Project: Bitcoin Price Prediction using Machine Learning

- **Objective: Develop a machine learning model to predict Bitcoin price trends based on historical data, helping traders make informed investment decisions.**
- **Dataset: Bitcoin Historical Price Dataset**

Project Goals:

1. Importing Necessary Libraries and Dataset:

- **Load required Python libraries:**
  - **Pandas for handling datasets.**
  - **NumPy for numerical operations.**
  - **Matplotlib/Seaborn for data visualization.**
  - **Sklearn for data preprocessing, model training, and evaluation.**
  - **XGBoost for high-performance machine learning prediction.**
- **Load the dataset using Pandas and check its structure.**

2. Data Preprocessing:

- **Handle missing values by filling them with previous data points.**
- **Convert date columns into DateTime format and set as index.**
- **Normalize numerical features using MinMaxScaler for uniform scaling.**
- **Create new features like Moving Averages (SMA, EMA), Bollinger Bands, and RSI.**
- **Split dataset into training (80%) and testing (20%) sets.**

3. Exploratory Data Analysis (EDA):

- **Visualize Bitcoin price trends over time using line charts.**
- **Analyze the impact of volume, volatility, and historical patterns on price changes.**
- **Identify correlations between different technical indicators.**

4. Model Training and Selection:

- **Train different machine learning models:**

    - **Linear Regression**
    - **Random Forest**
    - **Support Vector Machine (SVM)**
    - **XGBoost (Extreme Gradient Boosting)**
    - **LSTM (Long Short-Term Memory) for deep learning**
- **Compare model performance using RMSE (Root Mean Squared Error).**

5. Model Evaluation and Prediction:

- **Evaluate the best model based on:**
    - **Mean Absolute Error (MAE)**
    - **Mean Squared Error (MSE)**
    - **R^2 Score**
- **Predict Bitcoin price trends using real-time data from APIs (e.g., Binance, CoinGecko).**

Conclusion:

- **This model helps traders predict Bitcoin price trends based on past patterns.**
- **Future improvements can include deep learning models like LSTMs or Transformers for better accuracy.**