**Stock Price Trend Prediction with LSTM: -**

**Introduction**

Stock price forecasting is a key area of interest in the finance and data science community. In this project, we applied deep learning techniques, specifically Long Short-Term Memory (LSTM) networks, to predict the closing price of stocks. The model was trained on historical stock data from the all\_stocks\_5yr.csv dataset, which contains five years of daily stock information for various companies. For this project, we focused on predicting the stock price trend for **Apple Inc. (AAPL)**.

**Abstract**

The project’s objective was to develop a model capable of predicting future stock closing prices based on historical data trends. We used an LSTM neural network due to its strength in learning from sequential and time-dependent data. The dataset consisted of daily stock records including open, high, low, close prices, and trading volume. After preprocessing and scaling the data, we created sequences of 60 days to predict the next day's closing price. The model architecture contained two LSTM layers with dropout to prevent overfitting, followed by a dense output layer. The model was trained for 20 epochs and evaluated on a test set. We plotted the actual versus predicted closing prices, showing that the model successfully captured the trend of stock price movements.

**Tools Used**

* **Python** (programming language)
* **Pandas, NumPy** (data processing)
* **Matplotlib** (visualization)
* **Scikit-Learn** (MinMaxScaler for data scaling)
* **TensorFlow & Keras** (LSTM model development)

**Steps Involved**

1️⃣ **Data loading and exploration:** Loaded all\_stocks\_5yr.csv, filtered for AAPL, and visualized its closing price over time.  
2️⃣ **Preprocessing:** Selected features: open, high, low, close, and volume. Applied MinMax scaling and created sequences of 60 timesteps.  
3️⃣ **Model building:** Developed an LSTM model with:

* 2 LSTM layers (50 units each)
* Dropout layers (0.2) for regularization
* A dense layer to output closing price  
  4️⃣ **Training:** Trained on 80% of data for 20 epochs, validated on the remaining 20%.  
  5️⃣ **Evaluation:** Plotted training/validation loss and compared actual vs. predicted prices.  
  6️⃣ **Saving:** Saved the model as aapl\_lstm\_model. keras (recommended Keras format).

**Results**

The LSTM model was able to learn patterns in the historical stock data and produce reasonable predictions. The plotted graph showed the predicted closing prices closely followed the actual price trend. While not perfect (due to market volatility and external factors not included in the data), the model demonstrated the potential of deep learning in financial forecasting.

**Conclusion**

This project highlighted the application of LSTM networks for time-series forecasting of stock prices. The model successfully captured stock price trends, and the visualization confirmed its ability to follow actual price movements. The approach can be extended with technical indicators (like RSI or MACD) and hyperparameter tuning for improved performance. Future work could also include deployment using a web interface for real-time predictions.