs predicted values using line charts and dashboards.

- ***Deployment:*** Host predictions using a web app (e.g., Streamlit) or Jupyter Notebook.

6. Tools and Technologies

- *Programming Language :* *Python*

- *IDE/Notebook :* Google Colab or Jupyter Notebook

- *Libraries :* Data Handling: pandas, numpy

  Visualization: matplotlib, seaborn, plotly

  Forecasting Models: statsmodels, fbprophet, tensorflow/keras

  Evaluation: scikit-learn

- *Optional Deployment Tools*: *Streamlit for interactive web app*

7. Team Members and Roles

- *S.Dharshini-Downloading and cleaning stock data*

- *G.Durgadevi -Conducting exploratory data analysis (EDA)*

- *T.Durga-Implementing time series models (ARIMA, LSTM, Prophet)*

- *K.Geethanjali-* Evaluating models and visualizing predictions