Project Overview

This project is designed to retrieve historical price data for popular cryptocurrencies, calculate metrics, and predict future prices using an LSTM model. The project data is sourced from the CoinGecko API, structured in an Excel workbook with each cryptocurrency's data on a separate sheet, allowing for easy access and analysis.

Approach

1. **API Selection**:
    - We chose the CoinGecko API due to its reliability and extensive coverage of cryptocurrencies. CoinGecko provides up to 365 days of historical data for free, which is sufficient for short-term trend analysis.
    - The API allows us to retrieve data for several popular cryptocurrencies, such as Bitcoin, Ethereum, and Dogecoin, among others.
2. **Data Retrieval and Organization**:
    - A modular function, fetch_crypto_data_with_retries, handles data retrieval from the API. This function includes error handling and retries to manage rate-limiting issues.
    - The retrieved data for each cryptocurrency is saved to a dictionary and subsequently exported to an Excel workbook with separate sheets for each cryptocurrency.
3. **Metric Calculation and LSTM Model**:
    - We calculate important metrics like rolling highs and lows to capture recent trends in cryptocurrency prices.
    - An LSTM (Long Short-Term Memory) model is used for predicting future prices. LSTMs are effective for time-series data, allowing us to capture temporal dependencies and predict future high and low prices based on historical trends.
4. **Output**:
    - The data is exported to Cryptocurrency_Historical_Data.xlsx, with each cryptocurrency's historical data stored on a separate sheet. Each sheet includes columns for Date, Open, High, Low, and Close.
    - The model's predictions for future prices are displayed in the terminal, providing insights into the expected high and low prices.

Challenges

- **API Rate Limiting**:
    - CoinGecko's free API enforces rate limits, leading to 429 errors. To handle this, we implemented a retry mechanism with exponential backoff, where each retry waits longer before reattempting.
    - A global delay is also added between requests for different cryptocurrencies, ensuring requests are spaced out to minimize rate-limiting issues.
- **Data Consistency**:

    - The CoinGecko API only provides a single daily price value, which we replicated across Open, High, Low, and Close fields to align with typical time-series data formats.

Rationale

- **API Choice**: CoinGecko was selected as it provides reliable, up-to-date cryptocurrency data with a reasonable free tier.
- **Excel Export**: The data export to Excel allows for easy viewing and analysis, with each cryptocurrency organized in a separate sheet for clarity.
- **Model Choice**: The LSTM model was chosen for its strength in time-series forecasting, which is crucial for capturing trends in cryptocurrency prices.

This project provides a structured approach to retrieving, analyzing, and predicting cryptocurrency prices, addressing common challenges such as rate-limiting and data structuring, and presenting data in a user-friendly Excel format.