Stock Market Forecasting Internship Project
Forecasting Apple (AAPL) Stock Prices Using ARIMA, SARIMA & LSTM

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Organisation: ZIDIO Development
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Project Introduction

- Objective: Forecast short-term closing prices of Apple Inc. (AAPL).
- Developed as part of a Machine Learning internship.
- Implements classical statistical models (ARIMA, SARIMA) and a deep-learning model (LSTM).
- Built using a structured industry-standard Python workflow.

Techniques Used

- **ARIMA** – Linear model capturing trend using autoregression and differencing.
- **SARIMA** – ARIMA extended with seasonal pattern detection.
- **LSTM** – Deep learning model capable of nonlinear sequential learning.
- All models trained using historical AAPL stock closing prices.

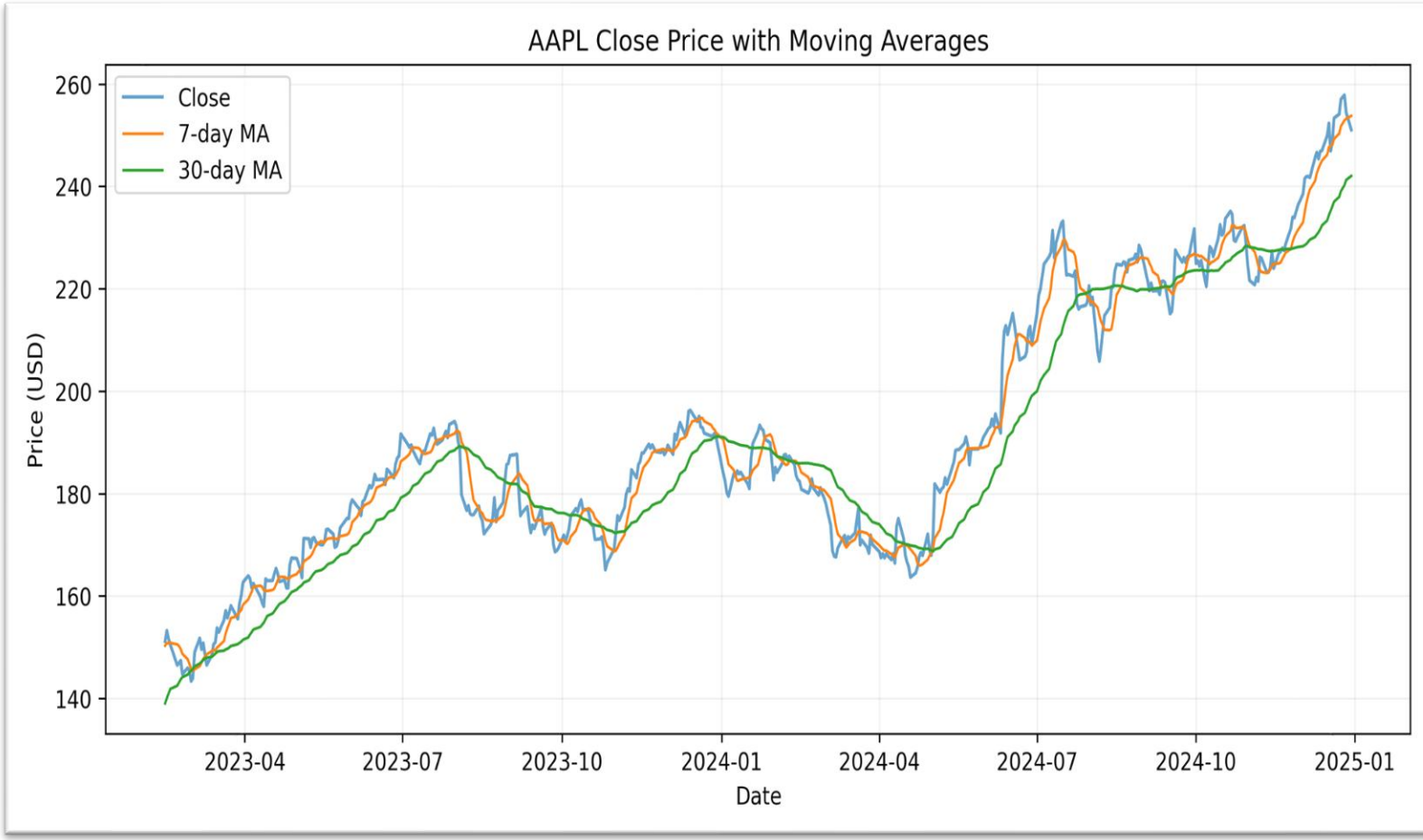
Software & Tools Used

- **Python**
- **Pandas, NumPy** – Data processing
- **Matplotlib, Seaborn** – Visual analytics
- **Statsmodels** – ARIMA/SARIMA
- **TensorFlow/Keras** – LSTM neural networks
- **YFinance** – Stock price data extraction

Stock Trend & Moving Averages

Insights:

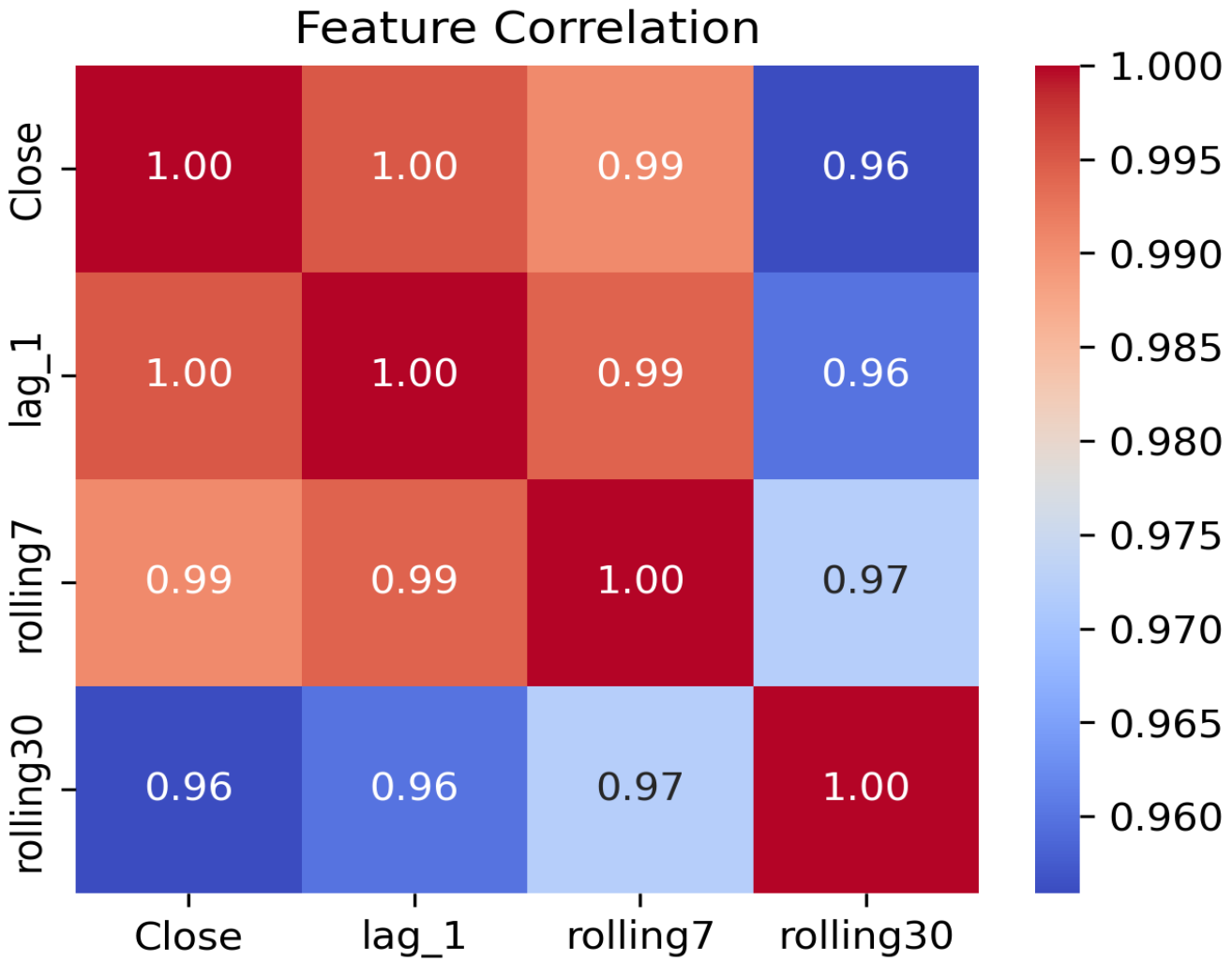
- 7-day & 30-day moving averages highlight longer-term trend direction.
- Shows the general upward/downward momentum of AAPL stock.
- Helps reduce noise and smoothen volatility for interpretation.



Feature Correlation Analysis

Insights:

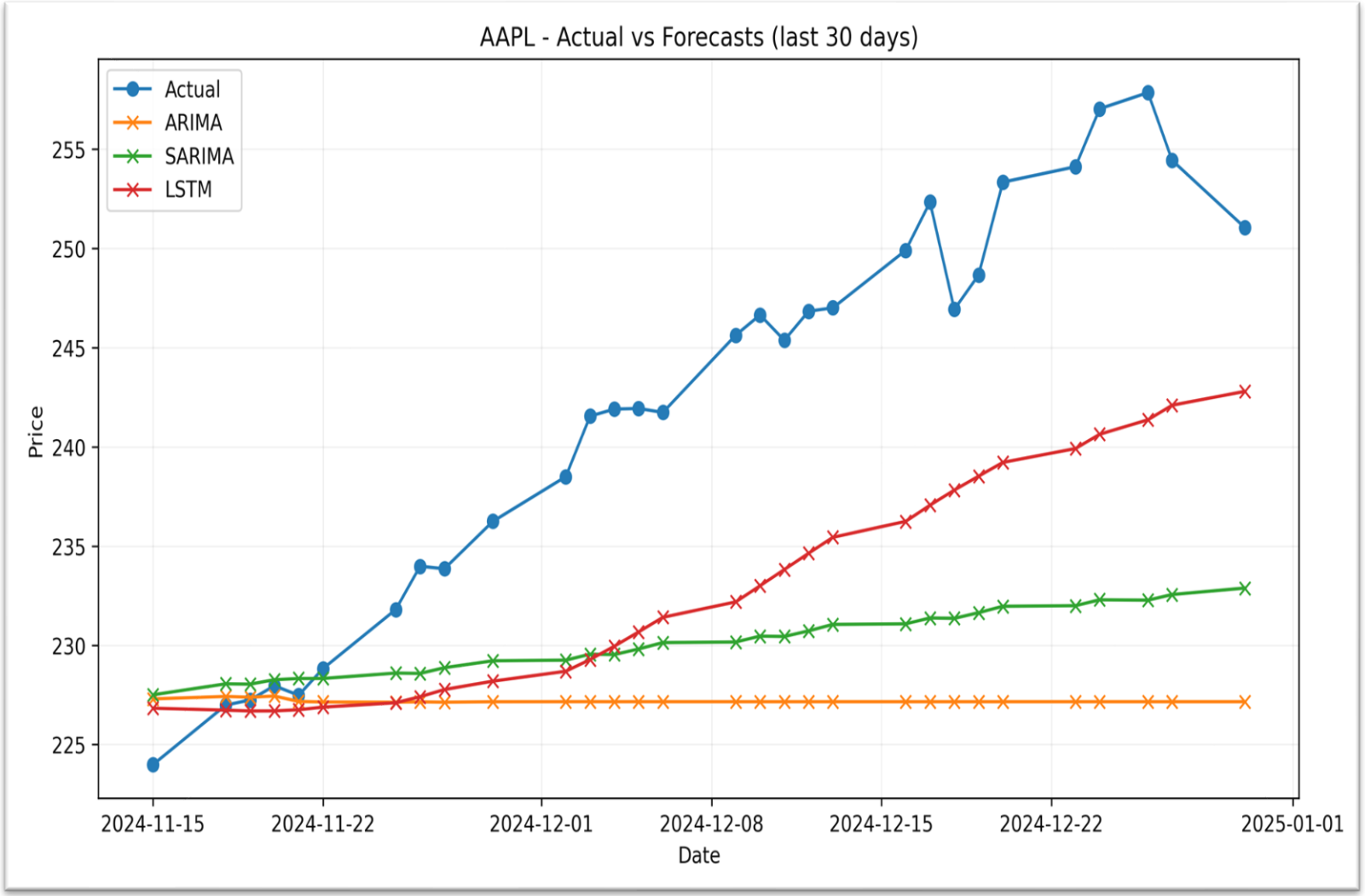
- Lag-1 feature has the strongest correlation with actual price.
- Rolling features help stabilize short-term fluctuations.
- Confirms strong time dependency in stock price behaviour.



Model Forecast Comparison

Insights:

- **ARIMA:** Produces nearly flat forecasts; underfits market volatility.
- **SARIMA:** Captures mild seasonality; better than ARIMA.
- **LSTM:** Most accurate and realistic; closely follows actual price movement.



Model Output Interpretation

Insights:

- ARIMA & SARIMA produce smoother, trend-focused forecasts.
- LSTM models complex nonlinear stock behavior.
- LSTM's predictions reflect stronger real-world correlation.

Model Performance Summary

From model_comparison.csv:

- **ARIMA MAPE:** 6.09%
- **SARIMA MAPE:** 4.96%
- **LSTM MAPE:** 4.25% (BEST)

Insights:

- LSTM delivered the lowest errors across all metrics.
- SARIMA improved over ARIMA due to seasonality modeling.
- Deep learning approach proved most effective.

Conclusion

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- Complete stock forecasting pipeline successfully developed.
- LSTM outperforms classical models significantly.
- Demonstrates strong skills in ML, DL, Time-Series Analysis, and Financial Modelling.
- Pipeline can be extended to multiple stocks and additional predictive features.
- Suitable for real-world financial forecasting applications.

Thank You