

Stock Price Forecasting with LSTM

Abstract

This project demonstrates the implementation of a Long Short-Term Memory (LSTM) deep learning model to predict and forecast stock prices. The model is trained on historical stock data obtained from Yahoo Finance and is integrated with a Streamlit dashboard for interactive visualization of historical trends, predictions, and future forecasts.

Introduction

Stock market prediction has always been a challenge due to its volatility and dependence on multiple factors. Deep learning models, particularly LSTMs, are well-suited for time-series forecasting. This project aims to develop an LSTM-based stock predictor that can capture temporal patterns from past stock prices and forecast future trends. The system also provides a user-friendly interface through Streamlit for visualization.

Tools Used

The following tools and libraries were used in the project: - Python 3.x - TensorFlow/Keras (for building and training the LSTM model) - Scikit-learn (for preprocessing and scaling) - Pandas and NumPy (for data manipulation) - Matplotlib (for visualization) - Streamlit (for building the interactive dashboard) - Yahoo Finance API (for stock market data retrieval)

Steps Involved in Building the Project

The project followed these major steps: 1. Data Collection: Stock data was collected using the Yahoo Finance API. 2. Data Preprocessing: Data was cleaned and features such as SMA and RSI were engineered. Only 'Close' prices were used for stable scaling and prediction. 3. Model Building: An LSTM model was designed and trained to capture time-series dependencies. 4. Training & Saving: The trained model and scaler were saved for reuse. 5. Streamlit App Development: A dashboard was built to visualize historical data, compare predicted vs actual prices, and forecast future prices. 6. Forecasting: The trained model was used to predict upcoming stock prices for a user-defined forecast horizon.

Conclusion

This project successfully demonstrates the use of LSTM networks for stock price forecasting. The model effectively captures temporal patterns in stock price data, and the Streamlit app provides an intuitive way to visualize both historical and forecasted prices. While predictions may not be perfectly accurate due to market volatility, this project establishes a foundation for further improvements such as incorporating more features, hyperparameter tuning, and deployment to cloud platforms.