Stock price prediction is a crucial and challenging task in financial markets, with significant implications for investors, traders, and financial analysts. The ability to anticipate future stock prices based on historical trends and market dynamics can lead to better investment strategies and risk management. Traditional statistical methods often fail to capture the complex, non-linear relationships present in financial time-series data. To address this challenge, this study implements a deep learning-based approach using Long Short-Term Memory (LSTM) networks, a type of recurrent neural network (RNN) specifically designed for sequential data.

The dataset is dynamically retrieved from Yahoo Finance (yfinance), focusing on the historical closing prices of stocks. The data undergoes preprocessing, including normalization using MinMax scaling, and is structured into sequences to create a time-dependent learning pattern. The LSTM model is designed with multiple layers to capture long-term dependencies in the data, utilizing dropout regularization to prevent overfitting. The model is trained using the Adam optimizer and evaluated using the Mean Squared Error (MSE) loss function to ensure accurate predictions.

To assess the model's performance, the predicted stock prices are compared with actual values using visual plots. The results demonstrate that LSTMs can effectively learn patterns in stock price movements and provide reliable forecasts. While this approach offers promising results, stock markets are influenced by various external factors such as macroeconomic trends, investor sentiment, and geopolitical events, which are not fully captured by historical price data alone. Future enhancements may include integrating technical indicators, news sentiment analysis, and macroeconomic indicators to improve predictive accuracy. Additionally, advanced deep learning models such as Transformer-based architectures, hybrid models, and reinforcement learning can be explored for better performance in real-time stock forecasting.

This research highlights the potential of deep learning in financial market analysis and provides a framework for further development in algorithmic trading, portfolio optimization, and automated investment strategies. The approach can be extended to multiple stocks, indices, and asset classes, making it a versatile tool for financial applications.