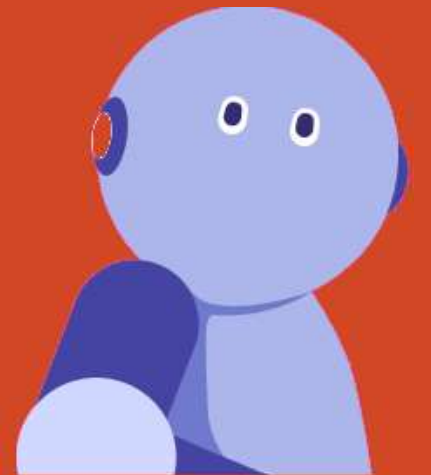# LLM Agents

-Pavan Balaji Nanjundappa

Agents are LLM-powered knowledge assistants that use tools to perform tasks like research, data extraction, and more. Agents range from simple question-answering to being able to sense, decide and take actions in order to complete tasks.

A Tool is a function given to the LLM. This function should fulfill a clear objective

Tool	Description
Web Search	Allows the agent to fetch up-to-date information from the internet.
Image Generation	Creates images based on text descriptions.
Retrieval	Retrieves information from an external source.
API Interface	Interacts with an external API (GitHub, YouTube, Spotify, etc.).

Agents work in a continuous cycle of: thinking (Thought) → acting (Act) and observing (Observe)

- Thought: The LLM part of the Agent decides what the next step should be.

- Action: The agent takes an action, by calling the tools with the associated arguments.

- Observation: The model reflects on the response from the tool.

ReAct approach : concatenation of "Reasoning" (Think) with "Acting" (Act)

Types of Agent Actions:

Type of Agent	Description
JSON Agent	The Action to take is specified in JSON format.
Code Agent	The Agent writes a code block that is interpreted externally.
Function-calling Agent	It is a subcategory of the JSON Agent which has been fine-tuned to generate a new message for each action.

In the **observation phase**, the agent:

- **Collects Feedback:** Receives data or confirmation that its action was successful (or not).

- **Appends Results:** Integrates the new information into its existing context, effectively updating its memory.

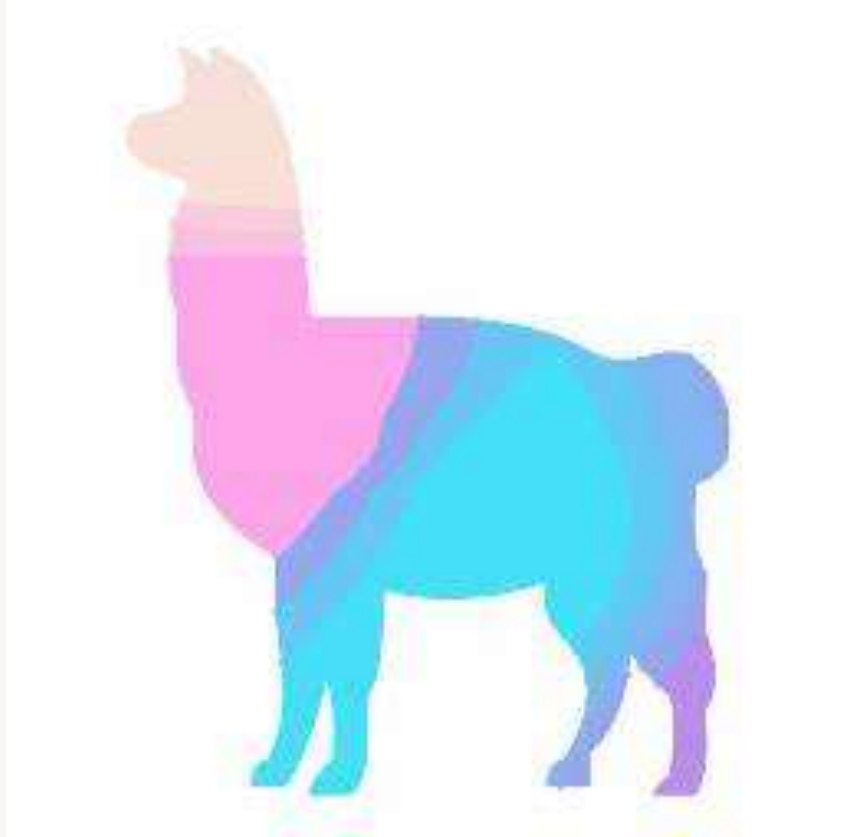- **Adapts its Strategy:** Uses this updated context to refine subsequent thoughts and actions.

Type of Observation	Example
System Feedback	Error messages, success notifications, status codes
Data Changes	Database updates, file system modifications, state changes
Environmental Data	Sensor readings, system metrics, resource usage
Response Analysis	API responses, query results, computation outputs
Time-based Events	Deadlines reached, scheduled tasks completed

Libraries:

- smolagents

- Llamaindex

- **LangGraph**

Key parts of **LlamaIndex**:

- **Components:** The foundational elements in LlamaIndex, like prompts, models, and databases, that integrate it with tools and libraries.

- **Tools:** Specialized components providing capabilities like searching, calculating, or accessing services, enabling agents to perform tasks.

- **Agents:** Autonomous entities that use tools and make decisions to achieve complex goals.

- **Workflows:** Structured step-by-step processes that organize logic and agentic behavior without explicitly using agents.

Demo