



AI PROJECT

STUDY BUDDY

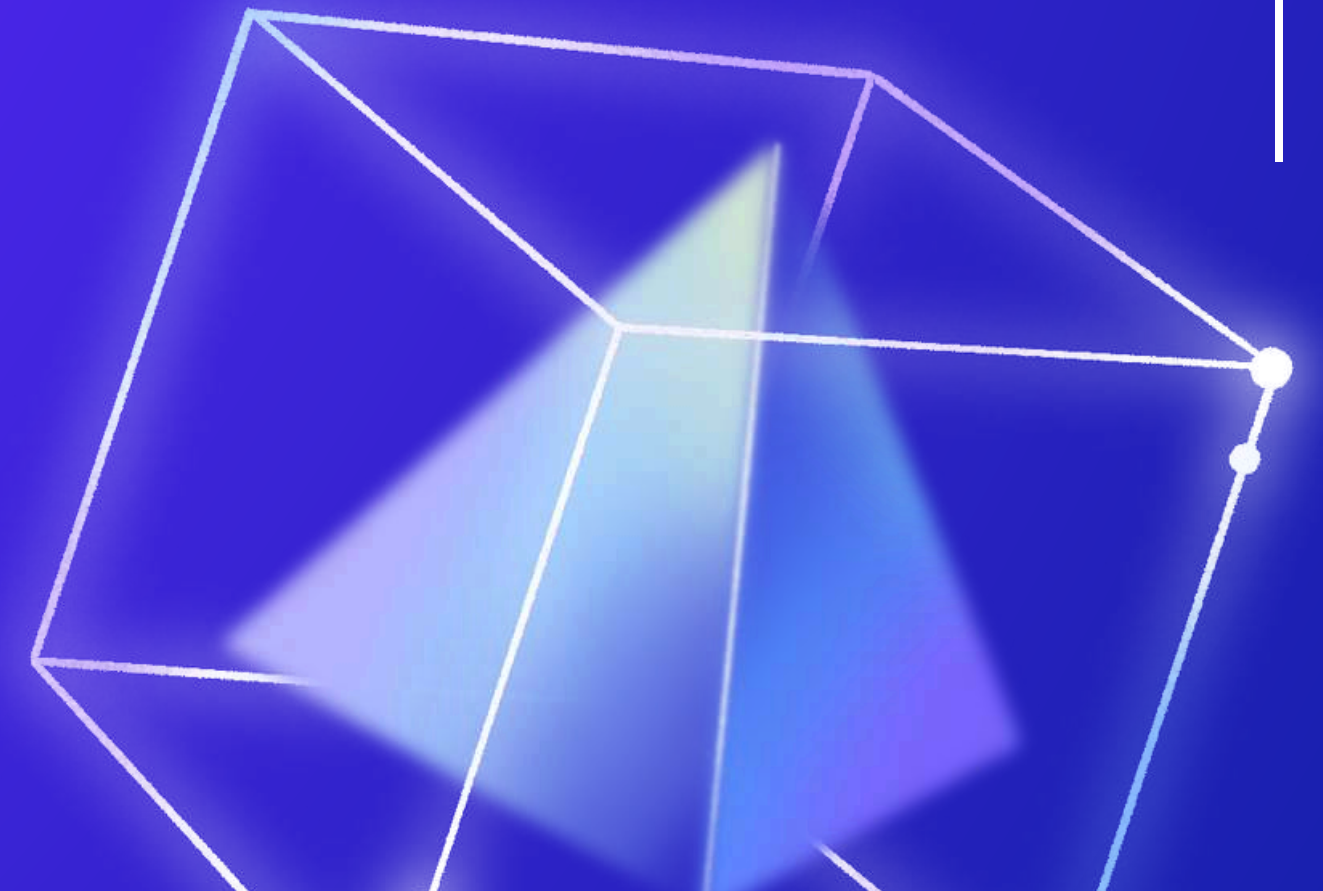
By – Aayush, Rohan, Gourish, Raghav





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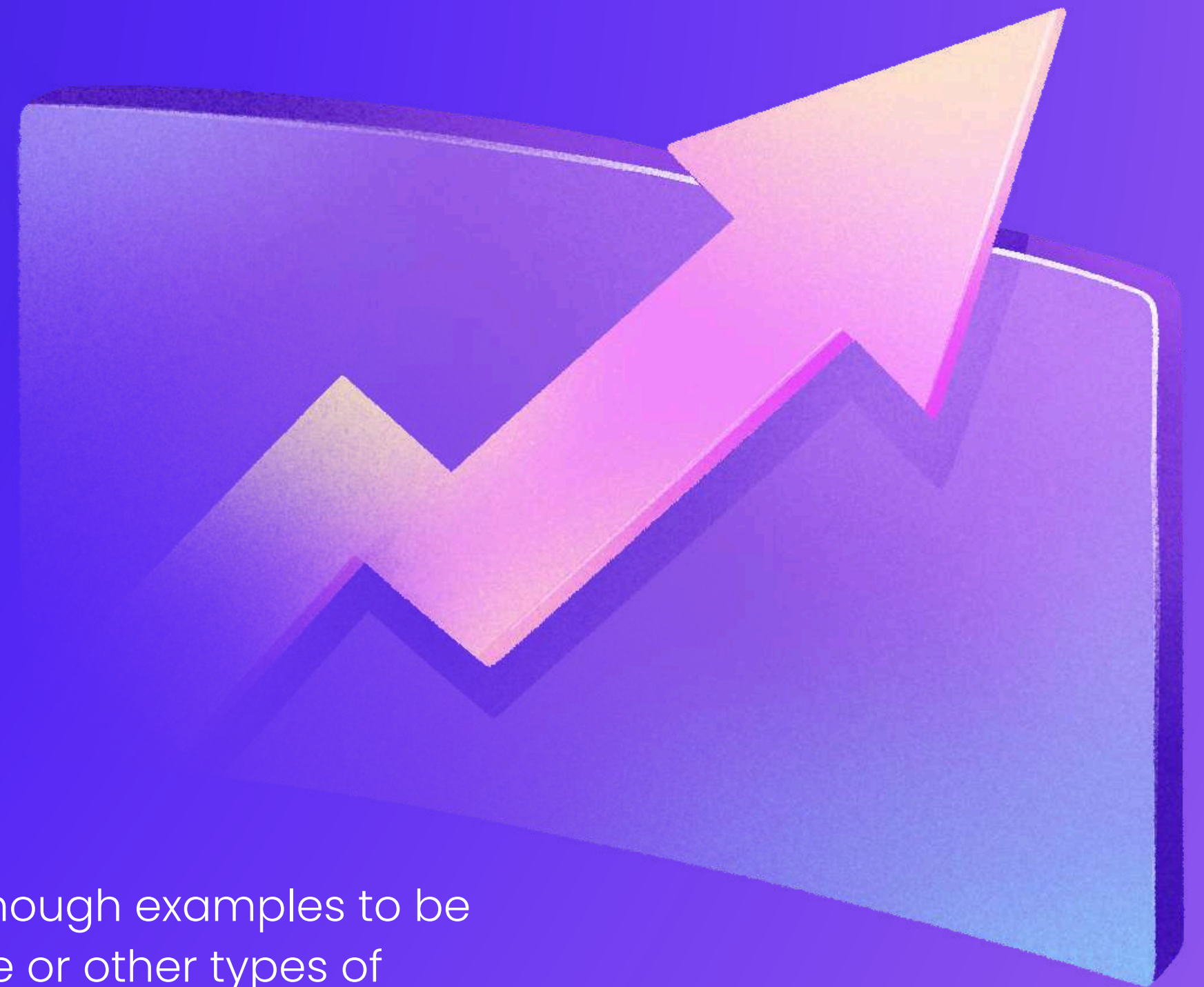


INTRODUCTION

We over rely on LLMs. Lets admit it, if we want a long technical paragraphs summarised, we are going to use ChatGPT.

Large Language Models (LLMs)

LLM is a computer program that has been fed enough examples to be able to recognize and interpret human language or other types of complex data. Many LLMs are trained on data that has been gathered from the Internet. They usually respond back in text.



ISSUES WITH LLMS

LLM HALLUCINATION

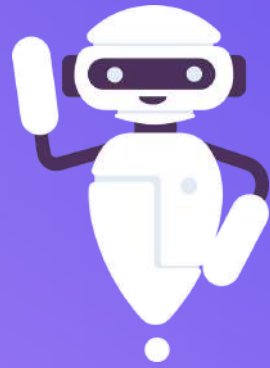
LLMs are prone to hallucinations. LLM hallucination poses significant challenges in generating accurate and reliable responses, stemming from factors such as source-reference divergence, biased training data leading to potential spread of misinformation

LLM INCONSISTENCY

LLMs can give conflicting outputs for very similar prompts – or even contradict themselves within the same response! This happens because LLMs make probabilistic predictions based on subtle patterns in their prompt and training data. They don't have strict logical consistency.

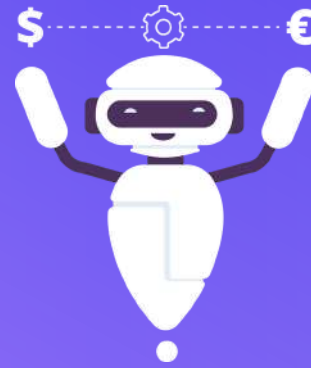


PROJECT OBJECTIVES



OBJECTIVE 01

Prevent
misinformation
caused by AI
Hallucinations



OBJECTIVE 02

Allow for ease of
access to study
material in a
conversation like
method



OBJECTIVE 03

Allow for information
to be imparted in
personalised way for
the end user

ACADEMIC STUDIES



GPT IN ACADEMIA

As an assistant to write scientific papers, ChatGPT has several advantages, including its capacity to generate and optimize text quickly, as well as to help users with several tasks, including organizing information or even connecting ideas in some cases. However, this tool is in no way ideal for generating new content.

- BLANCO-GONZALEZ A ET AL.

[HTTPS://DOI.ORG/10.3390/PH16060891](https://doi.org/10.3390/PH16060891)

APPLICATION OF AI IN EDUCATION AND WORK

- AI & ChatBots are powerful, they are able to score 60% on the Korean Medical Exam, and pass the cut off for the American Medical Exams
- ChatGPT bases its answers on a large training data set, it has the potential to generate misinformation or biased content.
- Training Data is only based of information before 2022, our courses evolve constantly to include the latest industry knowledge



SELF-REPORTED RELIANCE ON CHATGPT

- 16.5% were “knowledge seekers” exhibiting reliance for content acquisition, information retrieval, and summarization.
- 11.8% of participants relied on ChatGPT for obtaining feedback, planning, and quizzing (“proactive learners”).
- 23.1% relied on ChatGPT for drafting assignments and writing homework.



TECH STACK





FRONTEND - APP / SITE

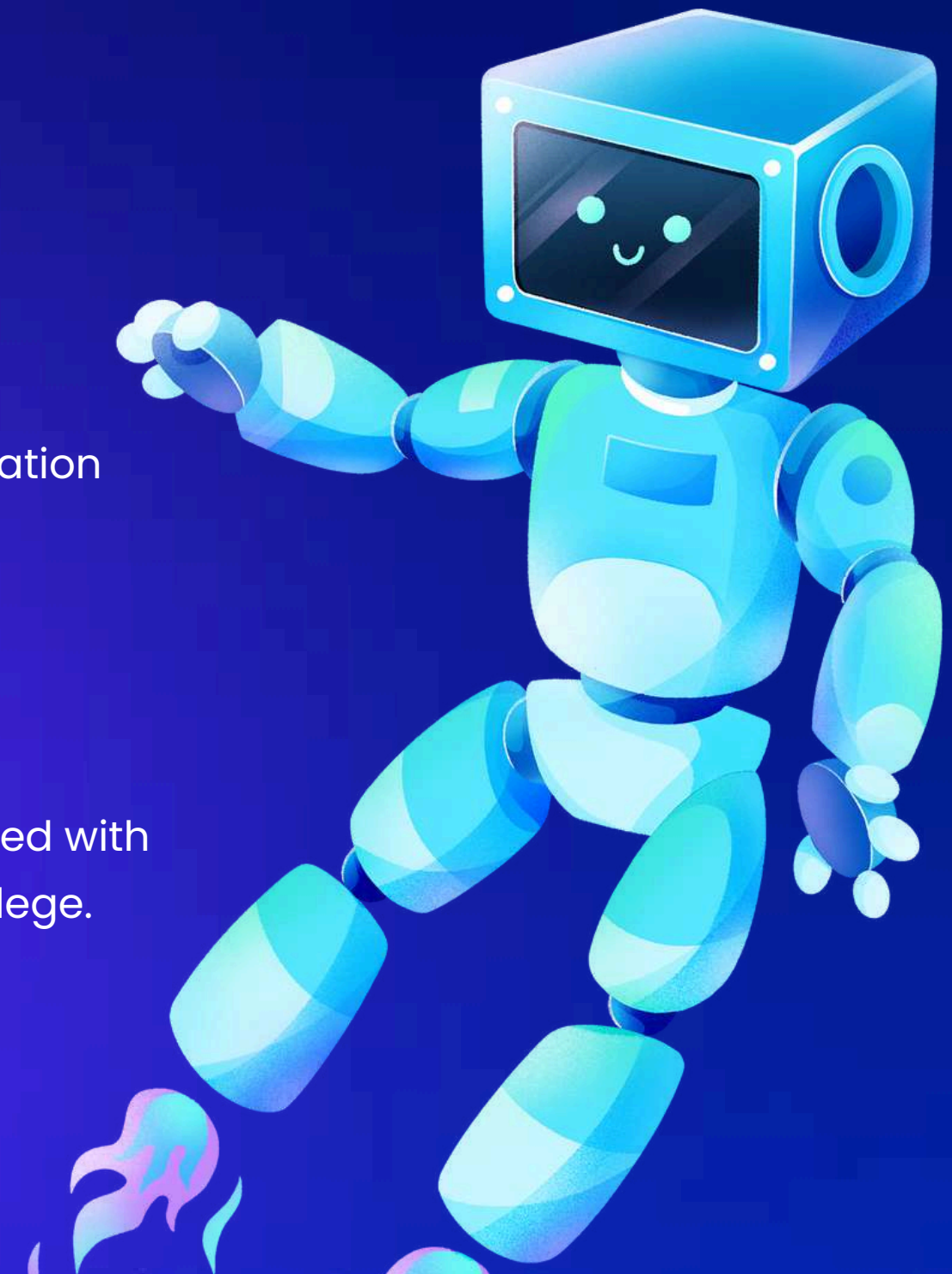
Build using Flutter (App) OR Astro Framework (Site)

MIDDLE WARE

An interface for the actual LLM and Frontend application to be written in Python. Storing temporary information in an SQL DB or Redis Cache

BACKEND

We aim to use generic models fine tuned with the study material provided by our college. This will running using ollama.

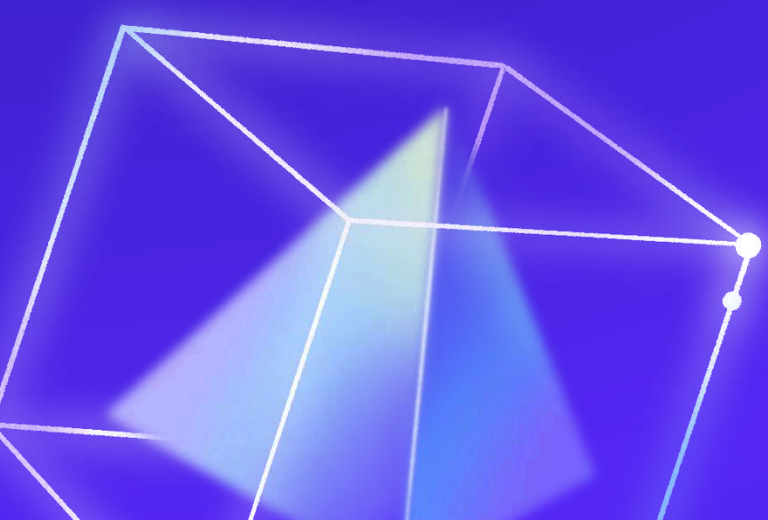




PROJECTIVE OBJECTIVE

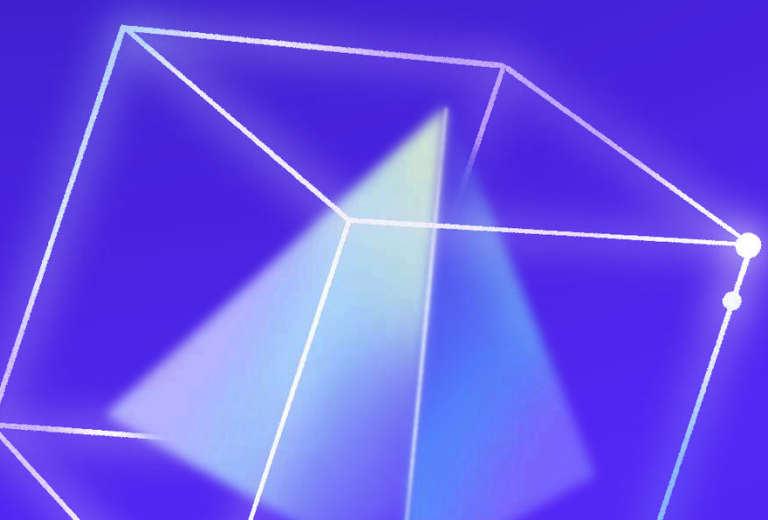
Create a dedicated and fine tuned LLM for students to use that can better help them understand concepts in their own personalised way.

The model should stay in line with material covered in classes and not hallucinate facts.





CHALLENGES FACED

- Data is everything in AI.
 - The Data extraction and clean up is a tedious manual process
 - Scale of Project and Data is large and needs to be scaled down
 - NotebookLM – Project by Google aiming to solve the same problem
- 

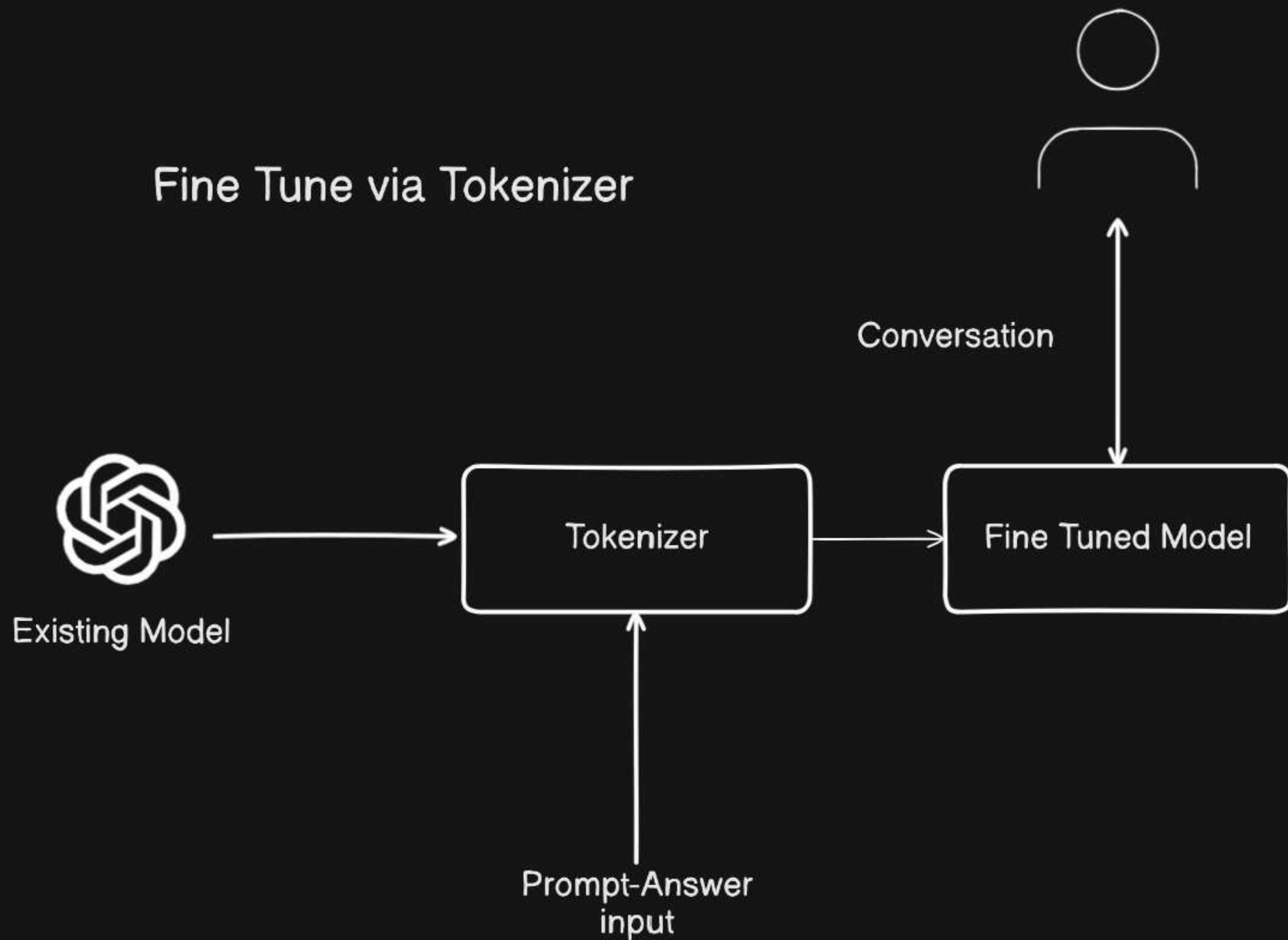




TOKENIZER



Fine Tune via Tokenizer




```

62 def summarize_text(text):
63     # Handle large texts by splitting and summarizing
64     max_chunk_size = 1024
65     text_chunks = [text[i:i+max_chunk_size] for i in range(0, len(text), max_chunk_size)]
66     summaries = []
67
68     for chunk in text_chunks:
69         inputs = tokenizer(chunk, max_length=max_chunk_size, return_tensors="pt", truncation=True)
70         summary_ids = model.generate(inputs["input_ids"], max_length=150, min_length=40, length_penalty=2.0, num_beams=4,
71         summary = tokenizer.decode(summary_ids[0], skip_special_tokens=True)
72         summaries.append(summary)
73
74     return ' '.join(summaries)
75
76 # Answer queries based on document content
77 @app.route('/query', methods=['POST'])
78 def answer_query():
79     data = request.get_json()
80     query = data.get('query')
81     document_text = data.get('document_text')
82
83     if not document_text or not query:
84         return jsonify({"error": "Document text and query are required"}), 400
85
86     inputs = tokenizer(f"summarize: {document_text} query: {query}", max_length=1024, return_tensors="pt", truncation=True)
87     output = model.generate(inputs["input_ids"], max_length=150, min_length=40, length_penalty=2.0, num_beams=4, early_stopping=True)
88     answer = tokenizer.decode(output[0], skip_special_tokens=True)
89
90     return jsonify({"answer": answer})

```



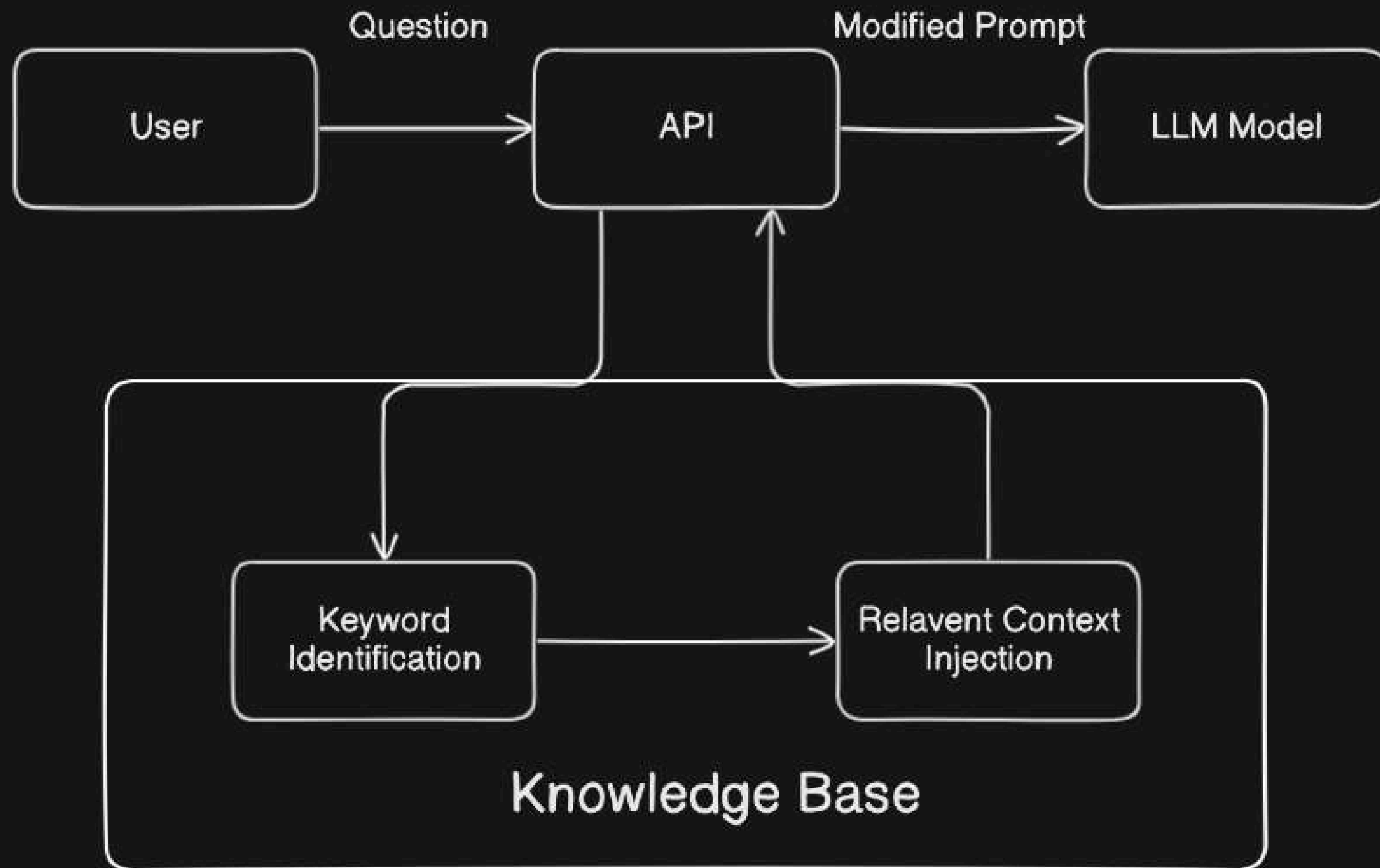
```
{
  "question": "What is digital image processing and what are its key elements?",
  "answer": {
    "low_level": "Digital image processing (DIP) refers to the use of computer systems to process digital images. It involves manip
    "mid_level": "Involves tasks such as segmentation, object description, and classification.\n - **Segmentation:** Separating th
    "high_level": "Involves 'making sense' of the information extracted from lower levels, like recognizing objects or understandin
    "examples": "For example, applying noise reduction to reduce visual artifacts and improving image clarity. Applying object dete
  }
},
{
  "question": "Explain the relationship between imaging machines and human vision.",
  "answer": {
    "imaging_machines": "Imaging machines offer a wider range of visual input (from radio waves to ultrasound) than our eyes. They
    "human_vision": "Human vision is specialized to perceive light and color, focusing primarily on objects in our immediate enviro
  }
},
{
  "question": "What do you mean by 'image processing' stopping and where does it begin? Where is image analysis in this discussion?",
  "answer": {
    "stop_and_begin": "Defining the boundary of image processing can be tricky. There's no clear-cut start or stop point.\n\n There
  }
},
{
  "question": "How are 'low-level,' 'mid-level,' and 'high-level' processing described within the context of image processing?",
  "answer": {
    "low_level": "**Low-level:** Focuses on basic operations like noise reduction or contrast enhancement, aiming to improve visual
    "mid_level": " **Mid-level:** Involves tasks like segmentation, object description, and classification where the goal is to ext
    "high_level": "**High-level:** Involves 'making sense' of the information extracted from lower levels - such as recognizing obj
  }
},
```




IN-CONTEXT



In-Context Injection



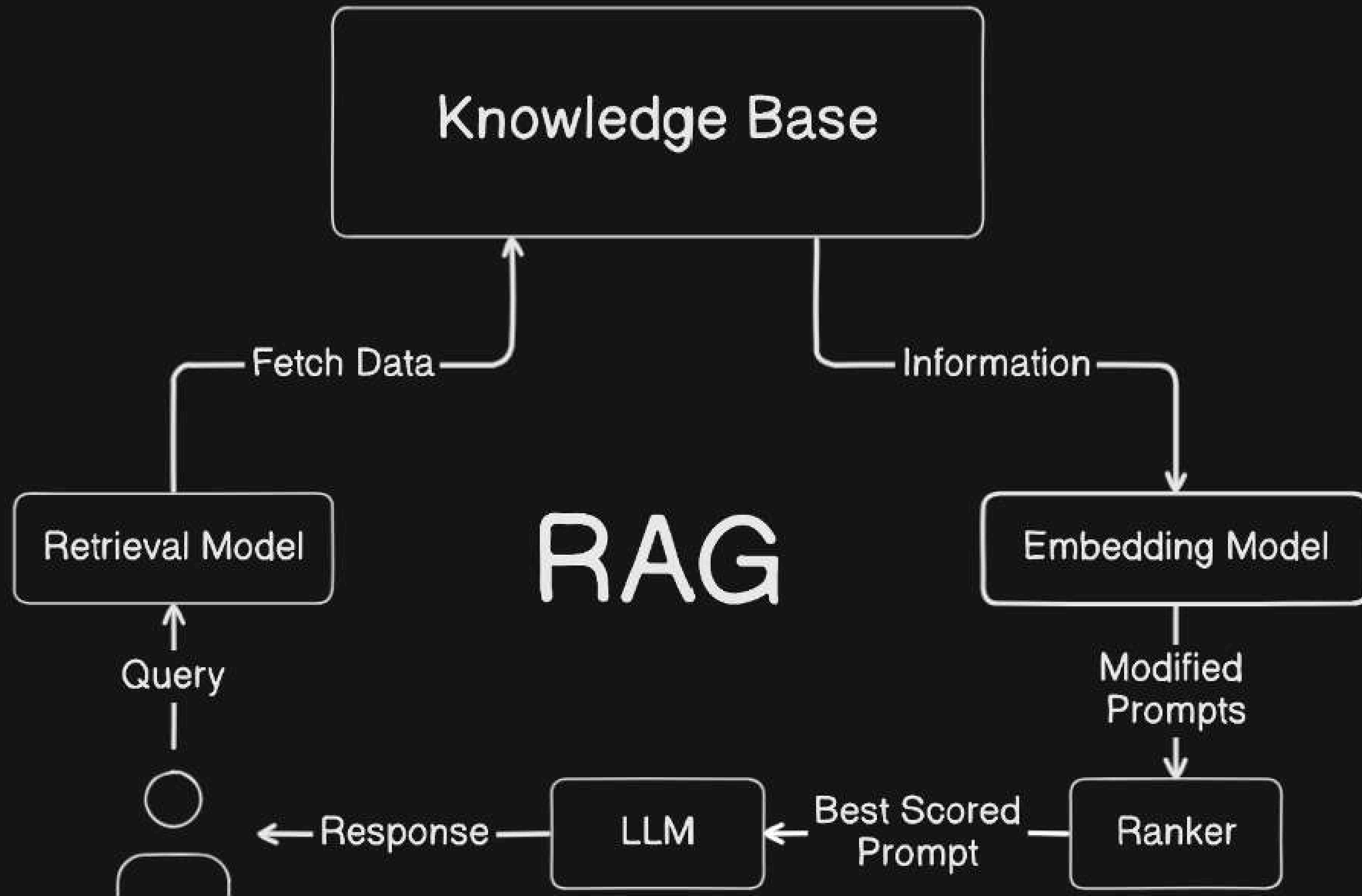

```
{
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    "key_elements": {
      "image_representation": "Images are represented as two-dimensional functions with spatial coordinates (x, y).",
      "pixels": "Individual elements making up a digital image, holding intensity values."
    },
    "levels": {
      "low_level": "Basic operations such as noise reduction or contrast enhancement.",
      "mid_level": "Tasks such as segmentation, object description, and classification.",
      "high_level": "Making sense of information extracted from lower levels, like recognizing objects or understanding scenes."
    },
    "examples": "Noise reduction to improve image clarity, object detection to identify specific objects."
  },
  "imaging_machines_vs_human_vision": {
    "imaging_machines": "Wider visual input range than human eyes (e.g., capturing radio waves, ultrasound, infrared, and X-rays).",
    "human_vision": "Specialized for visible spectrum light and color with limited wavelength range, focusing on immediate surroundings."
  },
  "image_processing_vs_image_analysis": {
    "image_processing": "Involves manipulating and analyzing images using tools like noise reduction and contrast enhancement.",
    "image_analysis": "Focuses on extracting information from images to gain insights about their content and structure."
  },
  "processing_levels": {
    "low_level": "Focus on basic operations like noise reduction and contrast enhancement.",
    "mid_level": "Involves segmentation, object description, and classification.",
    "high_level": "Involves interpreting information, such as recognizing objects and understanding scenes."
  },
  "text_analysis_with_dip": {
    "definition": "Application of digital image processing techniques to analyze text documents, such as OCR and document layout analysis.",
    "key_elements": {
      "text_recognition": "Using image processing techniques to identify and extract text from scanned documents or images.",
      "document_structure": "Analyzing the layout and organization of text documents, such as identifying headers, footers, and sections."
    },
    "examples": "Automated document classification, sentiment analysis of text extracted from images, and image-based text-to-speech conversion."
  }
}
```




RAG

RETRIEVAL-AUGMENTED GENERATION







OUTPUTS

Default gemma

```
>>> What is a Pixel?
```

```
The term "pixel" has two meanings, both related to technology:
```

```
**1. In digital images:**
```

```
* **A pixel is the smallest element of an image.** Each pixel is like a tiny box containing color information that creates the overall picture.
```

```
* **More pixels = higher resolution.** Images with more pixels have finer details and better quality than those with fewer. Think of it like individual dots forming a larger canvas – the more dots, the clearer the picture!
```

```
**2. In the context of Google:**
```

```
* **Google Pixel is a brand of smartphones made by Google.** These phones are renowned for their camera technology and AI features. They prioritize image processing and offer unique software experiences that often focus on user privacy and security.
```

```
Let me know if you'd like to delve deeper into either meaning! 😊
```

```
>>> |Send a message (/? for help)
```


Custom Prompt Gemma

```
>>> What is a pixel?
```

```
In the context of the passage, "pixel" refers to the basic unit of an image that represents color and light intensity. Each pixel on a digital image is like a tiny square or dot that holds information about its own brightness (color), position, and how it contributes to the overall picture.
```

```
Let me know if you'd like me to explain anything further! 😊
```

```
>>> |Send a message (/? for help)
```

Log from API / Ollama server

```
INFO:httpx:HTTP Request: GET http://localhost:8001/heartbeat/e960c894-ae35-4929-9124-fd3c409262f6 "HTTP/1.1 200 OK"  
INFO:werkzeug:127.0.0.1 - - [18/Oct/2024 20:53:45] "GET / HTTP/1.1" 200 -  
INFO:root:Received message: What is a pixel?  
INFO:httpx:HTTP Request: POST http://localhost:8001/queue/join "HTTP/1.1 200 OK"  
INFO:httpx:HTTP Request: GET http://localhost:8001/queue/data?session_hash=e960c894-ae35-4929-9124-fd3c409262f6 "HTTP/1.1 200 OK"  
INFO:root:Gradio response: A pixel is the term used most widely to denote the elements of a digital image. It refers to an individual  
hat has a particular location and value, making up part of the overall composition of the image.<hr>Sources:
```

1. CV_1.1.pdf (page 1)
2. CV_1.3.pdf (page 1)

Frontend

Study-Buddy

You: What is a Pixel?

Buddy: A pixel is the term used most widely to denote the elements of a digital image. It refers to each individual element in a digital image that has a particular location and value, making up the overall composition of the image.

Sources: 1. CV_1.1.pdf (page 1) 2. CV_1.3.pdf (page 1)

Type your message...

Send

REFERENCES

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- Kim TW. Application of artificial intelligence chatbots, including ChatGPT, in education, scholarly work, programming, and content generation and its prospects: a narrative review. *J Educ Eval Health Prof.* 2023;20.38. doi:10.3352/jeehp.2023.20.38
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THANK YOU!

