**Database Project (Fall 2023)**

**Homework #10 (50pts, Due date: Dec 6)**

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**Instruction:** In this homework, we provide a jupyter notebook file (DBP\_Homework10.ipynb). You should follow the instructions in these documents. Only the provided code's ‘*EDIT HERE*’ sections must be edited. You must *DELETE* your *GOOGLE\_API\_KEY* before submitting.

**Submission Guide:** Submit two files as follows:

-DBP\_Homwork10\_StudentID.zip

- DBP\_Homwork10\_StudentID.ipynb

- DBP\_Homwork10\_StudentID.pdf

**1. [20pts]** **You want to provide a Question Answering service based on Retrieval-Augmented Generation (RAG) for a given webpage. To raise the satisfaction of users, you have to do prompt engineering.** Prompt engineering is to make an optimal prompt for a given task.

So, you should implement the RAG pipeline as given parameters.

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| **Parameters** |
| Splitter: RecursiveCharacterTextSplitter  Chunk size for splitter: 800  Chunk overlap size for splitter: 100  Vector store: Chromadb  Embedding for vector store: GooglePalmEmbeddings  Retriever: Same as vector store  Retriever search type: similarity  Retriever search kwargs k: 6 |

Next, you should do prompt engineering for the given query string *“What is Task Decomposition?”*. **You should apply three prompts to the RAG pipeline: two prompts from Langchain hub (**[**https://smith.langchain.com/hub**](https://smith.langchain.com/hub)**) and one prompt on your own.**

1. Langchian hub - rlm/rag-prompt

**[Answer]**

Enter your code and result here. You must show your result (captured image or string).

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1. Langchain hub – gregkamradt/test-question-making

**[Answer]**

Enter your code and result here. You must show your result (captured image or string).

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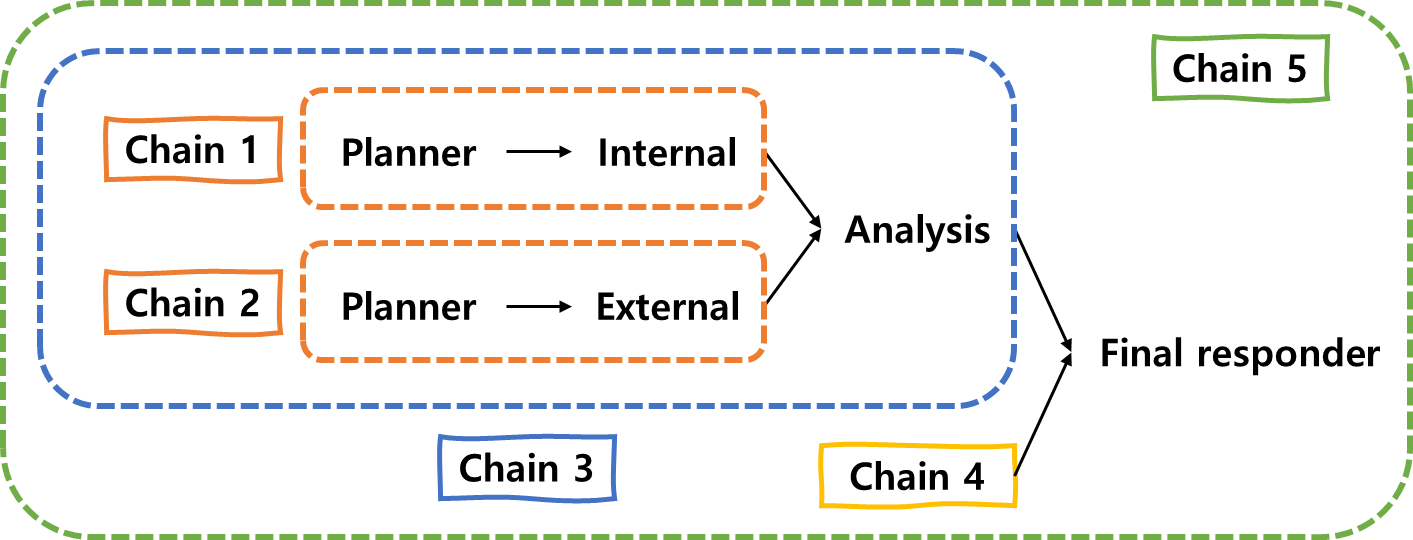
1. Create a new prompt to help your QA service.

**[Answer]**

Enter your code and result here. You must show your result (captured image or string).

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**2. [30pts]** **Implement a RAG multiple chain pipeline.** The purpose of this pipeline is to find information about stakeholders for a given project. **The pipeline contains five chains.** The details of the chains are shown in the below figure.



The implementation parameters are same as question 1 in text\_splitter, vectorstore, retriever, llm variables. The prompts for planner, internal and external are in the given ipynb file. You can use from\_tempate() method for them. But you have to use from\_messages() method for analysis and final\_responder. The specific messages are shown in the table below.

|  |  |
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| analysis | ("system", "Generate a stakeholder analysis map for a given project."),  ("human", "The details of a given project is following: {result3}"),  ("ai", "Internal stakeholders:\n{result1}\n\nExternal stakeholders:\n{result2}") |
| final\_responder | ("system", "Generate a final response given the information."),  ("ai", "{a\_response}"),  ("human", "Common pitfalls:\n{a\_pitfalls}") |

**Read the given ipynb file carefully and write all your codes and results here.**

**[Answer]**

Enter your code and result here. You must show your result (captured image or string).

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