Project: Microsoft Stock Price Prediction with Machine Learning

- **Objective: Build a time-series forecasting model using TensorFlow to predict Microsoft's stock price based on historical data.**

- **Dataset: [Microsoft Stock Price Dataset](#)**

Project Goals:

1. Importing Necessary Libraries and Dataset:

- **Load required Python libraries:**

    o **Pandas for handling datasets.**

    o **NumPy for numerical operations.**

    o **Matplotlib/Seaborn for data visualization.**

    o **Sklearn for data preprocessing and model evaluation.**

    o **TensorFlow for deep learning-based time series forecasting.**

- **Load the dataset using Pandas and explore its structure.**

2. Data Preprocessing:

- **Convert the date column into DateTime format and set it as an index.**

- **Handle missing values by filling them using interpolation.**

- **Normalize numerical features using MinMaxScaler to improve model performance.**

- **Create additional features like:**

    o **Moving Averages (SMA, EMA)**

    o **Bollinger Bands**

    o **RSI (Relative Strength Index)**

- **Split dataset into training (80%) and testing (20%) sets.**

3. Exploratory Data Analysis (EDA):

- **Visualize Microsoft stock price trends over time using line charts.**

- **Analyze price correlations with trading volume and technical indicators.**

- **Identify seasonal patterns and market trends.**

4. Model Training and Selection:

- **Train different machine learning models:**
  - **Linear Regression**
  - **Random Forest**
  - **XGBoost**
  - **LSTM (Long Short-Term Memory) using TensorFlow**
- **Use LSTM (Deep Learning Model) for accurate time series forecasting.**

5. Model Evaluation and Prediction:

- **Evaluate the best model using:**
  - **Mean Absolute Error (MAE)**
  - **Root Mean Squared Error (RMSE)**
  - **R^2 Score**
- **Predict Microsoft stock prices for the next 30 days using real-time market data.**

Conclusion:

- **This model provides an accurate prediction of Microsoft's stock price trends using historical data and deep learning techniques.**
- **Future improvements can include Transformer-based models (e.g., GPT for time series forecasting).**