Stock Price Trend Prediction with LSTM

THUNDURTHY SAI MANIKHANTA THRIVEEDH

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Introduction

Stock price prediction is a challenging task due to the highly volatile and non-linear nature of financial markets. Traditional methods often fail to capture complex temporal patterns. Deep learning models like LSTM have shown promise in time-series forecasting due to their ability to remember long-term dependencies. In this project, I utilized Python libraries and historical stock data from Yahoo Finance API to build an end-to-end forecasting system.

Abstract

This project aims to predict stock prices using historical data and machine learning techniques. The Long Short-Term Memory (LSTM) neural network, a type of Recurrent Neural Network (RNN), is used to capture long-term dependencies in stock time-series data. By preprocessing financial data the model is trained to predict future stock prices with improved accuracy.

Tools Used

- Python
- Jupyter Notebook
- `yfinance` for data extraction
- `NumPy`, `Pandas` for data manipulation
- `Matplotlib` for visualization
- `scikit-learn` for preprocessing
- `TensorFlow / Keras` for building the LSTM model
- `Streamlit` for Dashboard

Steps Involved in Building the Project

1. **Data Collection:** Stock data was downloaded using the `yfinance` API for AAPL ticker.

2. **Preprocessing:** Features were normalized to improve model convergence.

3. **Model Building:** An LSTM model was designed with layers such as LSTM, Dense, and Dropout.

4. **Training:** The model was trained using the historical stock data, with Mean Squared Error as the loss function and Adam Optmizer.

5. **Evaluation:** The model was validated using test data and predictions were plotted to visualize performance.

Conclusion

LSTM models have shown good potential in predicting stock price trends, especially when trained normalized data. While perfect accuracy remains elusive due to market uncertainties, this model can help capture underlying patterns and provide directional insights into stock movements.