Stock Price Prediction Using LSTM – Project Report

Introduction

Stock markets are highly volatile and complex, making it difficult to predict prices using traditional methods. In this project, we built a deep learning-based solution to predict stock closing prices using a Long Short-Term Memory (LSTM) neural network model. The model was deployed using a Streamlit web interface that allows users to input a stock ticker and get predicted prices, including the next day's expected close.

Abstract

This project explores the use of machine learning, specifically LSTM networks, for time series forecasting of stock prices. Historical stock data is fetched using the yfinance API, preprocessed with indicators like RSI and SMA, and used to train an LSTM model. A user-friendly interface was developed to visualize actual vs predicted prices and optionally forecast the next day's price. The result is a powerful tool demonstrating how AI can assist in financial forecasting.

Tools Used

- **Python –** Programming language
- **Streamlit –** For building the interactive web app
- **TensorFlow / Keras –** For LSTM model training and inference
- **yfinance –** To download historical stock data
- **Matplotlib –** For plotting prediction graphs
- **scikit-learn –** For data normalization (MinMaxScaler)
- **Pandas & NumPy –** For data manipulation

Steps Involved in Building the Project

1. **Data Collection**: Downloaded historical stock data using the yfinance API.
2. **Feature Engineering**: Calculated technical indicators such as RSI (Relative Strength Index) and SMA (Simple Moving Average).
3. **Data Preprocessing**: Normalized the dataset using MinMaxScaler and structured it into sequences suitable for LSTM.
4. **Model Training**: Trained an LSTM model to predict the closing prices using past data sequences.
5. **Model Deployment**: Built a Streamlit interface to accept user input and display actual vs predicted prices.
6. **Prediction**: Integrated a checkbox option to forecast the next day's closing price using the last known sequence.

Conclusion

This project successfully demonstrates how deep learning can be applied to financial time series forecasting. The use of LSTM helped capture temporal dependencies in the data, leading to better predictions. The interactive web app makes it easy for users to test predictions for various stocks and understand the model’s performance visually. Future enhancements can include multi-feature models, better tuning, or integration of external market sentiment data.