Research Automation Project using Multi-Agent LangGraph

Introduction to LangGraph

LangGraph: A specialized library within the LangChain ecosystem.

Focuses on creating stateful multi-agent systems.

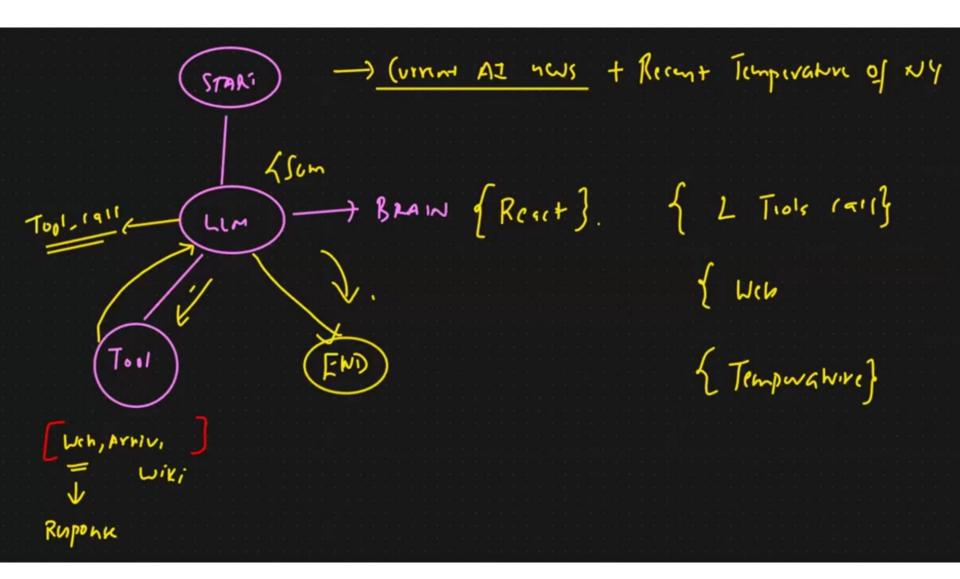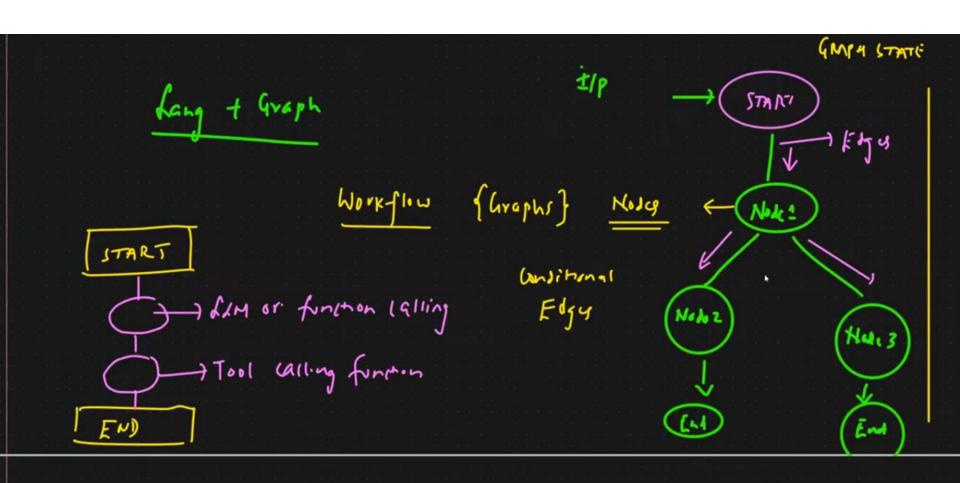Ideal for managing complex, non-linear workflows.

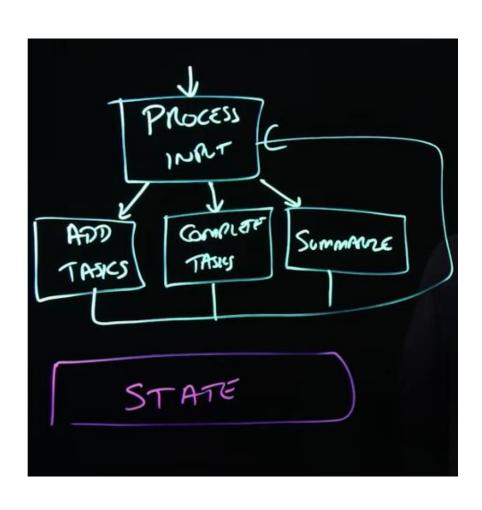| LangChain	Feature	LangGraph
LLM Apps	Primary Focus	Multi Agent
Chain	Structure	Graph
Memory, Prompt, LLM Agent	Components	Nodes, Edges, State
Limited	State Mgmt.	Robust
SEQ	Use Cases	Complex

Most important concepts in LangGraph

Nodes: Function/Runnable that CHANGES the state and RETURNS the state

Edges: Defines Connection & Flow between nodes (Conditional edges allow for conditional routing)

State: Data passed and changed from nodes

START $\longrightarrow$ Current AI news + Recent Temperature of NY

$\{Sum$

LLM $\longrightarrow$ BRAIN $\{React\}$. $\{$ 2 Tools call $\}$

Tool-call

$\{$ Web

$\{Temperature\}$

Tool

END

[Web, Archive]
   $=$ Wiki
$\downarrow$

Response

Lang + Graph

I/p → START

→ Edges
↓

Workflow   {Graphs}   Nodes   ← Node 1

START

→ LLM or function calling

→ Tool calling function

END

Conditional
Edges

Node 2

Node 3

End

End

LangGraph Workflow Overview

Task Management Assistant Example

Workflow Overview:

- Process Inputs: LLM processes user input to determine intent and routes to appropriate action node.

- Action Nodes:

  - Add Tasks: Inserts new tasks into the state.

  - Complete Tasks: Updates tasks to 'finished'.

  - Summarize Tasks: Generates a summary of tasks using an LLM.

State Component

Purpose: Maintains task list across all interactions.

Key Features:

- Accessible by all nodes.

- Allows for context-aware decision-making.

Ensures interaction continuity.

Features of LangGraph

- Supports flexible workflows with stateful agents.

- Handles user requests in any order dynamically.

- Returns to the Process Input Node after every action.

Benefits

- Simplifies creation of stateful multi-agent systems.

- Enables non-linear workflows for diverse applications.

- Ensures contextual continuity with robust state management.

Conclusion

- LangGraph enables developers to create dynamic and adaptable assistants.

- Ideal for handling complex, multi-step interactions efficiently.

Hands-On Components

- Setting Up Tools:

  - Install necessary libraries: `langchain_community`, `langgraph`, etc.

  - Use API keys for tools like Anthropic and Tavily.

- Defining Agents:

  - Agents with specific roles and tools (e.g., Python execution, data search).

- Defining the Graph:

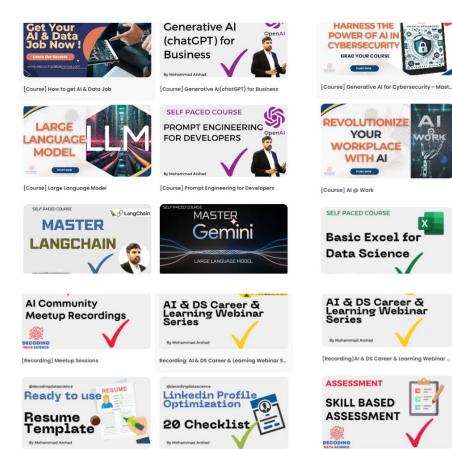 - Create a workflow with nodes and edges to automate tasks.

Demo Workflow

- Example Task:

  - Input: "Get USA's GDP over the past 5 years and generate a line chart."

  - Steps:

    1. Researcher gathers GDP data.

    2. Chart Generator creates a visualization.

    3. Final output shared with the user.

- Add Visual of Generated Chart (Page 5 from the uploaded file).

Key Takeaways

- Efficient Research Automation:

  - Simplifies complex tasks through multi-agent collaboration.

- Customizable Framework:

  - Adapt workflows for academic, business, or industrial research needs.

- Interactive Exploration:

  - Combine agents to extend functionality beyond basic automation.
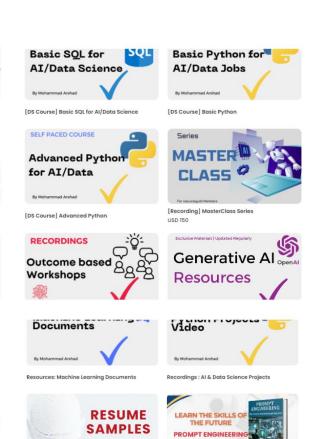
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