**Title: Stock Price Trend Prediction using LSTM**

**Introduction**

Traditional statistical models struggle to capture the long-term dependencies in time-series data. LSTM, a type of recurrent neural network (RNN), is well-suited for this purpose due to its ability to remember patterns over long sequences.

**Abstract**

With the advent of deep learning, particularly recurrent neural networks like Long Short-Term Memory (LSTM), it has become feasible to model sequential data such as stock prices. This project aims to forecast future stock trends by training an LSTM-based neural networks on historical stock prices. The system is built and visualized using Python, with potential for deployment via Streamlit.

**Tools & Technologies Used**

* **Language:** Python
* **Libraries:**
* **yfinance -** For fetching historical stock data
* **pandas** – Data manipulation and analysis
* **numpy -** Numerical computations
* **matplotlib -** Visualization
* **sklearn.preprocessing.MinMaxScaler -** Data normalization
* **keras** (TensorFlow backbend) – Model building (LSTM)

**Steps Involved in Building the Project**

**1.Data Collection**

Historical stock price data of Apple Inc. (AAPL) was collected using the yfinance API from 2015 to 2024. The closing price was chosen for trend modeling.

**2.Data Processing**

The closing prices were normalized to a [0,1] scale using Min-Max normalization. A window of 60 days was used to create sequences (X,y) fror supervised learning.

**3.Model Construction (LSTM)**

An LSTM neural networks was built using Keras:

* First LSTM layer with return sequences
* Second LSTM layer with final output
* Dense layer to output predicted value

The model was compiled with the Adam optimizer and mean squared error loss.

**4.Model Training and Evaluation**

The dataset was split into training and testing sets (80:20). The model was trained over 20 epochs and evaluated by plotting predicted prices versus actual values.

**5.Visualization**

Graphical representation was generated:

* Actual vs Predicted prices
* Trend visualization using 20-day Moving Average (MA20)
* RSI plotted to identify overbought/oversold zones

**Conclusion**

This project demonstrates the power of LSTM networks in predicting stock market trends using sequential data. The model was able to capture the underlying trends in Apple’s stock price with reasonable accuracy. Supplementing predictions with technical indicators like Moving Average and RSI provided further insights into market behavior. While this model doesn’t guarantee perfect forecasting due to market randomness, it showcases how deep learning can enhance traditional financial analysis.

In future extensions, one could incorporate multiple stock features (Open, High, Low, Volume), test other architectures (GRU, attention-based models), or integrate real-time prediction via APIs and dashboards.