

# Cryptocurrency ChatBot

## 1. Introduction

This application is designed to handle cryptocurrency-related queries, specifically regarding the prices of various cryptocurrencies. The app uses a custom classification system to detect if a query pertains to the price of a cryptocurrency and responds accordingly, leveraging both general and historical data. If the query is ambiguous or unrelated to prices, it answers in a general manner.

## 2. Features

- **Cryptocurrency Price Queries:** Provides current cryptocurrency prices in USD and answers questions related to it.
- **Context-based answering:** Maintain context across multiple messages in a conversation
- **General Query Responses:** Answers non-price queries and provides general information, such as facts, definitions, etc.
- **Cache Optimisation:** The application uses a cache for cryptocurrency price data to reduce redundant API calls.
- **Rate limiting :** The application limits api calls done over a minute. A maximum of 6 api calls are allowed in a minute and can be configured.

## 3. Architecture Overview

The application consists of the following components:

1. **User Interface :** Streamlit
2. **FastAPI :** FastAPI: Acts as the backend service for handling queries and managing API calls.
3. **CoinGecko API:** Retrieves live cryptocurrency prices for accurate and timely responses.(<https://www.coingecko.com/>)
4. **Classification System:** Uses TogetherAI's Llama 3.1B to classify if a query is crypto price-related or general.
5. **Response Logic:** Handles response differentiation based on the classification which uses TogetherAI's Llama 3.1B
6. **Translation:** Google Translate API for translating non-English queries to English.
7. **In-memory Cache:** Stores recent cryptocurrency prices to minimise API requests and reduce latency. TTLcache from cachetools.
8. **Redis:** Stores conversation history for context-based responses and implements rate limiting to control request frequency.

## 4. Prompt Approach for Query Classification

### 4.1. Price-Related Query Classification

If a query is related to the price of a cryptocurrency, the app classifies it as a **YES** and includes the cryptocurrency name.

**Example:**

**User Query:** "What is the price of Bitcoin?"

**Classification Result:**

- **Flag:** YES
- **Cryptocurrency:** Bitcoin

**User Query:** "What is deforestation?"

**Classification Result:**

- **Flag:** NO
- **Cryptocurrency:** None

```
"Classify if the given query is specifically asking for the current price of bitcoin, ethereum, or any other cryptocurrency. "
"Respond with:\nYES\n<cryptocurrency_name>\nif the query is about the price, or\nNO\nif it is not asking about the price.\n"
"Example queries and responses:\n"
" - 'What is the price of bitcoin?' should return 'YES\nBitcoin'.\n"
" - 'Tell me about bitcoin' should return 'NO'.\n"
" - 'Current value of Ethereum?' should return 'YES\nEthereum'.\n"
"This is the query: " + query
```

### 4.2. General Query Handling (Non-Price Related)

If the query is not related to cryptocurrency prices, the system responds with a general answer. However, it will use the conversation history if needed, like when the query refers to an earlier context or if the subject is unclear.

**Example:**

- **User Query:** "Tell me about Bitcoin"
- **Response:** Provides general information on Bitcoin.

```
f"Here is the conversation history:\n{history}\n"
"Answer the user's query in a general way, without focusing solely on cryptocurrency, unless contextually relevant. "
"Use the history to maintain context only if necessary, especially in cases of ambiguous or incomplete queries. "
"For example, if a query lacks a specific cryptocurrency name but references a previous question (e.g., 'what is it now'), "
"refer back to the last mentioned cryptocurrency and its price to maintain continuity.\n"
"Other than that answer the query in the most general way"
f"The user's question is: '{query}'"
```

### 4.3. Handling Price related queries

If the query is related to cryptocurrency prices, the system responds with the current price of the cryptocurrency by fetching data from the api. It responds with the price and answers the rest of the query as well.

#### Example:

- **User Query:** “What is the price of Bitcoin??”
- **Response:** Provides the current price and answers the rest of the query if provided.

```
f"Here is the conversation history:\n{history}\n"
f"Mostly focus on the current query. Only refer to the conversation history if required to maintain context or clarify details.
f"Do not deviate from the main topic.\n"
f"Answer the query properly using the price message.If it is a comparison between prices , try using history"
f"Crypto info: {price_message}\n"
f"The user's question is: '{query}'"
```

### 4.4. Handling Ambiguous Queries

When a query is ambiguous or does not specify a cryptocurrency, the system will refer to the most recent relevant data from the history.

#### Example:

- **User Query:** "What is the price now?"
- **Response:** Refers to the last known price of a cryptocurrency from conversation history (if it was mentioned previously).

## 5. API Calls and Error Handling

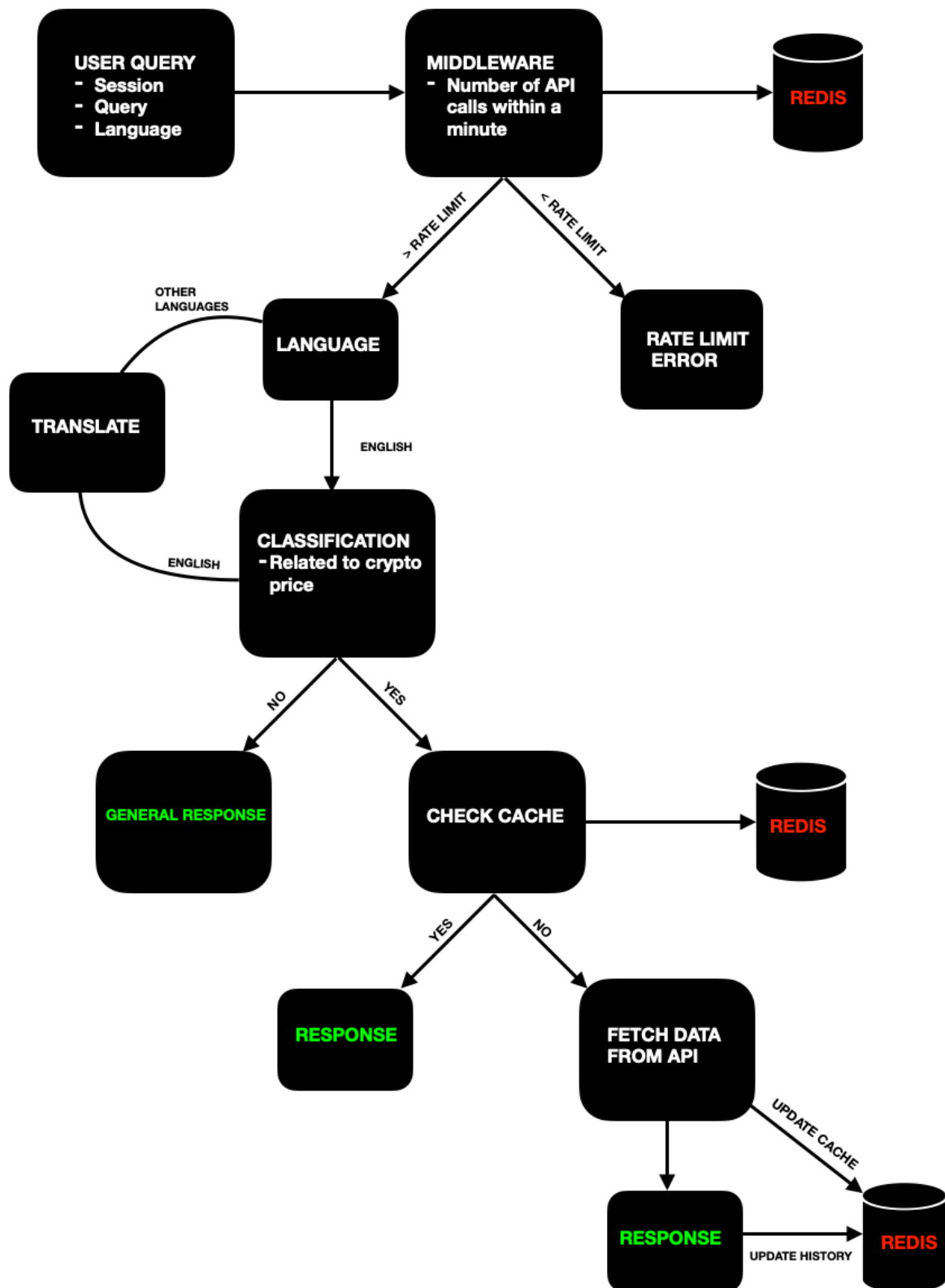
### 5.1. Fetching Cryptocurrency Price

The price of a cryptocurrency is fetched from the CoinGecko API. It includes proper error handling for failed API calls, such as network issues or invalid responses.

#### Error Handling:

- **RequestException:** Handles network or request errors.
- **KeyError:** Handles unexpected data formats from the API response.

## 6. Data Flow



### Context-Based Answering:

The application utilises context-based answering by passing conversation history to the prompt. This history enables more relevant responses, especially for follow-up queries where the specific cryptocurrency or price isn't explicitly mentioned. To stay within the model's context length(128k tokens), we trim older parts of the history, preserving recent interactions for context continuity without exceeding token constraints.

### Caching:

To improve efficiency, cryptocurrency prices are cached using *TTLcache* from *cachetools*. This cache reduces API calls and speeds up response times for repeated queries about the same cryptocurrency. Each element stays in the cache for 300 seconds, with a maximum capacity of 100 elements. If the cache is full, older entries are replaced as new queries are added, and outdated data is automatically refreshed based on the time-to-live (TTL) value.

### Rate Limiting:

Rate limiting is managed using Redis, which allows the app to control request frequency per IP address. Each IP is permitted up to 6 requests per minute; exceeding this limit results in temporary blocking. This ensures fair usage across users, prevents system overload, and maintains API performance stability.

The following code made 9 requests in a loop. An error was raised after the 6th API call.

```
(base) cra@Aadithyas-mac ~ % for i in {1..9}; do
  curl -X POST http://127.0.0.1:8001/query \
  -H "Content-Type: application/json" \
  -d '{"session_id": "session1", "query": "What is the price of Bitcoin?", "language": "English"}'
  sleep 1
done

{"response": "The current price of Bitcoin is 74842 USD."} {"response": "The current price of Bitcoin is 74842 USD."} {"response": "The current price of Bitcoin is 74842 USD."} {"response": "The current price of Bitcoin is 74842 USD."} {"response": "The current price of Bitcoin is 74842 USD."} {"response": "The current price of Bitcoin is 74842 USD."} Internal Server Error Internal Server Error Internal Server Error%
```

### User Query:

- Session - Creates a new session that saves the conversation flow.
- Query - User input question
- Language

# Snippets

## Cryptocurrency Query App

Session ID

1

Your query

What is the price of bitcoin?

Select Source Language

English

Submit

The current price of Bitcoin is 75106 USD.

## Cryptocurrency Query App

Session ID

1

Your query

What is the price now?

Select Source Language

English

Submit

The current price of Bitcoin is 75106 USD.

# Cryptocurrency Query App

Session ID

1

Your query

what is deforestation?

Select Source Language

English

Submit

Deforestation is the permanent destruction of forests, usually as a result of human activities. It involves the removal of trees and other vegetation from a forested area, often for purposes such as agriculture, urbanization, logging, or other land-use changes. This process can lead to significant environmental consequences, including loss of biodiversity, soil erosion, and disruption of ecosystems.

Deforestation can occur through various methods, including:

1. Clear-cutting: The removal of all trees from a forested area, often for logging or agriculture.
2. Selective logging: The removal of specific tree species or individual trees, often for timber or other forest products.
3. Shifting cultivation: The practice of clearing a forest area for agriculture and then abandoning it when the soil becomes depleted.

Session ID

1

Your query

Tell me about Ethereum and if possible the current value of it

Select Source Language

English

Submit

Ethereum is a decentralized, open-source blockchain platform that enables the creation of smart contracts and decentralized applications (dApps). It was founded in 2014 by Vitalik Buterin and has since become one of the largest and most widely used blockchain platforms.

Ethereum's primary function is to provide a platform for developers to build and deploy decentralized applications, which can be used for a wide range of purposes, including:

1. Decentralized finance (DeFi): Ethereum is widely used for DeFi applications, such as lending, borrowing, and trading.
2. Non-fungible tokens (NFTs): Ethereum is used to create and trade unique digital assets, such as art, collectibles, and in-game items.
3. Gaming: Ethereum-based games can offer unique experiences, such as decentralized ownership and governance.
4. Social media: Ethereum-based social media platforms can provide decentralized and censorship-resistant communication.

The current value of Ethereum is 2826.21 USD.

# Cryptocurrency Query App

Session ID

1

Your query

बिटकॉइन का कीमत क्या है ?

Select Source Language

Hindi

Submit

The current price of Bitcoin is 74973 USD.

# Cryptocurrency Query App

Session ID

1

Your query

what is the last cryptocurrency I asked about?

Select Source Language

English

Submit

Based on our conversation, the last cryptocurrency you asked about was Bitcoin.



# Cryptocurrency Query App

Session ID

1

Your query

konsa zyada keemat he bitcoin aur ethereum me se?

Select Source Language

Hindi

Submit

To determine which is more expensive, Bitcoin or Ethereum, I can compare their current prices.

Bitcoin is currently priced at 74973 USD, and Ethereum is priced at 2826.21 USD.

Based on this information, Bitcoin is more expensive than Ethereum.

# Cryptocurrency Query App

Session ID

1

Your query

aap kese he?

Select Source Language

Hindi

Submit

I'm a large language model, so I don't have feelings or emotions like humans do, but I'm functioning properly and ready to assist you with any questions or topics you'd like to discuss. How can I help you today?

# Cryptocurrency Query App

Session ID

1

Your query

Can you explain what Dogecoin is?

Select Source Language

English

Submit

Dogecoin is a decentralized digital currency that uses cryptography for secure and transparent transactions. It was created as a joke or a parody of Bitcoin, but has since gained a significant following and community. Dogecoin is based on the same underlying technology as Bitcoin, but with some key differences, such as a faster block time and a more relaxed approach to mining.

Dogecoin's primary function is to enable peer-to-peer transactions, allowing users to send and receive digital coins. It also has a strong focus on community engagement and charity, with the DOGE community often participating in fundraising efforts and other philanthropic activities.

The current value of Dogecoin is not mentioned in the conversation history, so I'll refrain from providing a specific price. However, I can tell you that Dogecoin's value can fluctuate like other cryptocurrencies, and its price may be influenced by market trends and other factors.

## Assumptions

1. **User Query Structure:** It is assumed that users clearly mention the cryptocurrency and relevant action (e.g., "price of Bitcoin") to get accurate classification results.
2. **Rate Limiting by IP:** The app assumes each user has a unique IP address; if multiple users share an IP, they may collectively exceed the rate limit.
3. **Session-based History:** It is assumed that session IDs are unique and properly managed, as they are crucial for maintaining context-based responses.

## Limitations

1. **Language Translation Context:** Translation may not always perfectly capture complex financial terminology, potentially affecting response accuracy for multilingual users.
2. **Classification Model Scope:** The Llama 3.1B model is used to detect cryptocurrency-related questions but may struggle with nuanced or ambiguous queries outside its training scope.
3. **Cache TTL Duration:** Cached cryptocurrency prices have a fixed TTL of 300 seconds, which may occasionally serve slightly outdated prices in rapidly fluctuating markets.