

# Time Series Forecasting for Stock Market

## 1. Introduction

This project focuses on the analysis and forecasting of stock market prices using time series techniques.

The objective is to understand stock trends and provide forecasts using statistical and deep learning models such as ARIMA, SARIMA, Prophet, and LSTM.

## 2. Tools & Technologies Used

- Python (Pandas, NumPy)
- Matplotlib, Seaborn, Plotly for Visualization
- Statsmodels for ARIMA/SARIMA
- Facebook Prophet
- TensorFlow/Keras for LSTM
- Streamlit for Dashboard (Optional)

## 3. Data Collection & Preprocessing

Historical stock price data was collected using the Yahoo Finance API. The dataset includes Open, High, Low, Close, and Volume prices.

Missing values were handled, and time series were checked for stationarity and normalized for deep learning models.

## 4. Exploratory Data Analysis (EDA)

Trends, seasonality, and noise in the stock data were visualized using line plots and decomposition techniques. Correlation analysis helped understand interdependencies among different features.

## 5. Model Implementation

# Time Series Forecasting for Stock Market

- ARIMA/SARIMA: Statistical models were used for capturing linear dependencies and seasonality.
- Prophet: A decomposable time series model to handle trend and seasonality with changepoints.
- LSTM: Deep learning model for sequence prediction, trained on historical data using time windows.

## 6. Model Evaluation & Comparison

Models were evaluated using RMSE, MAE, and MAPE metrics. Comparisons indicated the advantages of each model in short-term vs long-term forecasting.

## 7. Visualization & Dashboard

A Streamlit dashboard was created to interactively visualize the stock forecasts using Plotly.

## 8. Conclusion

This project provided a comprehensive learning experience in financial time series analysis. ARIMA and Prophet performed well for interpretable forecasts, while LSTM offered high accuracy for complex patterns.

## 9. Future Work

- Explore multivariate time series models.
- Integrate real-time data streaming.
- Improve LSTM architecture with attention mechanisms.