Root Agent Task Description

Objective

To build a Root Agent using LangChain that integrates six specialized agents into a cohesive intelligent system. The Root Agent will parse incoming user queries, intelligently route them to the relevant agent(s), and synthesize the outputs into a unified, human-readable response.

Integrated Agents

Agent Name	Description
Information Retrieval Agent	Handles research tasks (e.g., "Summarize recent AI startups").
Data Analysis Agent	Processes structured data and performs analysis (e.g., "Analyze funding trends").
Task Automation Agent	Automates routine tasks like drafting emails or scheduling (e.g., "Draft an investment summary email").
Conversational Q&A Agent	Provides contextual, conversational responses (e.g., "Explain the analysis results simply").
Decision Support Agent	Evaluates options and makes recommendations (e.g., "Recommend the best AI startup to invest in").
Sentiment Analysis Agent	Analyzes textual data for sentiment or tone (e.g., "Analyze customer reviews").

Functionality

• Query Parsing: Break down complex user queries into sub-tasks and identify responsible agents.

• Intelligent Routing: Dynamically assign sub-queries to appropriate agents.

• Output Synthesis: Aggregate results from multiple agents into a single response.

• Error Handling: Manage invalid queries and handle tool errors gracefully.

Implementation Requirements

• Use LangChain's AgentExecutor with a custom prompt for routing.

• Register all agents as LangChain Tools.

• Use a standardized JSON I/O schema for all agents:

```
{
 "query": "...",
 "result": "...",
 "error": "null"
}
```

• Example Prompt Template:

> *Given a user query, determine which of the following agents to use:*
> *- Research*
> *- Data Analysis*
> *- Automation*
> *- Conversational*
> *- Decision Support*
> *- Sentiment Analysis*
>
> *Parse the query, route sub-queries to relevant agents, and combine their outputs into a final response.*

Example Query Workflow

Query: "Research AI startups, analyze their funding data, evaluate the best investment option, analyze customer sentiment, draft an email summarizing findings, and explain the results conversationally."

Sub-task	Routed Agent
Research AI startups	Information Retrieval Agent
Analyze funding data	Data Analysis Agent
Evaluate best investment option	Decision Support Agent
Analyze customer sentiment	Sentiment Analysis Agent
Draft email summarizing findings	Task Automation Agent
Explain results in simple terms	Conversational Q&A Agent

The final output should be a structured, readable response combining all the information from different agents into a coherent summary.

Deliverables

1. Functional Root Agent: Python code using LangChain that routes and synthesizes multi-agent queries.

2. Demo Script: Demonstration of Root Agent handling at least three complex queries:

- • Research AI trends, visualize their impact, and draft a report.
- • Analyze product feedback, recommend improvements, and explain findings.
- • Compare marketing campaigns, analyze their sentiment, and schedule a presentation.

3. Documentation:

• Architecture overview
• Input/output formats
• Agent descriptions
• Integration strategy

4. Test Cases:

• Standard multi-intent queries
• Edge cases: ambiguous input, missing data, tool failures

Appendix: Architecture Overview

• LangChain AgentExecutor

• Tool registration for all six agents

• Custom PromptClassifier for routing logic

• Output Aggregator for final response synthesis