FINAL PROJECT REPORT

Title

Autonomous Agentic AI for Research Paper Discovery and Summarization in Agriculture.

Submitted By

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1. Introduction

Recent advancements in Artificial Intelligence have led to the development of intelligent systems capable of autonomous reasoning and execution. Unlike traditional chatbots, Agentic AI systems can plan, execute multi-step tasks, use external tools, and maintain memory. This project focuses on designing an Autonomous Task-Oriented AI Agent that can independently complete a complex research task.

2. Problem Statement

Design an Agentic AI system that can autonomously plan and execute a multi-step task using external tools.
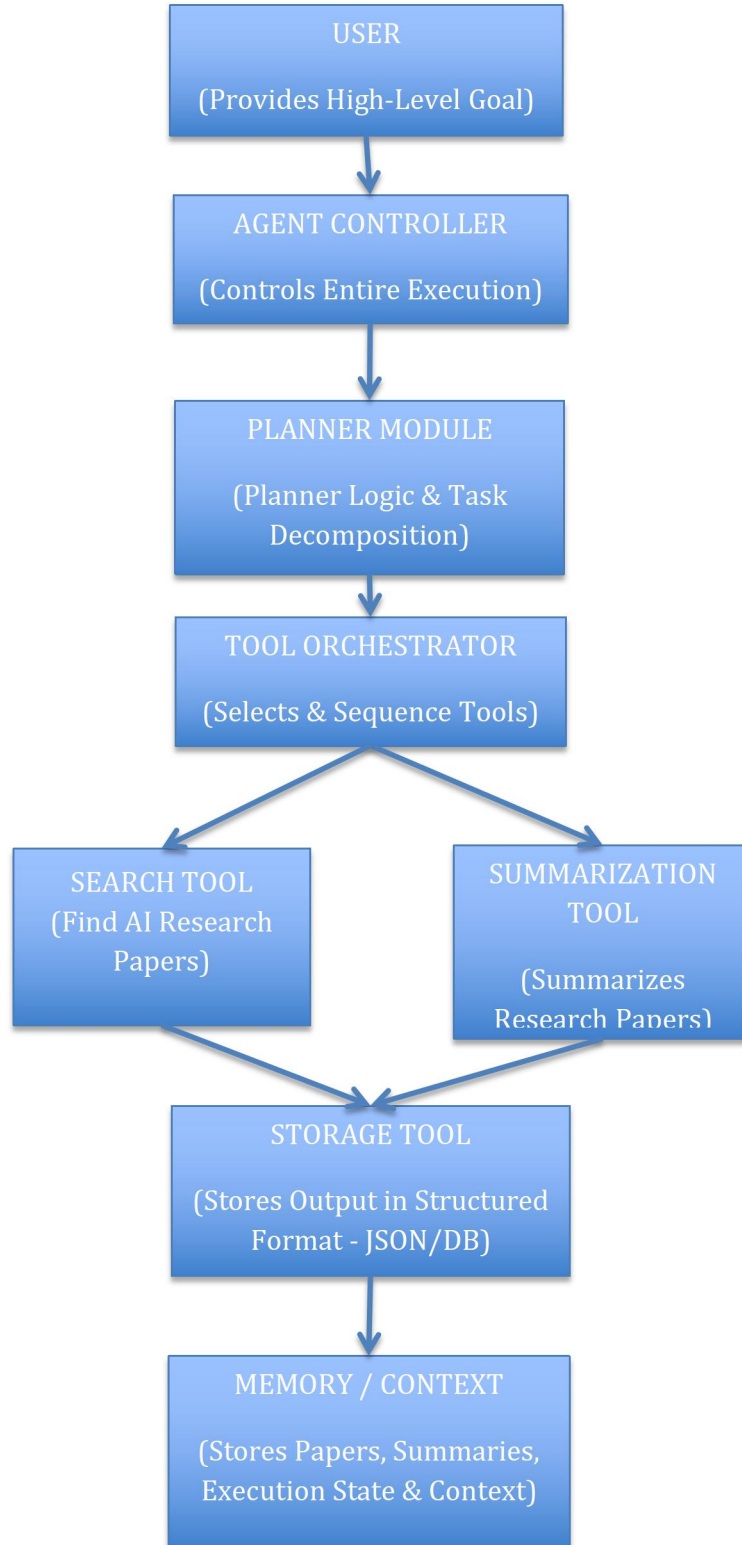
3. Scenario

The AI agent receives the goal: Find the top 3 recent AI research papers on agriculture, summarize them, and store the output in a structured format.

4. Objectives

• Design an autonomous Agentic AI system
• Implement task decomposition and planning
• Integrate external tools
• Maintain memory and context
• Generate structured output

5. System Architecture

```
┌─────────────────────────────────┐
│            USER                 │
│   (Provides High-Level Goal)    │
└─────────────────────────────────┘
                │
                ▼
┌─────────────────────────────────┐
│       AGENT CONTROLLER          │
│   (Controls Entire Execution)   │
└─────────────────────────────────┘
                │
                ▼
┌─────────────────────────────────┐
│       PLANNER MODULE            │
│   (Planner Logic & Task         │
│         Decomposition)          │
└─────────────────────────────────┘
                │
                ▼
┌─────────────────────────────────┐
│      TOOL ORCHESTRATOR          │
│   (Selects & Sequence Tools)    │
└─────────────────────────────────┘
         │                │
         ▼                ▼
┌──────────────┐   ┌──────────────┐
│ SEARCH TOOL  │   │ SUMMARIZATION│
│ (Find AI     │   │    TOOL      │
│  Research    │   │              │
│  Papers)     │   │ (Summarizes  │
│              │   │  Research    │
│              │   │  Papers)     │
└──────────────┘   └──────────────┘
         │                │
         ▼                ▼
┌─────────────────────────────────┐
│        STORAGE TOOL             │
│  (Stores Output in Structured   │
│     Format - JSON/DB)           │
└─────────────────────────────────┘
                │
                ▼
┌─────────────────────────────────┐
│      MEMORY / CONTEXT           │
│  (Stores Papers, Summaries,     │
│   Execution State & Context)    │
└─────────────────────────────────┘
```

6. Agent Workflow

1. User provides goal
2. Agent interprets goal
3. Planner decomposes tasks
4. Tools are selected and executed
5. Memory is updated
6. Structured output is generated

7. Task Decomposition

1. Search papers
2. Select top 3
3. Summarize papers
4. Store results

8. Tool Usage

Search Tool: Retrieves papers
Summarization Tool: Generates summaries
Storage Tool: Stores structured output
Memory Module: Maintains context

9. Memory Handling

Memory stores retrieved papers, summaries, and execution status to avoid repetition and ensure continuity.

10. Sample Output

{

"Research_Papers": [

{

"title": "AI for Crop Yield Prediction",

"year": 2024 },

{

"title": "Deep Learning in Precision Agriculture",

 "year": 2023 },

 {

 "title": "Computer Vision for Plant Disease Detection",

```
  "year": 2025,

  }

  ]

}
```

11. Conclusion

The project demonstrates an autonomous Agentic AI capable of reasoning, planning, tool usage, and memory handling.

12. Future Enhancements

• Integration with real APIs
• Advanced LLM summarization
• Multi-agent collaboration