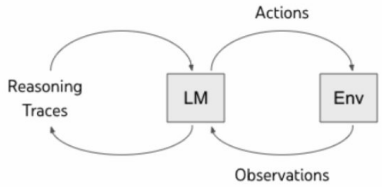
LangChain

DeepLearning.AI

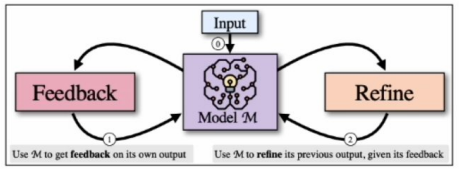
LangGraph supports Cyclic Graphs



ReAct (Reason + Act)

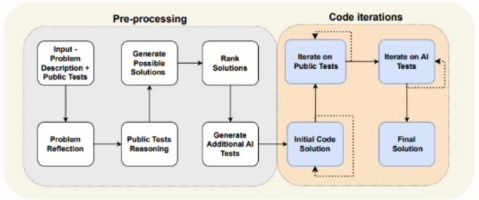
REACT: SYNERGIZING REASONING AND ACTING IN LANGUAGE MODELS

https://arxiv.org/pdf/2210.03629.pdf



SELF-REFINE:
Iterative Refinement with Self-Feedback

https://arxiv.org/pdf/2303.17651.pdf



(a) The proposed AlphaCodium flow.

Code Generation with AlphaCodium: From Prompt Engineering to Flow Engineering

https://arxiv.org/pdf/2401.08500.pdf

LangChain

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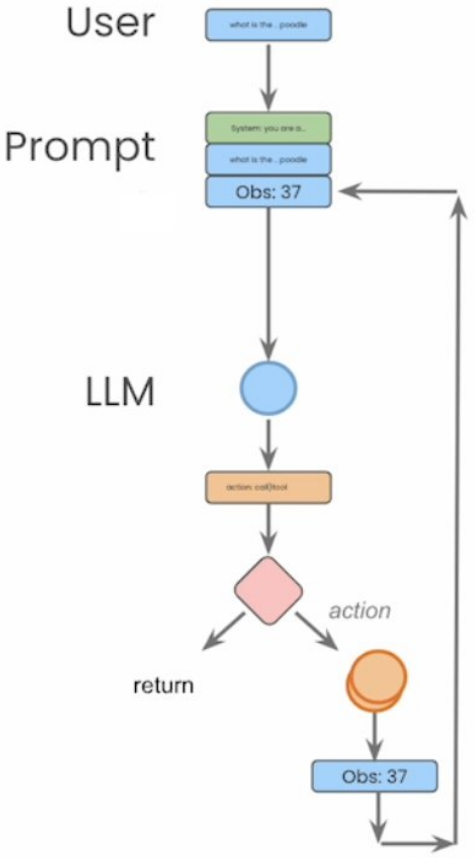
Break Down



"""
System:
You run in a loop of Thought, Action, PAUSE, Observation.
…
Your available actions are:

calculate:
e.g. calculate: 4 * 7 / 3
…
Example session:
…
User:
… weight of collie…

'**Thought:** To find the combined weight of a Border Collie and a Scottish Terrier, I need to first find the average weight of each breed and then add those weights together.
Action: average_dog_weight: Border Collie\n PAUSE'

Observation: a Border Collies average weight is 37 lbs

```
def query(question, max_turns=5):
    i = 0
    bot = Agent(prompt)
    next_prompt = question
    while i < max_turns:
        i += 1
        result = bot(next_prompt)
        print(result)
        actions = [action_re.match(a) for a in result.split('\n') if action_re.match(a)]
        if actions:
            # There is an action to run
            action, action_input = actions[0].groups()
            if action not in known_actions:
                raise Exception("Unknown action: {}: {}".format(action, action_input))
            print(" -- running {} {}".format(action, action_input))
            observation = known_actions[action](action_input)
            print("Observation:", observation)
            next_prompt = "Observation: {}".format(observation)
        else:
            return
```

```
def calculate(what):
    return eval(what)

def average_dog_weight(name):
    if name in "Scottish Terrier":
        return("Scottish Terriers average 20 lbs")
    elif name in "Border Collie":
        return("a Border Collies average weight is 37
lbs")
    elif name in "Toy Poodle":
        return("a toy poodles average weight is 7 lbs")
    else:
        return("An average dog weights 50 lbs")
```

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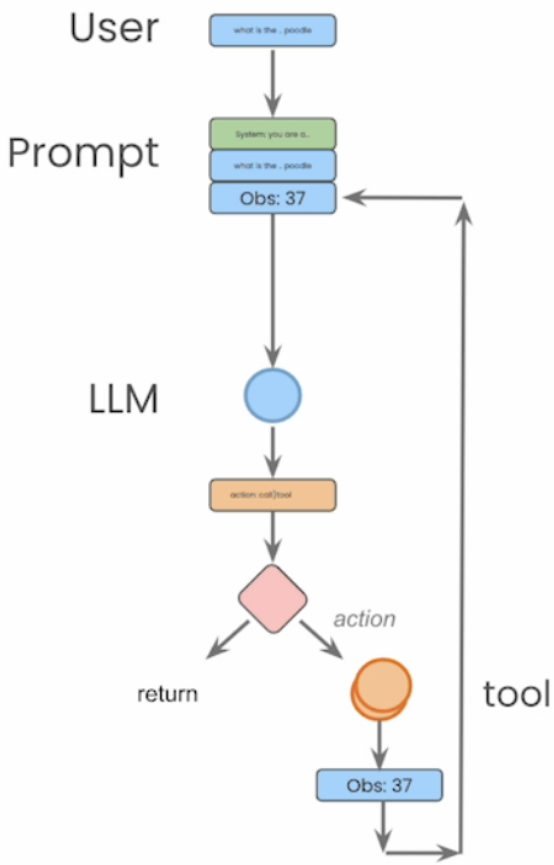
LangChain: Prompts



Prompt templates allow reusable prompts

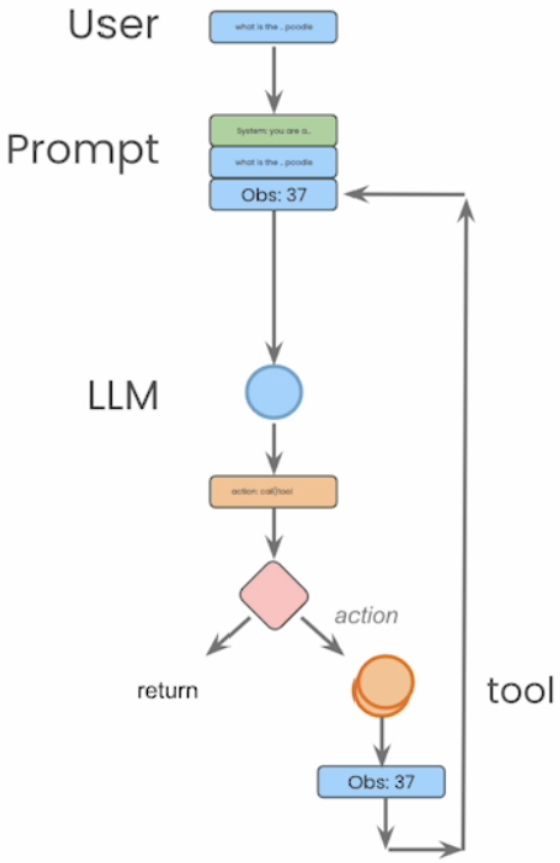
```
from langchain.prompts import PromptTemplate
prompt_template = PromptTemplate.from_template(
  "Tell me a {adjective} joke about {content}."
```

There are also prompts for agents available in the hub:

```
prompt = hub.pull("hwchase17/react")
```

https://smith.langchain.com/hub/hwchase17/react

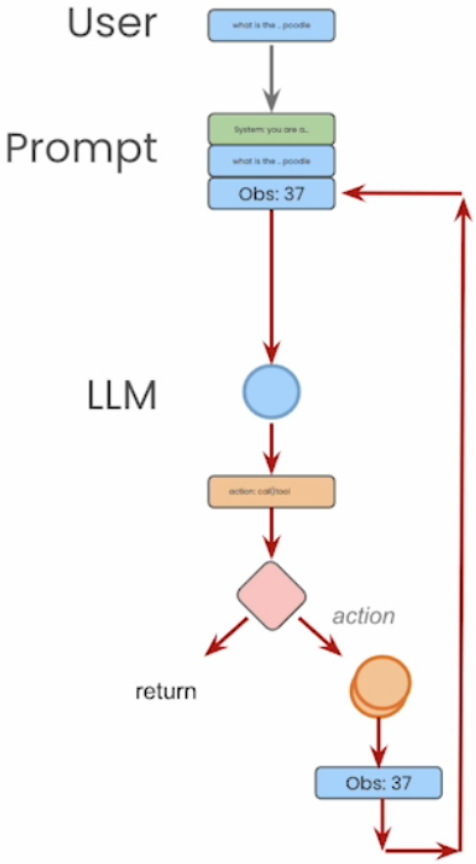
LangChain: Tools




```
# get a tool from the library
from langchain_community.tools.tavily_search import \
TavilySearchResults
tool = TavilySearchResults(max_results=2)

self.tools = {t.name: t for t in tools}
self.model = model.bind_tools([tool])
```

New in LangGraph



- Cyclic Graphs
- Persistence
- Human-in-the-loop

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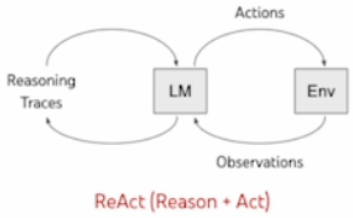
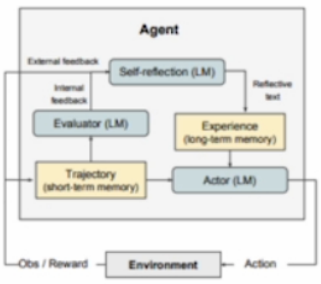
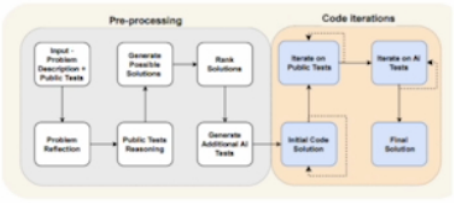
Graphs



ReAct (Reason + Act)





(a) The proposed AlphaCodium flow.

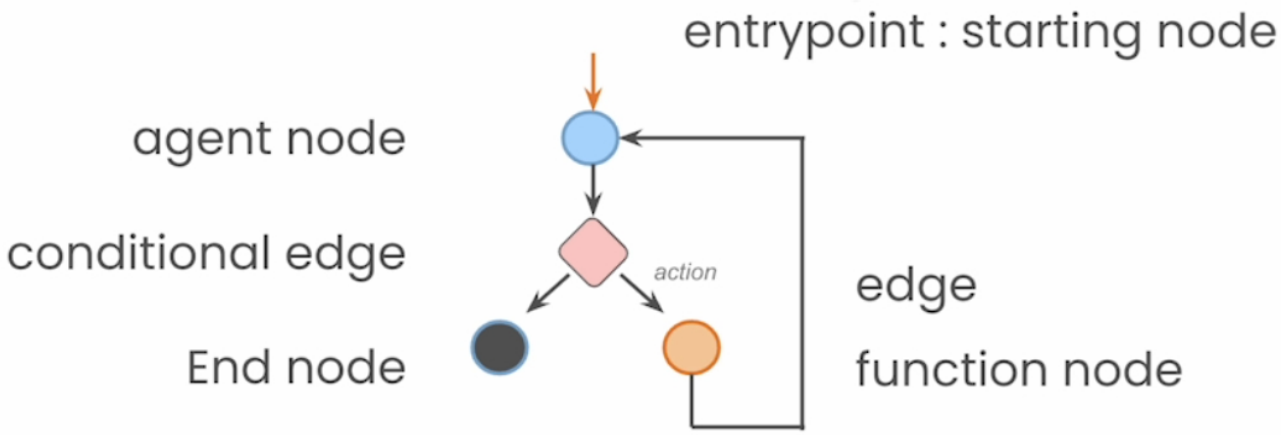
- LangGraph is an extension of LangChain that supports graphs.
- Single and Multi-agent flows are described and represented as graphs.
- Allows for extremely controlled “flows”
- Built-in persistence allows for human-in-the-loop workflows

Graphs

Nodes: Agents or functions

Edges: connect nodes

Conditional edges: decisions



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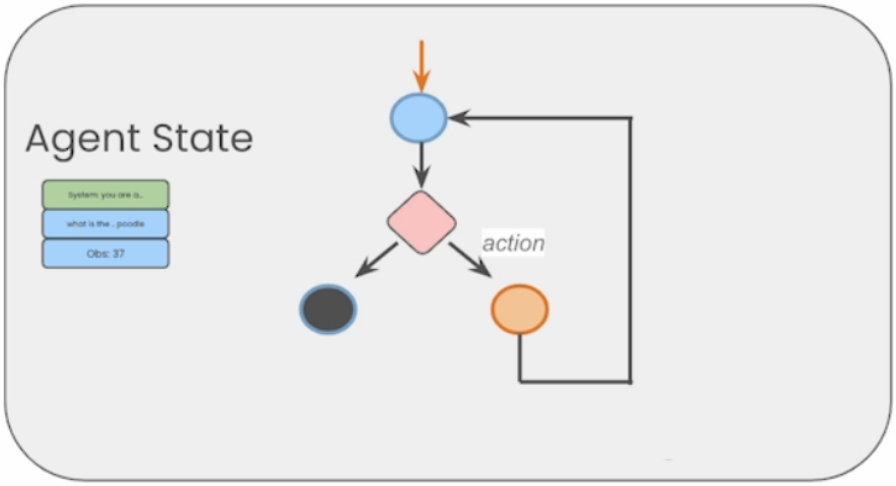
Data/State



- Agent State is accessible to all parts of the graph
- It is local to the graph
- Can be stored in a persistence layer

Simple

```
class AgentState(TypedDict):
    messages: Annotated[Sequence[BaseMessage], operator.add]
```

Complex

```
class AgentState(TypedDict):
    input: str
    chat_history: list[BaseMessage]
    agent_outcome: Union[AgentAction, AgentFinish, None]
    intermediate_steps: Annotated[list[tuple[AgentAction, str]], operator.add]
```

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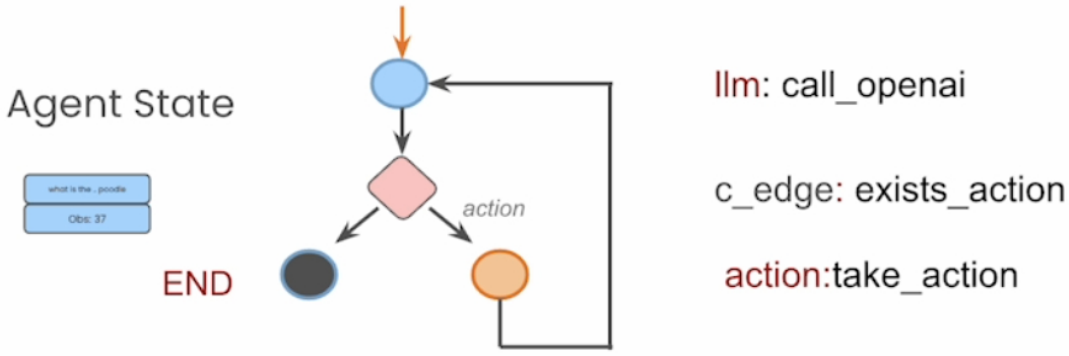
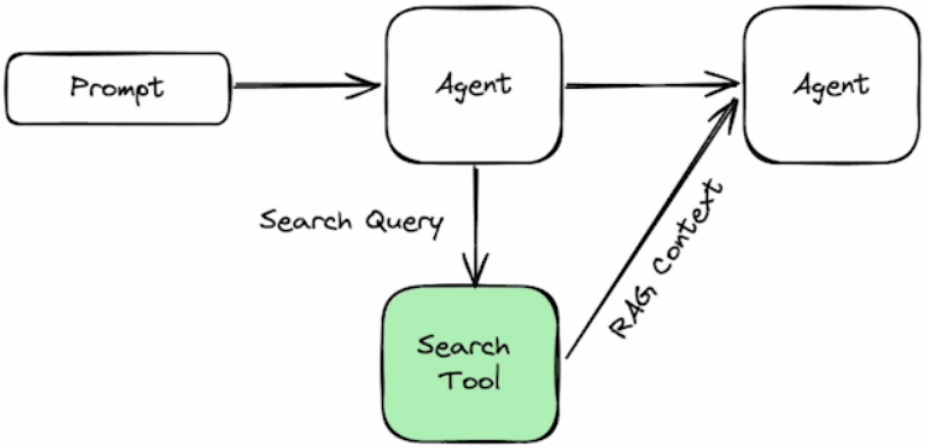
CODE



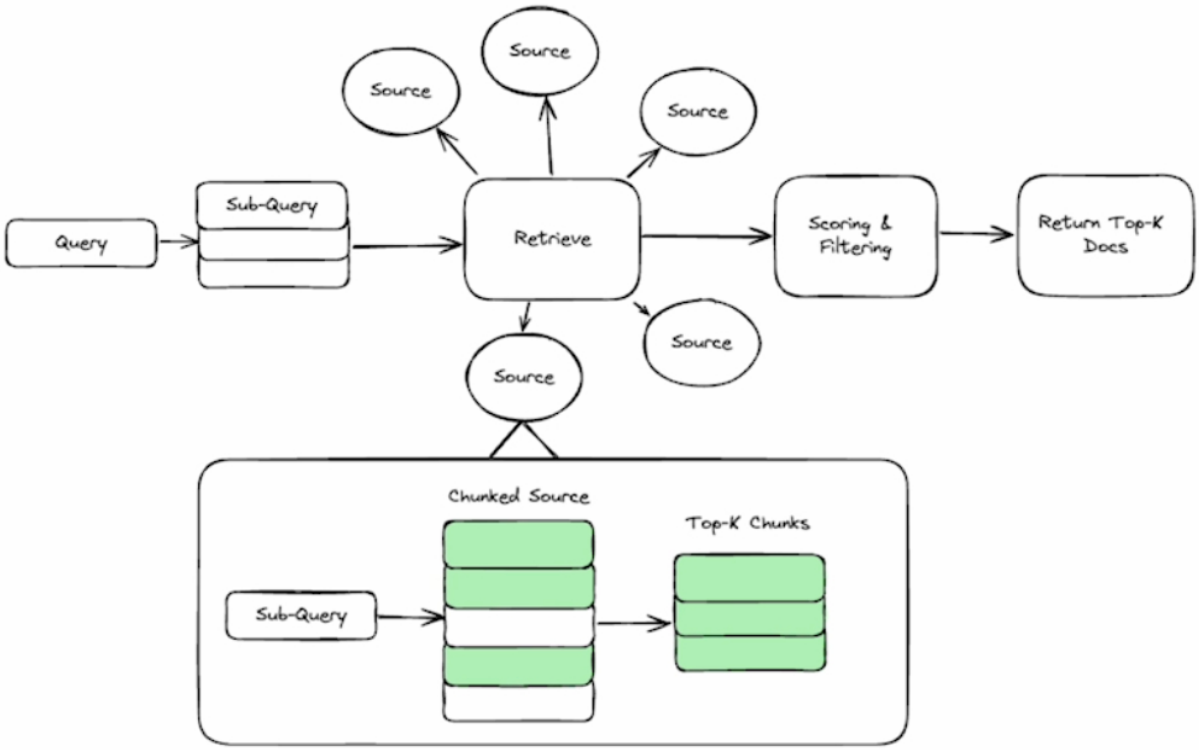
State

```
class AgentState(TypedDict):
    messages: Annotated[list[AnyMessage], operator.add]
```

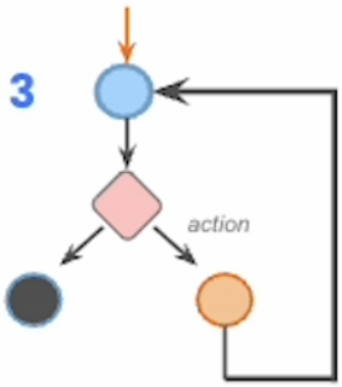
Why Search Tool



Inside a Search Tool



State Memory



Memory

state 3

state 2

state 1

state 0

StateSnapshot: { AgentState, useful_things}

{ .., thread, thread_ts..}

```
config={'configurable': {'thread_id': '1',
                         'thread_ts': '1ef17b36-ed06-6185-8001-15cf75dea535'}}
```

LangChain

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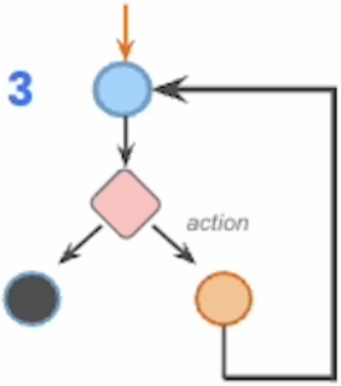
State Memory



Memory

state 3

state 2

state 1

state 0

config={'configurable': {'thread_id': '1'}}

g.get_state(thread)

state 3

Returns 'current state'

LangChain

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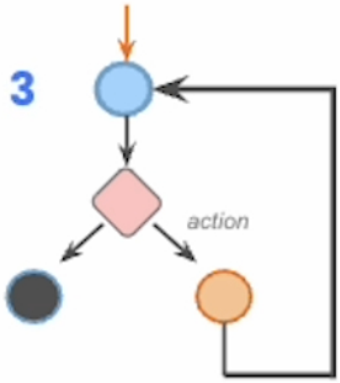
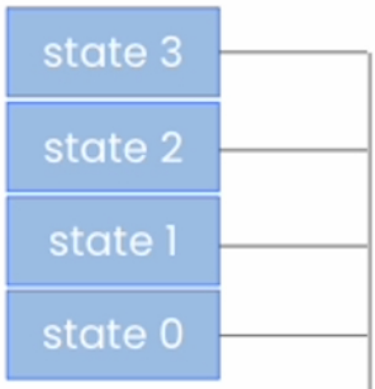
State Memory



Memory



g.get_state_history(thread)

Returns iterator over all StateSnapshots

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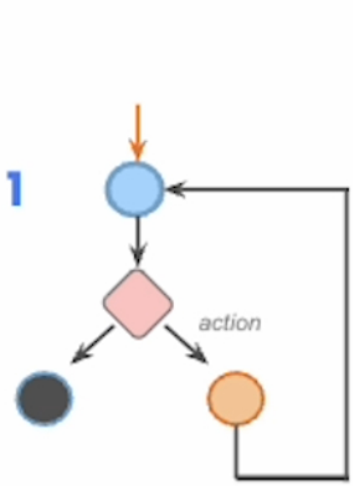
State Memory



Memory

g.invoke(None,{ .., thread, thread_ts..})
g.stream(None,{ .., thread, thread_ts..})

state 1

runs with state 1 as starting point
Time Travel

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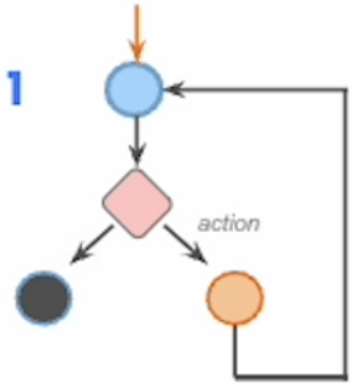
State Memory



Memory

state 3
state 2
state 1
state 0

without thread_ts

g.invoke(None,{ .., thread})
g.stream(None,{ .., thread})

state 3

Uses current state as starting point

LangChain

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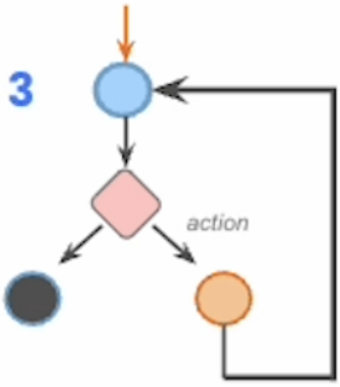
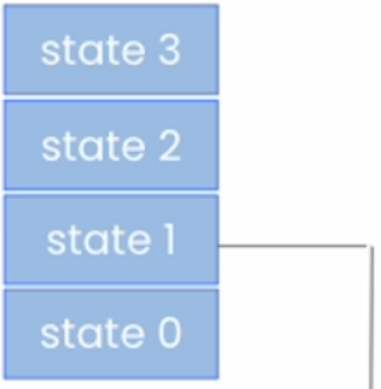
State Memory



Memory



g.get_state({thread, thread_ts})

state 1

Returns 'thread_ts state-snapshot'

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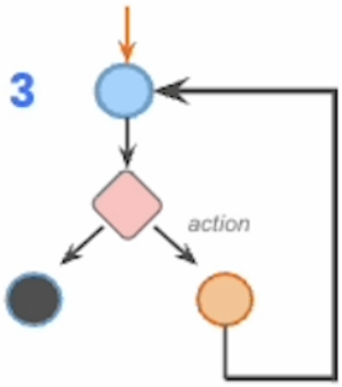
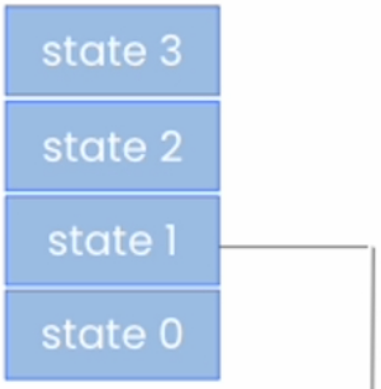
State Memory



Memory



g.get_state({thread, thread_ts})

modify it

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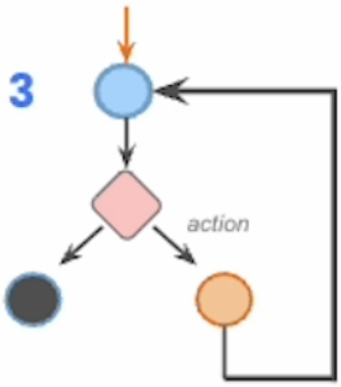
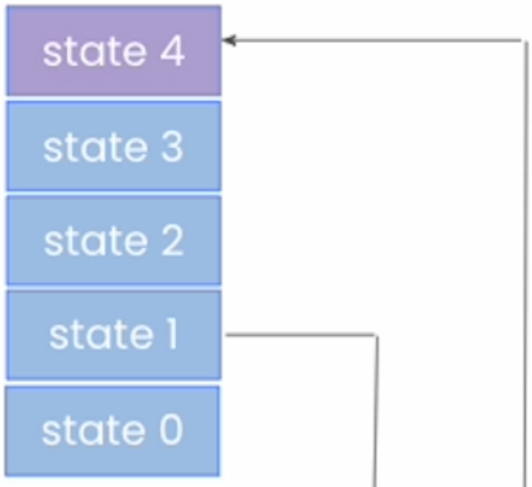
State Memory



Memory



g.get_state({thread, thread_ts})

modify it

g.update_state(thread, state1m.values)

run it g.stream(None, thread)

LangChain

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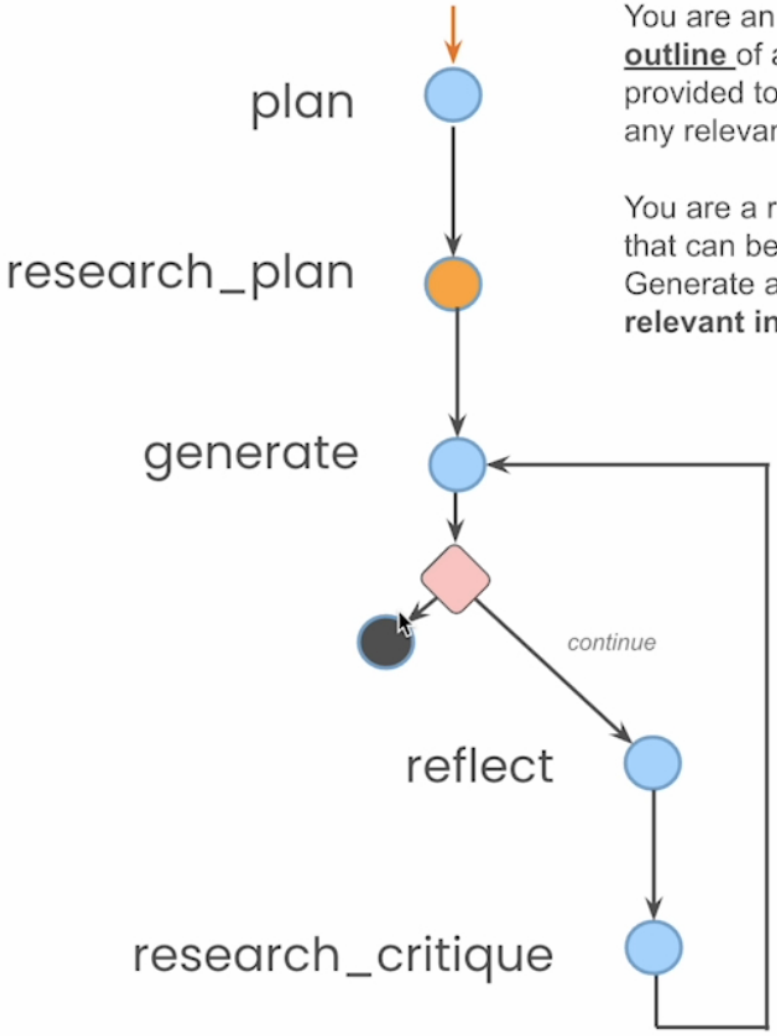
Essay Writer

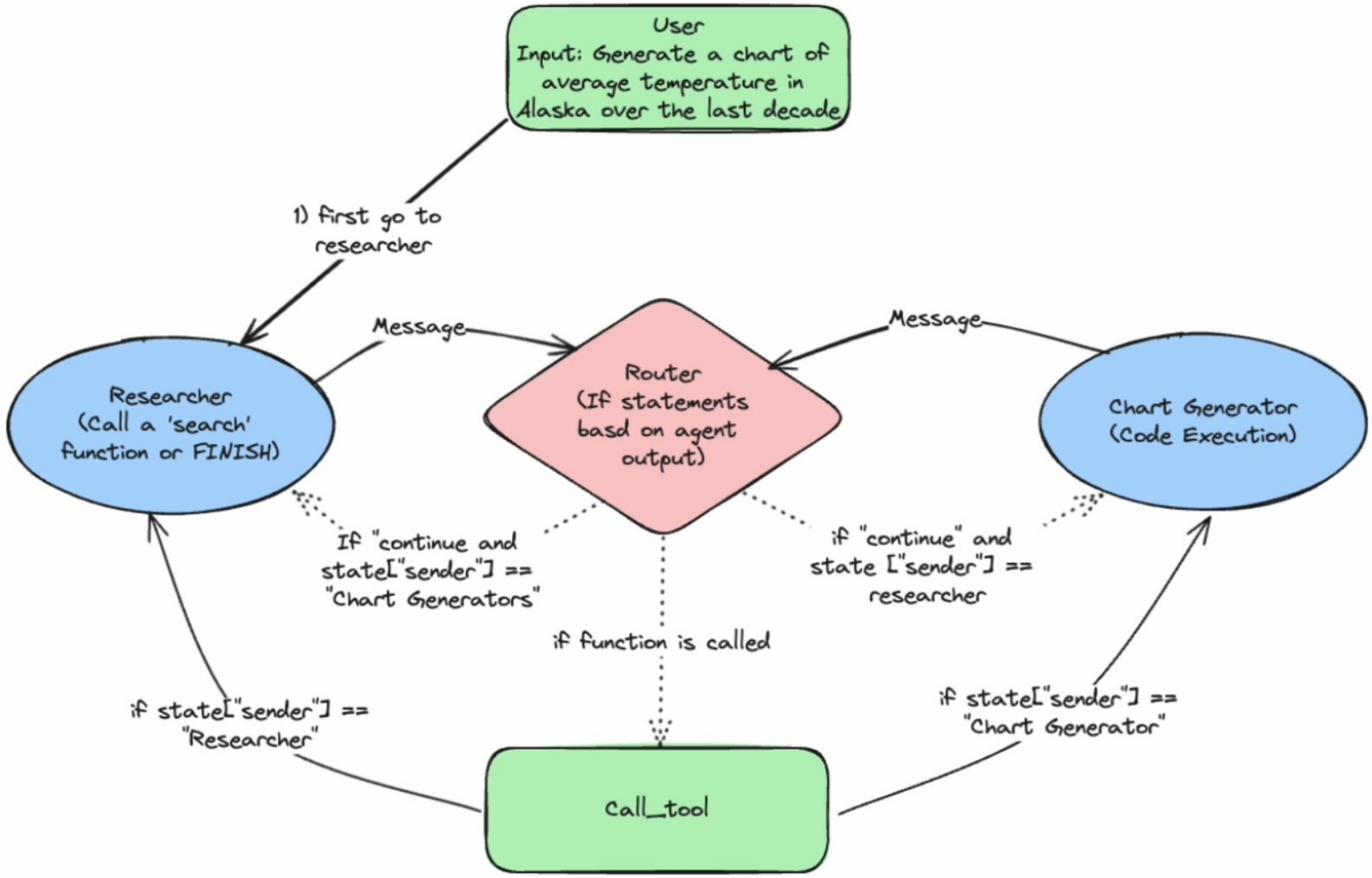


You are an expert writer tasked with writing a **high level outline** of an essay. Write such an outline for the user provided topic. Give an outline of the essay along with any relevant notes or instructions for the sections.

You are a researcher charged with providing information that can be used when writing the following essay. Generate a list of **search queries that will gather any relevant information.** Only generate 3 queries max.

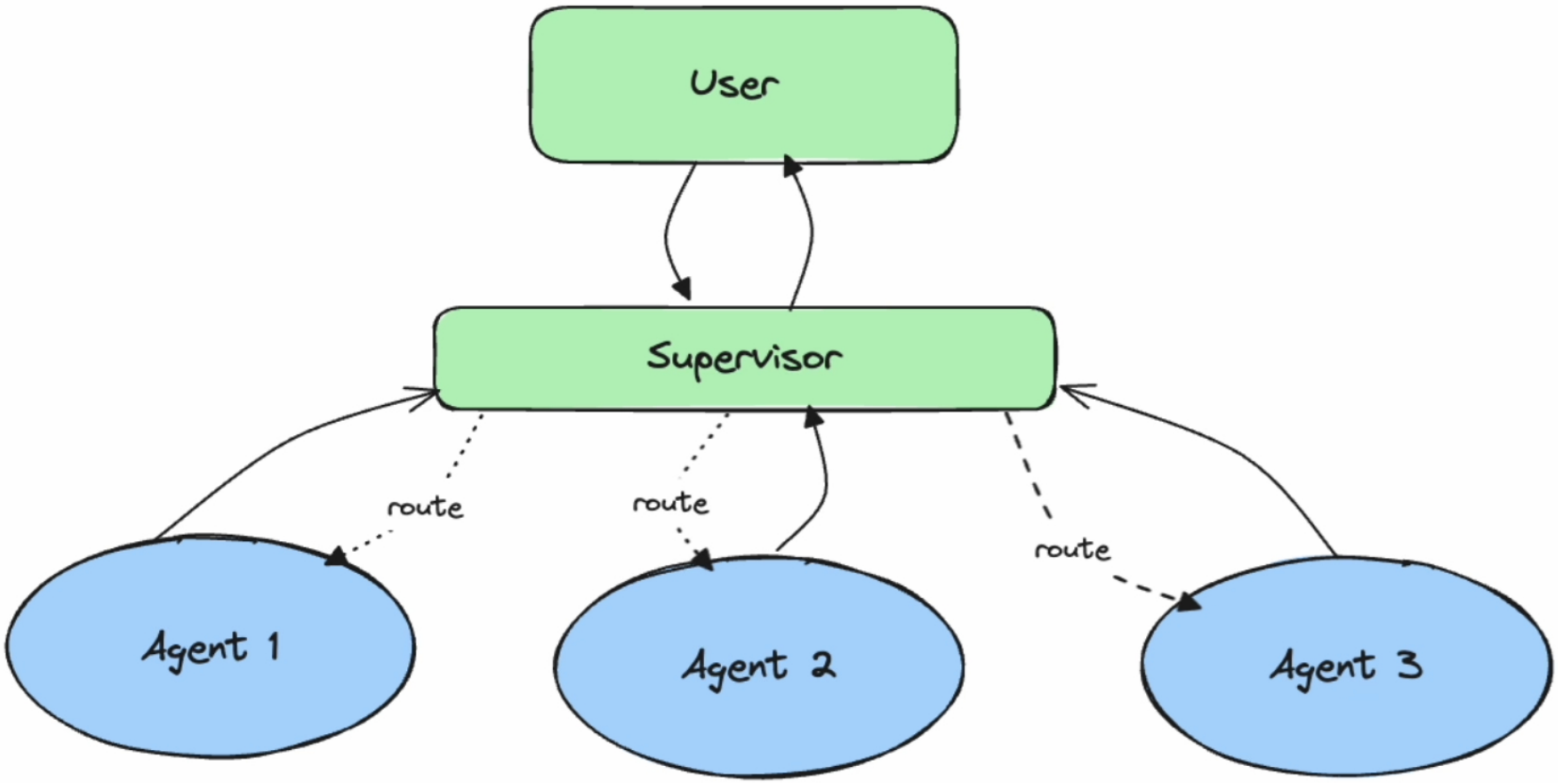
You are an essay assistant tasked with **writing excellent 5-paragraph essays.**Generate … If the **user provides critique, respond with a revised version** of your previous attempts. Utilize information:

Multi-Agent



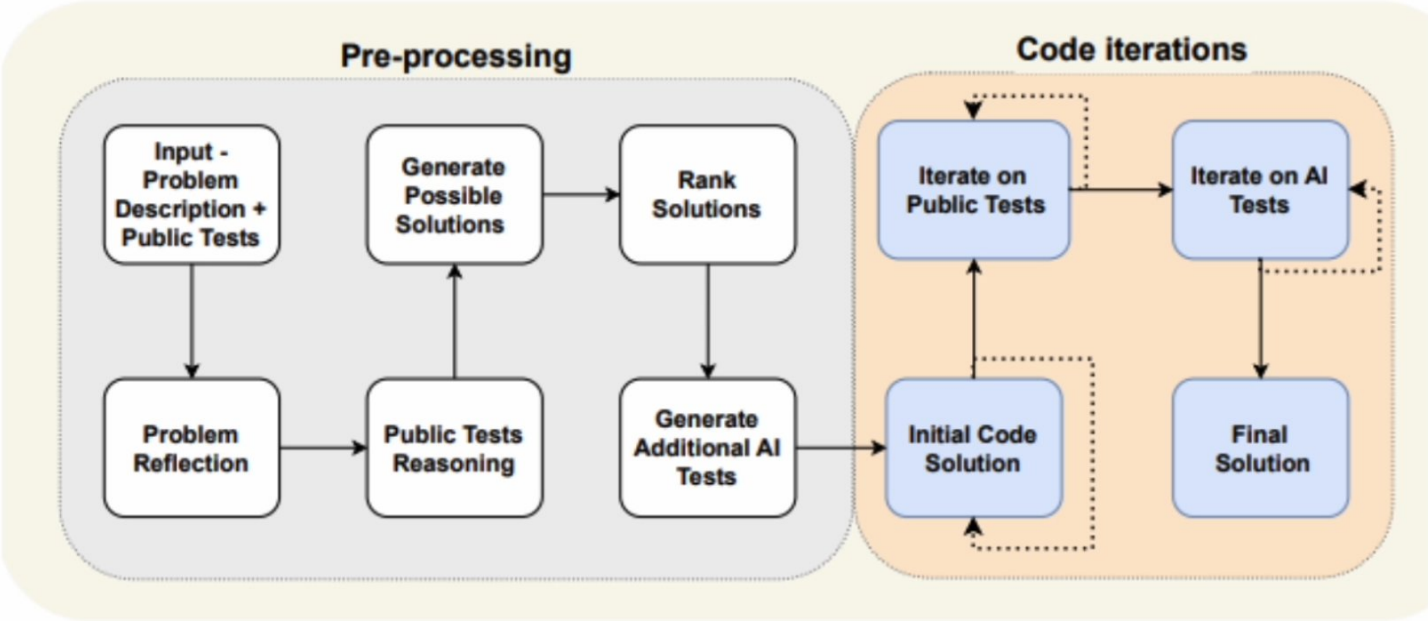
https://github.com/langchain-ai/langgraph/tree/main/examples/multi_agent

Supervisor



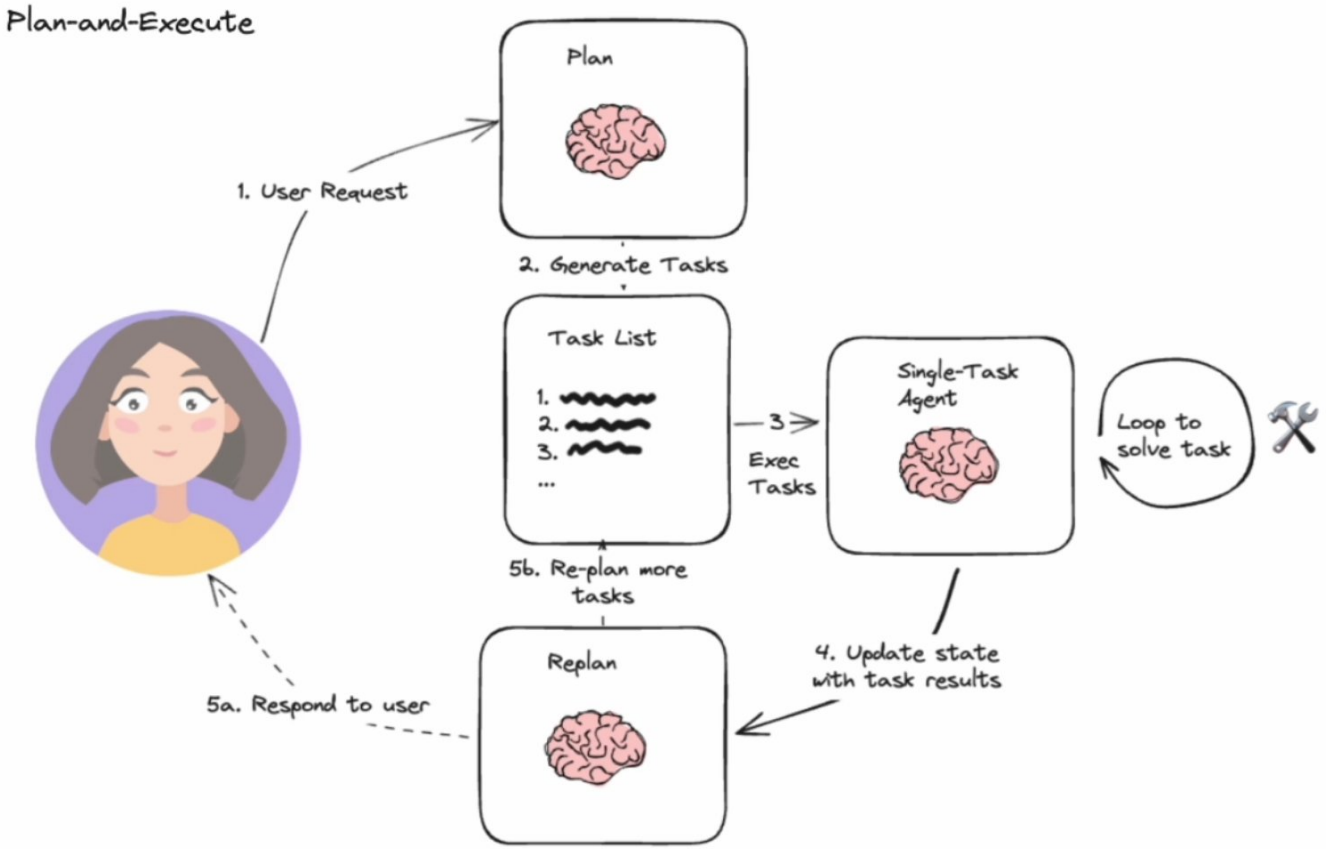
https://github.com/langchain-ai/langgraph/tree/main/examples/multi_agent

Flow Engineering



(a) The proposed AlphaCodium flow.

Plan and Execute



https://github.com/langchain-ai/langgraph/blob/main/examples/plan-and-execute/plan-and-execute.ipynb?ref=blog.langchain.dev

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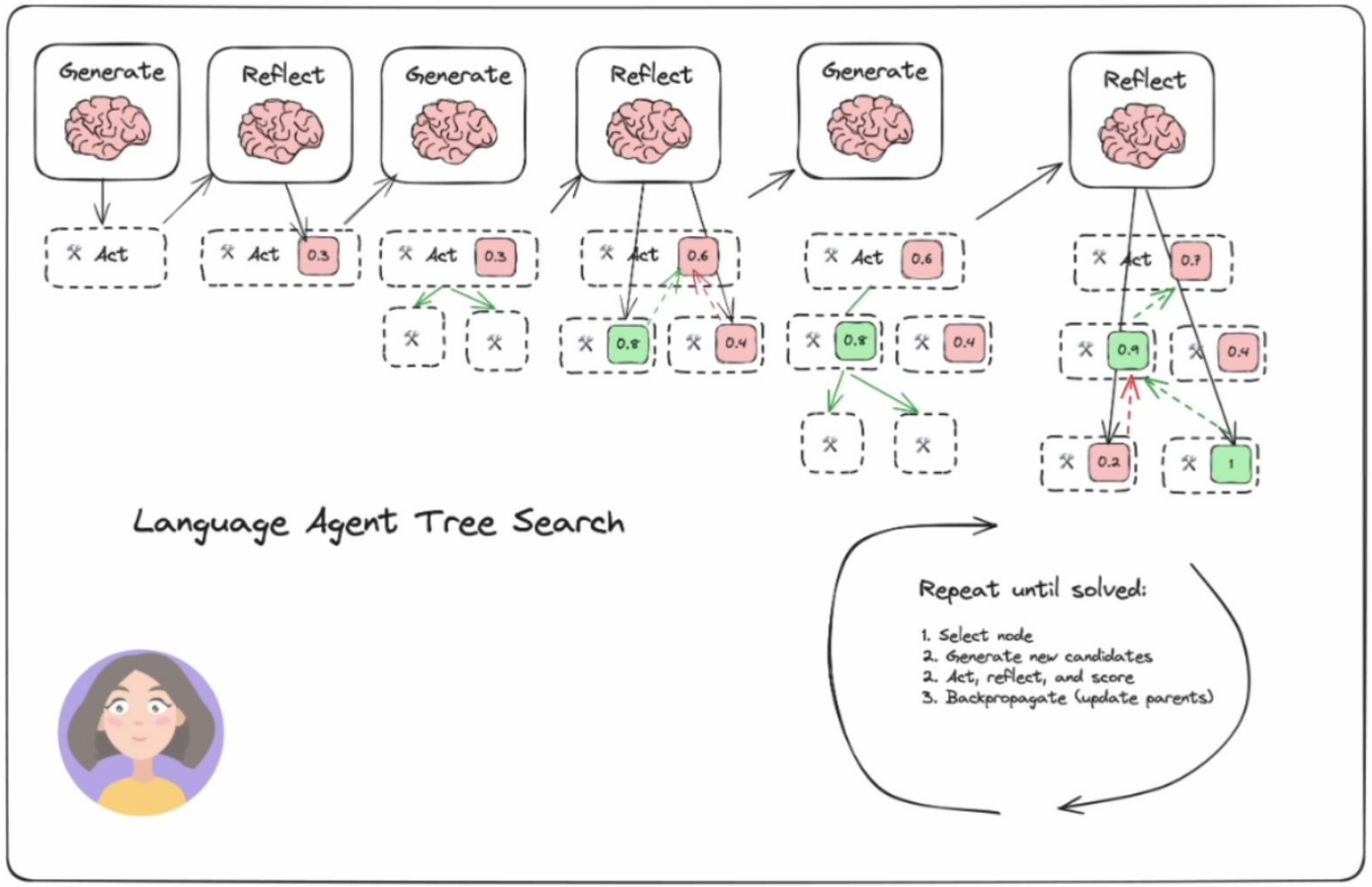
Language Agent Tree Search



https://github.com/langchain-ai/langgraph/blob/main/examples/lats/lats.ipynb