Deep Research AI Agentic System

1. Project Overview

The **Deep Research AI Agentic System** is designed to automate online information gathering and response generation using **AI-powered agents**. The system consists of a **dual-agent approach**:

- **Research Agent:** Uses **Tavily** to crawl and gather information from the web.
- **Answer Drafter Agent:** Processes the collected data and generates structured responses.

The **LangGraph** and **LangChain** frameworks are used to coordinate these agents, ensuring smooth workflow orchestration and intelligent response formulation.

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2. Technologies Used

Technology	**Purpose**
Tavily	Web crawling & data extraction
LangChain	Language model integration & response generation
LangGraph	Orchestration of agent workflow
Python	Primary programming language
GitHub	Version control & collaboration

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3. System Architecture

The system follows a **modular design**, where each agent has a distinct responsibility:

1. **Research Agent**
   - Uses Tavily to perform **web crawling** and gather **relevant online data**.
   - Filters unnecessary data and stores relevant information.
2. **Answer Drafter Agent**
   - Uses **LangChain** to process gathered data.
   - Formulates a structured **response** based on context.
3. **LangGraph Role**
   - Connects both agents in a workflow.
   - Ensures smooth **interaction and decision-making** between the agents.

Workflow Diagram (Optional)

```
[ User Request ] → [ Research Agent (Tavily) ] → [ Processed Data ] →
[ Answer Drafter Agent (LangChain) ] → [ Final Response ]
```

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4. Implementation Details

Agent 1: Research Agent (Web Scraper)

- Fetches **real-time online information** using Tavily.
- Filters **unnecessary data** to keep only relevant details.

Agent 2: Answer Drafter (Response Generator)

- Takes the processed data and **structures a response**.
- Uses **LLMs (Language Models)** via LangChain for summarization.

LangGraph Role

- **Orchestrates interactions** between the two agents.
- Defines conditions and **task execution flow**.

LangChain Role

- Helps **LLMs** understand and summarize research data.
- Supports **NLP-based response generation**.

5.Installation & Setup

To set up the system, follow these steps:

Prerequisites

- Install **Python** (version 3.8+ recommended)
- Install the required dependencies

Run the following command:

```
pip install langchain tavily langgraph
```

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6. How to Run the System

Step 1: Clone the GitHub Repository

```
git clone https://github.com/nayera-hassan2/Deep-Research-AI-Agent.git
cd Deep-Research-AI-Agent
```

Step 2: Run the Python Script

```
python main.py
```

Step 3: Input Your Query

- The system will fetch relevant data and generate an answer.

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7. Results & Future Improvements

Current Outcomes

- Automated **real-time research** from web sources.
- AI-powered **structured response generation**.
- Modular agent-based architecture for **scalability**.

Future Enhancements

- Improve **data filtering** for better accuracy.
- Implement **multi-agent collaboration** for deeper insights.
- Add **memory & knowledge retention** for long-term research tasks.