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

Phase-2 Submission

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Github Repository Link: https://github.com/Hemnath-07/stock-price-prediction-ai.git

1. Problem Statement

"The stock market is driven by a mix of economic trends and human emotion—can AI uncover the hidden patterns?"
The aim is to build a robust **AI-powered prediction system** that can accurately forecast **stock prices** using **Time Series Analysis** with models like **LSTM**, **GRU**, **Prophet**, and **ARIMA**. This empowers investors with data-backed decisions beyond traditional charts and gut feelings.

2. Project Objectives

☑ Predict real-time and future stock prices using LSTM/GRU
☺ Forecast short-term and long-term market trends
🐂◿ Classify bullish/bearish trends using supervised learning
▣ Deploy a Streamlit web app for live predictions
📊 Compare Prophet and Deep Learning models
♀ Build dashboards for easy interpretation
☐ Provide smart, AI-driven decision tools for traders

3. Flowchart of the Project Workflow
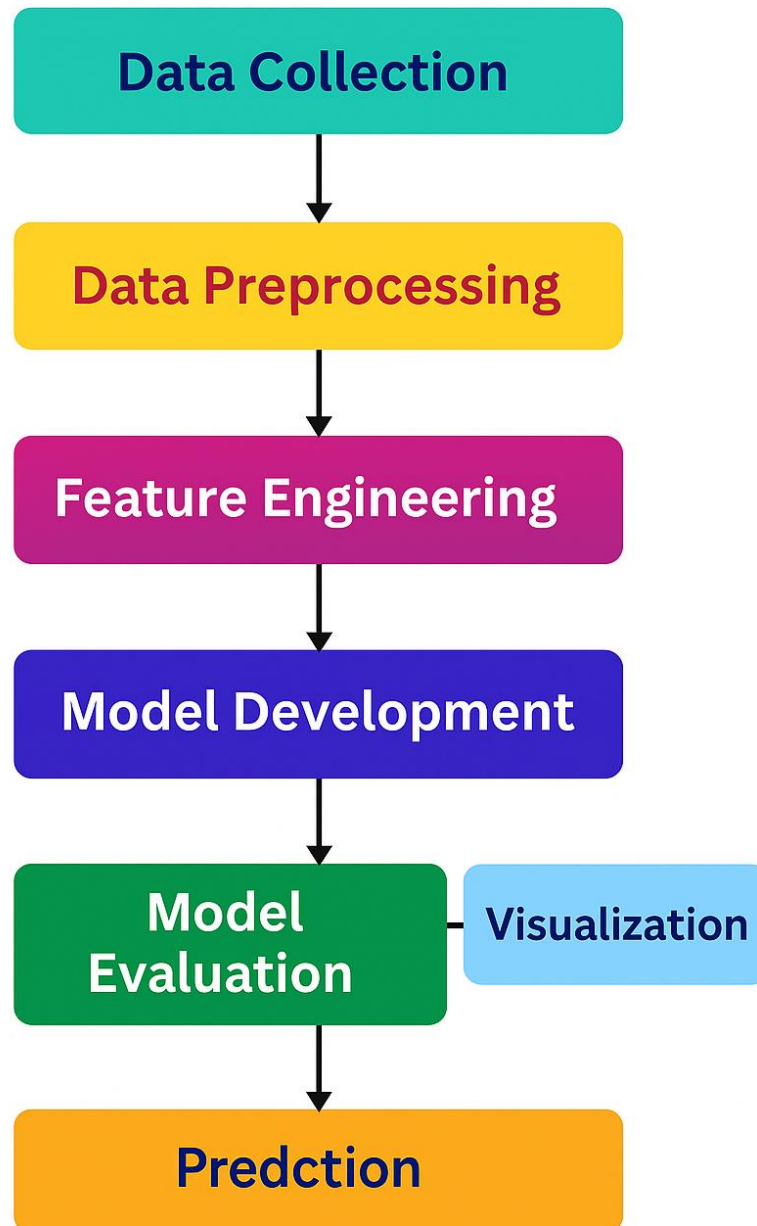
4. Data Description

Attribute	Description
Source	Yahoo Finance API (via yfinance) & Kaggle
Type	Time-series (daily)
Time Range	2000 – 2024
Features	Date, Open, High, Low, Close, Volume
Target Variable	Close
Nature	Dynamic (live) + Historical (static)

5. Data Preprocessing

- Removed missing values & formatted date indices
- Focused on **'Close'** price for prediction
- Created 60-day sequences for LSTM input
- Final shape: (samples, time steps, features)

6. Exploratory Data Analysis (EDA)

- ➢ ☐ Line plots for closing price trends
- ➢ ☑ Volume bar plot
- ➢ Used plots to visualize volatility, moving averages
- ➢ Checked correlations between Open, Close, Volume
- ➢ Detected seasonal & upward trends in NIFTY 50/100 stocks
- ➢ Identified stocks with high variance for modeling

7. Feature Engineering

- ✓ Sequenced 60 prior days to predict next-day price
- ✓ LSTM-ready input (no categorical data or PCA applied)
- ✓ Focused on time-relevant patterns for deep learning
- ✓ Generated technical indicators (SMA, EMA, RSI, MACD)
- ✓ Added trend labels (bullish/bearish)
- ✓ Created 60-day sliding window sequences for DL models
- ✓ Dropped irrelevant date parts after extraction

8. Model Building

Model	Highlights
LSTM	Best at capturing trends; deep learning-based
GRU	Slightly faster, similar to LSTM in accuracy
Prophet	Quick, explainable components (trend/seasonality)
ARIMA	Strong on stationary series

- 📊 Train/Test Split: 80/20
- 📐 Metrics: RMSE, MAE

9. Visualization of Results & Model Insights

- **Prophet Trend Components** (forecast decomposition)
- **Model Comparison** visualizations

10. Tools and Technologies Used

Category	Tools
Language	Python
IDE	Google Colab
Libraries	pandas, numpy, seaborn, scikit-learn, tensorflow, prophet, yfinance
Visualization	matplotlib, seaborn, plotly
Deployment	Streamlit Cloud (Web App)

11. Team Members and Contributions

NAME	ROLE
ADITHYA B	End-to-end development, modeling
HEMNATH S	Model evaluation & tuning
HARISHKUMAR K	REPORT & PRESENTATION
JOSHUVA D	DATA COLLECTION