Stock Price Trend Prediction with LSTM & Streamlit Dashboard

Introduction

Stock market prediction has always been a challenging task due to its dynamic and volatile nature. Investors and financial analysts rely on technical analysis, past patterns, and advanced models to forecast future stock price movements. With the advancement of Artificial Intelligence and Deep Learning, Recurrent Neural Networks (RNNs), especially Long Short-Term Memory (LSTM) networks, have proven to be highly effective for sequence-based prediction problems such as stock price forecasting.

This project focuses on building an LSTM-based model to predict future stock prices based on historical data. Additionally, technical indicators like Moving Averages (MA) and Relative Strength Index (RSI) are integrated to support trading decisions. An **interactive Streamlit dashboard** is also included, allowing users to input stock tickers and date ranges and view predictions in real time.

Abstract

The primary objective of this project is to design and implement a stock price trend prediction system using an LSTM neural network. The dataset is collected using the Yahoo Finance API, which provides historical stock prices. After preprocessing and normalization, the data is used to train the LSTM model. The model predicts stock closing prices, which are compared with actual values to evaluate performance.

To enhance the analysis, technical indicators such as Moving Averages (20-day & 50-day) and RSI are calculated and visualized. A **Streamlit-based dashboard** was built to make the results interactive and user-friendly, showing scaled prices, daily % changes, and LSTM-based predictions.

Tools Used

- **Programming Language:** Python
- **Libraries:** Pandas, NumPy, Matplotlib, Seaborn, Scikit-learn, TensorFlow/Keras
- **Data Source:** Yahoo Finance API (yfinance)
- **Visualization:** Matplotlib & Seaborn
- **Dashboard (Deployment):** Streamlit

Steps Involved in Building the Project

1. **Data Collection:** Fetched historical stock prices using the Yahoo Finance API.
2. **Preprocessing:** Cleaned, normalized, and prepared data for sequence modeling.
3. **Feature Engineering:** Created sequences of past stock prices to predict future values.
4. **Model Development:** Built and trained an LSTM model using Keras for time-series forecasting.
5. **Evaluation:** Compared predicted prices with actual values using line charts.

6. **Technical Indicators:** Implemented Moving Averages (MA20 & MA50) and Relative Strength Index (RSI).
7. **Visualization:** Plotted closing prices, moving averages, RSI, and prediction vs actual trends.
8. **Deployment:** Developed an **interactive Streamlit dashboard** to visualize historical stock trends, predicted closing prices, and technical indicators.

Conclusion

This project demonstrates the effectiveness of LSTM networks in stock price forecasting. The predictions closely follow real market trends, proving that deep learning can significantly aid financial analysis. The integration of technical indicators provides additional insights into market momentum and overbought/oversold conditions.

The **Streamlit dashboard** allows users to easily interact with the model, test multiple tickers, and visualize predictions alongside technical indicators, enhancing usability and accessibility.

While the model performs well, stock markets are influenced by various unpredictable factors such as global events, policies, and sentiment. Therefore, predictions should be used as supportive tools, not standalone financial advice.

Future improvements may include incorporating more advanced models (GRU, Transformer-based models), sentiment analysis from news, and deployment on cloud platforms for real-time forecasting.