

# Amazon Stock Price Forecasting

## 1. Project Objective

Forecasting the next 5 business-day closing prices (one trading week) of Amazon stock, using time-series modeling techniques, and identify the most effective predictive approach.

## 2. Project Summary

This project explores multiple forecasting models including ARIMA, Facebook Prophet, LSTM, and XGBoost to predict Amazon's next-week closing stock prices. The dataset is enriched with time-series features such as lag values, rolling statistics, and technical indicators (RSI, MACD, CMF). Among the evaluated models, XGBoost delivered the most accurate results, with a forecasting error of no more than 1.08%, and was therefore selected for deployment in the final web application.

## 3. Dataset Overview

Based on historical Amazon stock data (1997-2021)

## 4. Tools and Techniques Used

- Languages: Python
- Libraries: pandas, NumPy, scikit-learn, XGBoost, matplotlib, seaborn, statsmodels, prophet, keras, joblib
- Environment: Jupyter Notebook
- Deployment: Flask API for real-time customer input and forecasting

## 5. Feature Engineering

- Lag features (lag\_1 to lag\_7)
- Rolling statistics (mean, std, min, max)
- Technical indicators: RSI, MACD, CMF

## 6. Models Compared

- ARIMA
- Facebook Prophet
- XGBoost
- LSTM

## 7. Evaluation Metrics

Model	Mean Absolute Error	Root Mean Squared Error
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ARIMA	3.85%	4.46%
Prophet	2.07%	2.39%
XGBoost	1.08%	1.44%
LSTM	1.44%	1.77%

LSTM and XGBoost performed best overall. ARIMA and Prophet were useful as a baseline models but had lower performance.

## 8. Key Takeaways

- XGBoost outperforms deep learning and classical models significantly because it leverages: rich technical indicators, engineered lag/rolling features, simpler training and less data-requirement compared to LSTM
- LSTM Underperformed, but with careful tuning and more improvement could come closer to XGBoost
- Flask app successfully deployed for real-time customer input and forecasting

## 9. Resources

[GitHub Repo](#)

[Kaggle Notebook](#)

[Flask App Demo](#)