Digital Asset Financial Advisor – Bitcoin Close Price Prediction

This project builds a machine learning and deep learning pipeline to predict Bitcoin close prices using historical market data and investor sentiment indicators.
It is part of a broader initiative to develop a digital asset financial advisor, integrating sentiment analysis, market trends, and time-series forecasting.

📌 Project Overview

Goal: Predict short-term Bitcoin closing prices using historical price data, sentiment indices, and other market indicators.

Key Approaches:

1. **ARIMA** for statistical time-series forecasting.
2. Base Machine Learning Models **(Linear Regression, Random Forest)** for quick benchmarks.
3. **LSTM (Long Short-Term Memory)** deep learning model for sequential data patterns.

Data Sources:

- Historical Bitcoin price and market metrics.
- Investor sentiment indicators (e.g., Fear & Greed Index, sentiment volatility).
- Additional social and market dominance metrics.

⚙️ Features

Data Preprocessing:

- Missing value handling, feature engineering, lag/rolling averages, and normalization.
- Feature Engineering:
- Lag features for past closing prices.
- Sentiment index transformations.
- Time-based cyclical features

Modeling:

- ARIMA for baseline forecasting.
- Linear Regression & Random Forest for initial benchmarks.
- LSTM for capturing sequential dependencies in Bitcoin price movements.

Evaluation Metrics:

- MAE (Mean Absolute Error)

- RMSE (Root Mean Squared Error)
- R^2 (Coefficient of Determination)

📊 Visualization

Price trends vs. predictions.

Correlation analysis between sentiment and price.

Actual vs. Predicted plots for model comparison.

💡 Future Enhancements

➔ Incorporate attention mechanisms for feature importance in LSTM.

➔ Expand to multi-cryptocurrency forecasting.

➔ Deploy as a real-time prediction API for digital asset advisory.