ReAct Web Research Agent Report

ReAct Web Research Agent Report

i. How LLM is Used for Reasoning

This ReAct (Reasoning + Acting) agent integrates Googles Gemini LLM to simulate human-like reasoning during a multi-step research process. The reasoning step involves using the LLM to:

1. Generate Research Questions (Planning Phase):

- The Gemini model is prompted to generate 56 detailed, diverse, and relevant research questions based on a user-defined topic.

- The questions are formulated to cover various factual and analytical dimensions, ensuring broad coverage for deeper understanding.

2. Summarize Web Search Results:

- After web results are fetched using the Tavily API, Gemini is used again to process these raw results and synthesize a clear, concise summary.

- This step transforms scattered factual content into digestible insights, showcasing the reasoning ability of the LLM.

3. Draft a Comprehensive Conclusion:

- Gemini also synthesizes all the individual summaries and questions into a structured, multi-paragraph conclusion that reflects key findings and implications.

By guiding the LLM through explicit prompts and structuring each step, the agent leverages LLM reasoning to organize, summarize, and interpret web data intelligently.

ii. Code and Program Flow

The agent operates in the following structured phases:

1. Initialization

- The agent is initialized using API keys for:

- Google Gemini: for LLM-powered reasoning.

- Tavily: for real-time web search results.

- These are configured once and reused through the process.

2. Planning Phase: Generate Questions

- The generate_research_questions() method sends a prompt to Gemini asking it to create specific research questions about the topic.

- These questions are stored for later use.

3. Acting Phase: Search and Summarize

- For each generated question:

- Tavily performs an advanced web search.

- The top 5 results are fetched, and the title, URL, and content are extracted.

- Gemini is used again to summarize these results into 23 informative sentences.

4. Report Generation

- All questions, summaries, and top sources are compiled into a markdown-formatted report via generate_report().

- Gemini generates the final conclusion section, aggregating insights from all the questions.

5. Saving the Report

- The report can optionally be saved to a markdown file using save_report().

6. User Interaction

- A main() function handles interaction in Google Colab: API setup, input collection, and execution.

This agent demonstrates a clean ReAct loop: the LLM plans (generates questions), the agent acts (searches), and the LLM reasons again (summarizes and concludes), showcasing the synergy between reasoning and acting steps in modern AI workflows.

Github:
https://github.com/Varadharajan03/Agentic_AI_Workshop/blob/23113c902bce1bf4da07f9adce2c7ad5814929c9/Day%204/Web_Research_Agent_using_the_ReAct_Pattern.zip