

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

## Phase-1 Submission

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## 1. Problem Statement

### Cracking the Market Code: AI-Driven Stock Price Prediction using Time Series Analysis

The global stock market is a volatile and complex system where prices fluctuate based on economic indicators, trends, and human emotions. Investors often rely on technical charts and intuition, which may not always lead to accurate decisions. The goal of this project is to build an AI-powered system that can predict real-time and future stock prices with high accuracy using time series models. By leveraging deep learning and machine learning models, this project aims to empower traders and financial analysts with reliable, data-driven predictions.

## 2. Objectives of the Project

- Predict real-time and future stock prices using LSTM/GRU models.
- Forecast both short-term and long-term price trends.
- Classify market trends (bullish or bearish) using supervised learning.
- Build a deployable web app to display live forecasts and predictions.
- Provide comparisons between Prophet, ARIMA, and deep learning models.
- Create visual dashboards for interpretation and insights.
- Empower financial users with AI-powered decision-making tools.

## 3. Scope of the Project

- i) Time series forecasting using live and historical financial data.
- ii) Real-time prediction of closing prices using LSTM or GRU.
- iii) Multi-model comparisons using Prophet and ARIMA.
- iv) Deployment as a Streamlit web application.
- v) Real-time stock price streaming using Yahoo Finance API.
- vi) Focused on Indian and global stocks (e.g., TCS, Reliance, Tesla).
- vii) Limitations: Live prediction will be limited by Colab runtime and API request limits.

## 4. Data Sources

- i) **Real-time Data:** `yfinance` Python library (Yahoo Finance API)
- ii) **Static Historical Data:** Kaggle datasets on Nifty50 and S&P 500 stocks
  - a. Public, structured time-series data
  - b. Includes daily OHLCV (Open, High, Low, Close, Volume)
  - c. Static data for model training; real-time feed for prediction
- iii) All datasets used are publicly accessible and free.

## 5. High-Level Methodology

### Data Collection:

- Download historical stock data from Kaggle
- Use `yfinance` for real-time live prices

### Data Cleaning:

- Handle null values, remove duplicates, format date index
- Normalize or scale prices for deep learning models

### Exploratory Data Analysis (EDA):

- Use line charts, candlestick plots, and correlation heatmaps
- Analyze volatility, trend strength, and volume

### Feature Engineering:

- Create technical indicators (SMA, EMA, RSI)
- Generate lag features, rolling averages

### Model Building:

- Prophet for trend + seasonality forecasting
- ARIMA for traditional time series
- LSTM/GRU using TensorFlow for deep learning price prediction

### Model Evaluation:

- Metrics: RMSE, MAE, MAPE, Direction Accuracy
- Train/test split, cross-validation for classical models

### Visualization & Interpretation:

- Use `matplotlib`, `plotly`, and `seaborn` for graphs
- Streamlit dashboard to visualize real-time predictions

### Deployment:

- Deploy Streamlit app on Streamlit Cloud
- Real-time updates via yfinance API

## 6. Tools and Technologies

**Programming Language: Python**

**Notebook/IDE: Google Colab**

**Libraries:**

- `pandas`, `numpy`, `matplotlib`, `seaborn`, `plotly`
- `scikit-learn`, `yfinance`, `prophet`, `statsmodels`
- `tensorflow` (LSTM/GRU), `streamlit`

**Deployment Tool: Streamlit Cloud**

## **7.DATA SETS :**

[https://www.kaggle.com/datasets/rohanrao/nifty50-stock-market-data?utm\\_source=chatgpt.com](https://www.kaggle.com/datasets/rohanrao/nifty50-stock-market-data?utm_source=chatgpt.com)

[https://www.kaggle.com/datasets/s3programmer/stock-market-dataset-for-financial-analysis?utm\\_source=chatgpt.com](https://www.kaggle.com/datasets/s3programmer/stock-market-dataset-for-financial-analysis?utm_source=chatgpt.com)

[https://www.kaggle.com/datasets/debashis74017/stock-market-data-nifty-100-stocks-5-min-data?utm\\_source=chatgpt.com](https://www.kaggle.com/datasets/debashis74017/stock-market-data-nifty-100-stocks-5-min-data?utm_source=chatgpt.com)

## 8.Team Members and Roles

NAME	ROLE
ADITHYA B	MODEL BUILDING
HEMNATH S	EVALUATION
HARISHKUMAR K	REPORT & PRESENTATION
JOSHUVA D	DATA COLLECTION