Introduction to LangGraph: A Beginner's Guide

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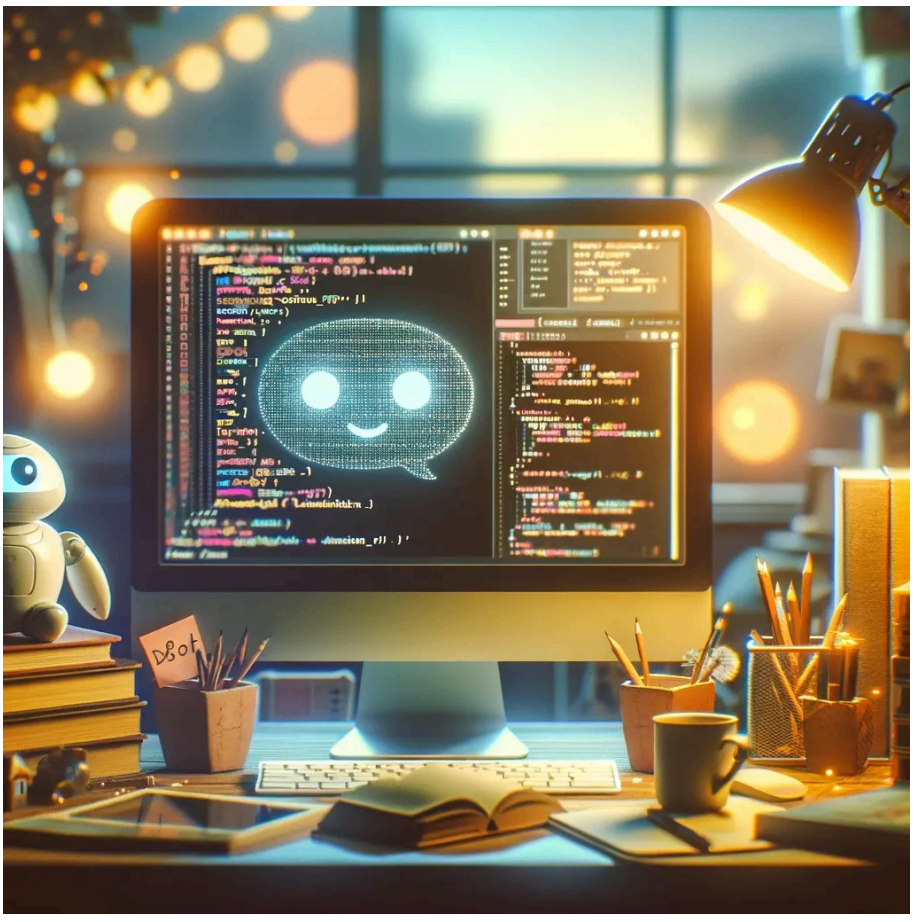

LangGraph is a powerful tool for building stateful, multi-actor applications with Large Language Models (LLMs). It extends the LangChain library, allowing you to coordinate multiple chains (or actors) across multiple steps of computation in a cyclic manner. In this article, we'll introduce LangGraph, walk you through its basic concepts, and share some insights and common points of confusion for beginners.

What is LangGraph?

LangGraph is a library built on top of LangChain, designed to add cyclic computational capabilities to your LLM applications. While LangChain allows you to define chains of computation (Directed Acyclic Graphs or DAGs), LangGraph introduces the ability to add cycles, enabling more complex, agent-like behaviors where you can call an LLM in a loop, asking it what action to take next.

Key Concepts

- **Stateful Graph:** LangGraph revolves around the concept of a stateful graph, where each node in the graph represents a step in your computation, and the graph maintains a state that is passed around and updated as the computation progresses.
- **Nodes:** Nodes are the building blocks of your LangGraph. Each node represents a function or a computation step. You define nodes to perform specific tasks, such as processing input, making decisions, or interacting with external APIs.
- **Edges:** Edges connect the nodes in your graph, defining the flow of computation. LangGraph supports conditional edges, allowing you to dynamically determine the next node to execute based on the current state of the graph.

A Simple Example

Let's walk through a simple example where we use LangGraph to classify user input as either a "greeting" or a "search" query and respond accordingly.

Step 1: Define the Graph State

First, we define the state structure for our graph. In this example, our state includes the user's question, the classification of the question, and a response.

```
from typing import Dict, TypedDict, Optional
class GraphState(TypedDict):
    question: Optional[str] = None
    classification: Optional[str] = None
    response: Optional[str] = None
```

Step 2: Create the Graph

Next, we create a new instance of `StateGraph` with our `GraphState` structure.

```
from langgraph.graph import StateGraph
```

```
workflow = StateGraph(GraphState)
```

Step 3: Define Nodes

We define nodes for classifying the input, handling greetings, and handling search queries.

```
def classify_input_node(state):
    question = state.get('question', '').strip()
    classification = classify(question)  # Assume a function that classifies the
    return {"classification": classification}
def handle_greeting_node(state):
    return {"response": "Hello! How can I help you today?"}
def handle_search_node(state):
    question = state.get('question', '').strip()
    search_result = f"Search result for '{question}'"
    return {"response": search_result}
```

Step 4: Add Nodes to the Graph

We add our nodes to the graph and define the flow using edges and conditional edges.

```
workflow.add_node("classify_input", classify_input_node)
workflow.add_node("handle_greeting", handle_greeting_node)
workflow.add_node("handle_search", handle_search_node)

def decide_next_node(state):
    return "handle_greeting" if state.get('classification') == "greeting" else "
workflow.add_conditional_edges(
    "classify_input",
    decide_next_node,
    {
        "handle_greeting": "handle_greeting",
        "handle_search": "handle_search"
    }
)
```

Step 5: Set Entry and End Points

We set the entry point for our graph and define the end points.

```
workflow.set_entry_point("classify_input")
workflow.add_edge('handle_greeting', END)
workflow.add_edge('handle_search', END)
```

Step 6: Compile and Run the Graph

Finally, we compile our graph and run it with some input.

```
app = workflow.compile()
inputs = {"question": "Hello, how are you?"}
result = app.invoke(inputs)
print(result)
```

Common Confusions

- **State Management:** Understanding how the state is passed around and updated in the graph can be tricky. Remember that each node receives the current state, can modify it, and passes it on to the next node.
- **Conditional Edges:** Setting up conditional edges requires careful consideration of the conditions and the mapping of outcomes to the next nodes. Ensure that the keys returned by the condition function match the keys in the conditional edge mapping.
- **Dead-End Nodes:** Every node in the graph should have a path leading to another node or to the `END` node. If a node has no outgoing edges, it's considered a dead-end, and you'll need to add an edge to avoid errors.

Conclusion

LangGraph is a versatile tool for building complex, stateful applications with LLMs. By understanding its core concepts and working through simple examples, beginners can start to leverage its power for their projects. Remember to pay attention to state management, conditional edges, and ensuring there are no dead-end nodes in your graph. Happy coding!

Langchain | Llm | AI | Chatbots | Python

Written by CPlog

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AI enthusiast & Principal Data Scientist at LFX & Li & Fung. I innovate with LLMs, LangChain, Stable Diffusion & ComfyUI to revolutionize supply chains.

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Thomas Modern

What are your thoughts?

Kiss Tibor (Cloud Mentor) he/him
Sep 20, 2024

Great introduction. Code does not work

11 2 replies Reply

TELIKICHERLA R.K.KAMESWARA SARMA
Jul 22, 2024

what does classify() do in this ? it functionality missing in the article. How do we classify it as Search/greeting? Please help on classify(question)

20 3 replies Reply

Abubakar
Nov 22, 2024

Executable code:

from typing import Dict, TypedDict, Optional

from langgraph.graph import StateGraph, END

class GraphState(TypedDict, total=False):

question: str

classification: str

response: str

def classify(question: str) -> str:

return "greeting" if... more

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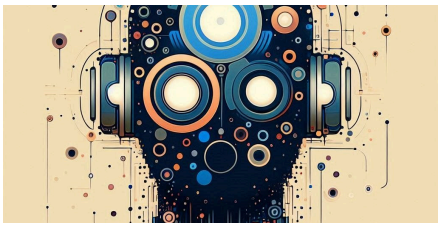

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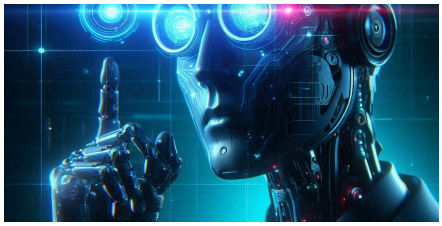

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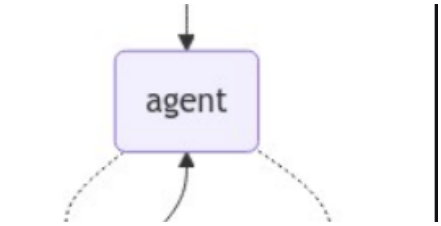

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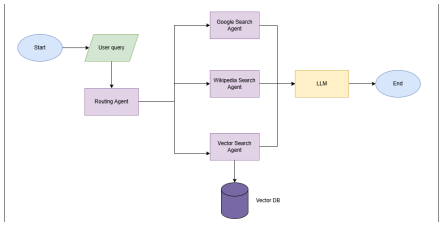

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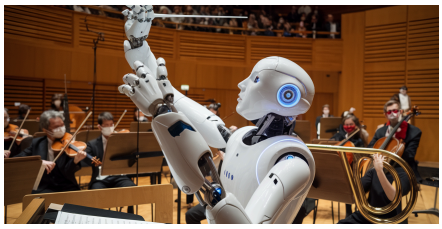

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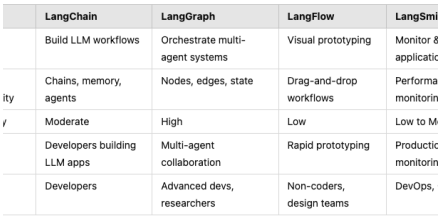

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/	Moderate	High	Low	Low to M
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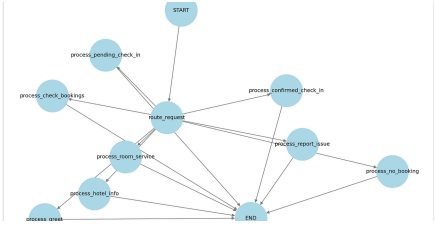

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