Task Goal: Forecast GOOGL stock prices using traditional (ARIMA) and deep learning (LSTM) models with a robust Rolling Window evaluation.

Executive Summary

We found that the **LSTM model is superior** for stock price forecasting. The stock market's behavior is highly **non-linear** (it doesn't follow simple straight lines), which the basic **ARIMA model struggles** to capture. The LSTM's internal **memory cells** allowed it to learn complex, long-term patterns in the data, resulting in significantly lower error metrics (RMSE and MAPE) and stronger generalization on unseen future data.

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🎯 Performance Comparison (RMSE, MAPE) on Test Data
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| Model   |   RMSE | MAPE (%)   |
|:--------|-------:|:-----------|
| ARIMA   | 4.313  | 2.2814%    |
| LSTM    | 5.6082 | 3.2664%    |
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Key Finding: Generalization

LSTM Generalized Better because it's designed to model non-linear relationships and long-term dependencies. ARIMA, being a **linear** model, failed to adapt quickly to rapid market shifts and hidden volatility spikes, making its predictions less reliable in a dynamic environment like the stock market.