Lesson 2: Multi-Agents

by Hand ✍️

Prof. Tom Yeh

University of Colorado Boulder

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OpenAI

New Agent API

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You think, saw, remembered, can

Creating or Cloning Agents

```python
from agents import Agent

# Basic
my_agent = Agent(
    name="my_agent",
    instructions="You are extremely friendly and helpful."
)

# Cloning with modifications
new_agent = my_agent.clone(
    name="my_new_agent",
    instructions="Now you're more formal."
)
```

Context

Sometimes you need to keep session data, credentials, or ephemeral state across multiple tool calls or steps. The Agents SDK allows a **context** object to be passed into the run.

- You create any Python class as context, or use a typed approach with `Agent(context_type=MyContext)`.
- Tools can then access that context, read data, and update it.

Using Context for User Sessions

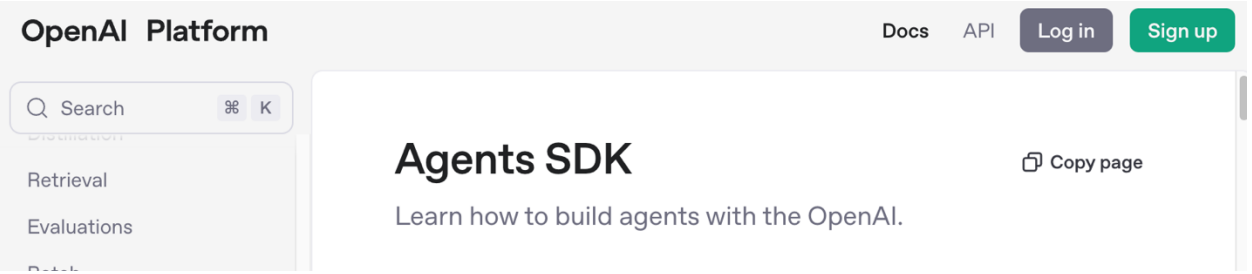
```python
from agents.run_context import AgentContextWrapper
from agents.tool import function_tool

class MyContext:
  def __init__(self, user_id: str):
      self.user_id = user_id
      self.seen_messages = []

@function_tool
def greet_user(context: AgentContextWrapper[MyContext], greeting: str) -> str:
  user_id = context.agent_context.user_id
  return f"Hello {user_id}, you said: {greeting}"

agent = Agent(
  name="my_agent_with_context",
  context_type=MyContext,
  tools=[greet_user],
)

my_ctx = MyContext(user_id="alice")
result = await AgentRunner.run(
  agent,
  input=["Hi agent!"],
  context=my_ctx,
)
```



https://platform.openai.com/docs/guides/agents-sdk#tools

What is AI by Hand ✍️?

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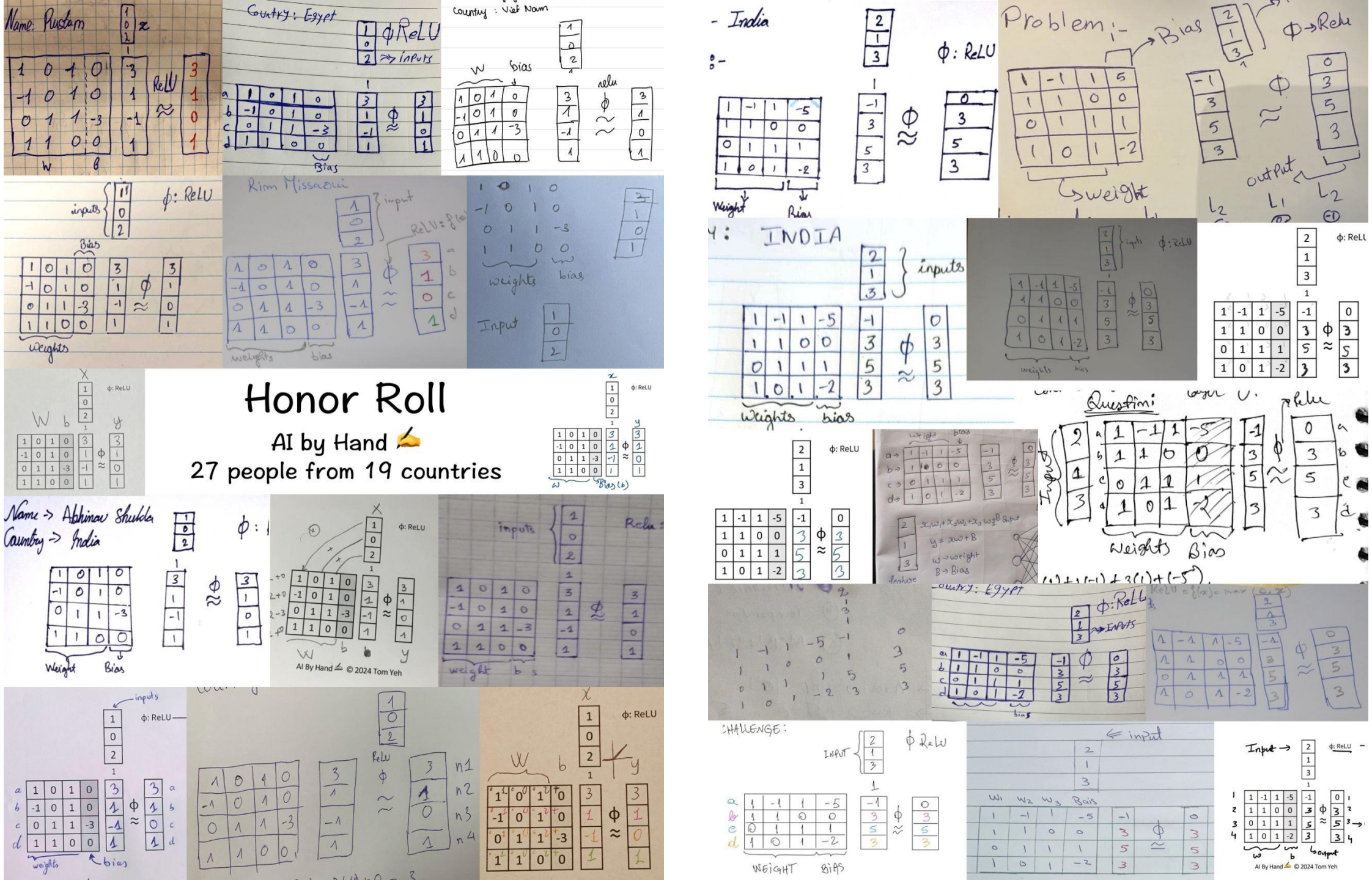


Honor Roll

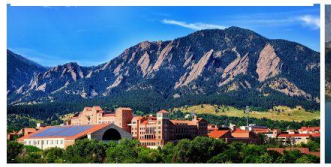
AI by Hand ✍

27 people from 19 countries

Neural Network

AI by Hand ✍️

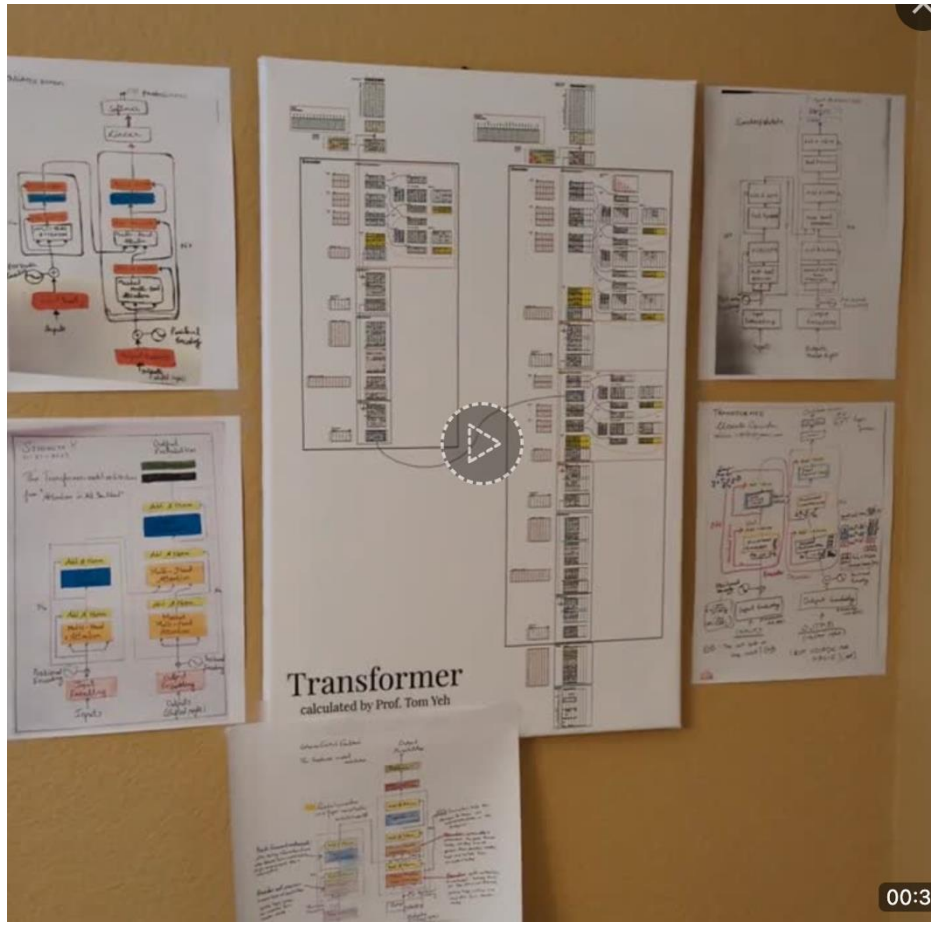
Tom | Sudhin | Bhishan



Boulder USA | Pokhar Nepal | Kathmandu Nepal

Watch my lecture videos at

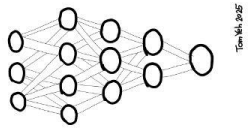
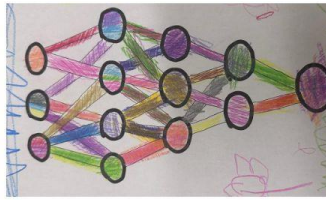
byhand.ai/youtube



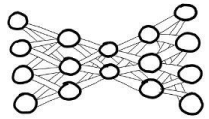
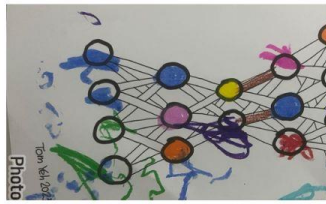
Color AI by Hand ✍️ Togeth

see my post to participate in th group art project

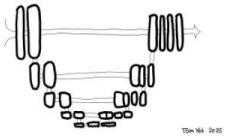
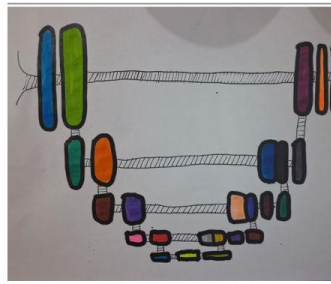
Neural Net

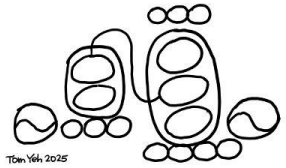
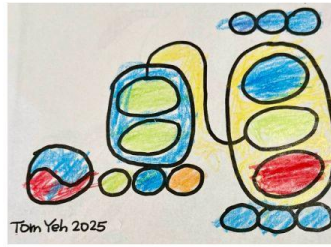
Auto-Encoder

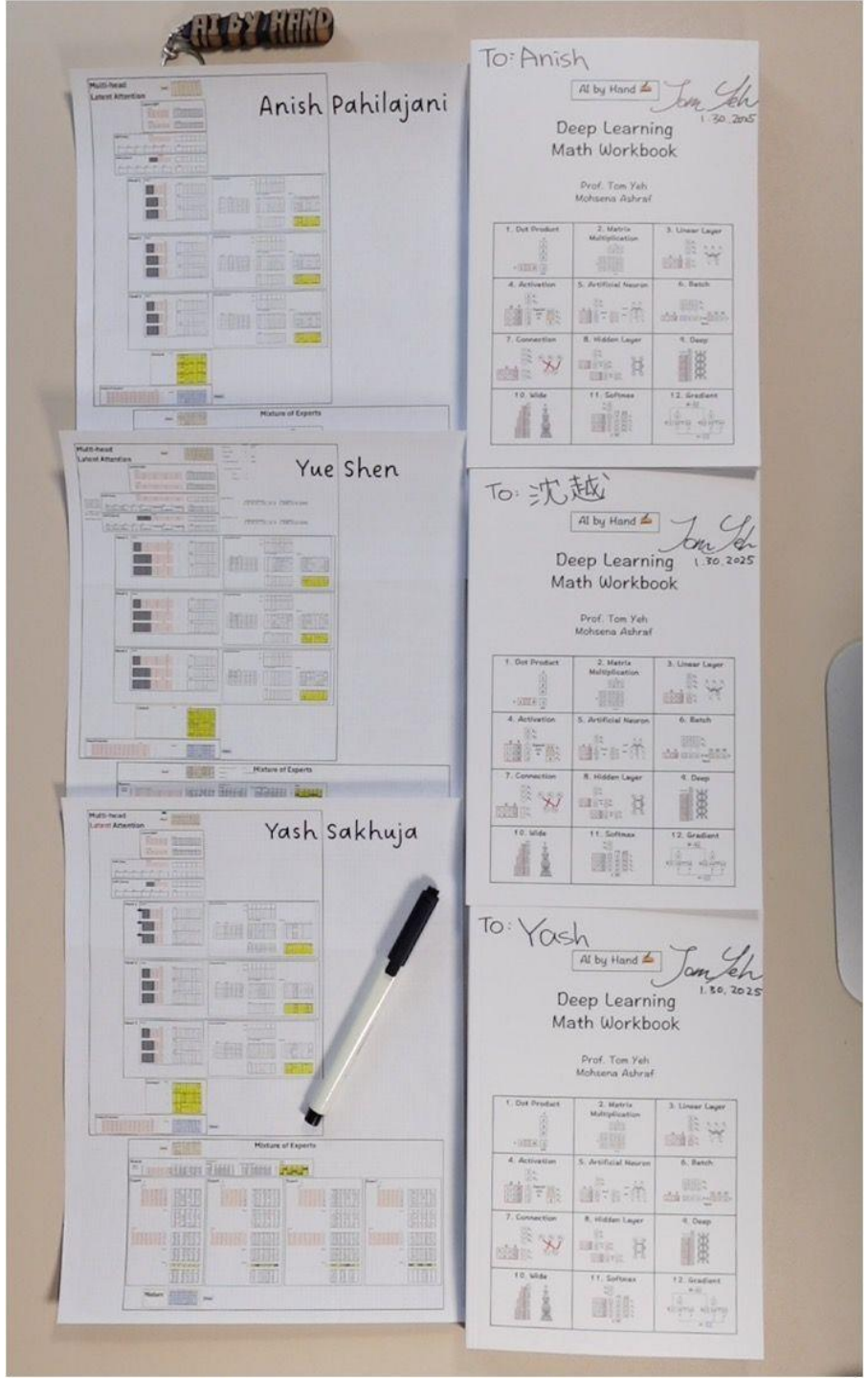



U-Net

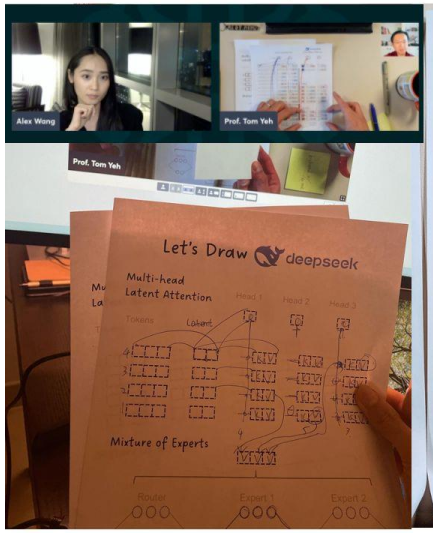



Transformer

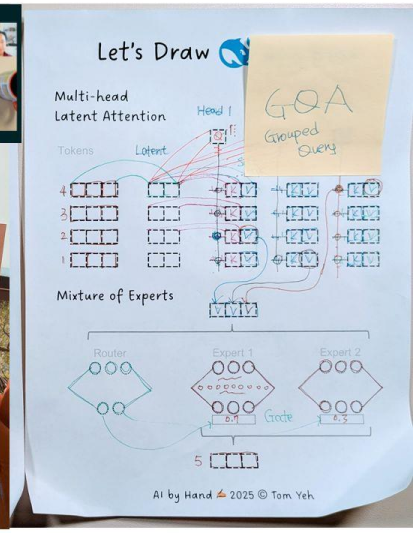



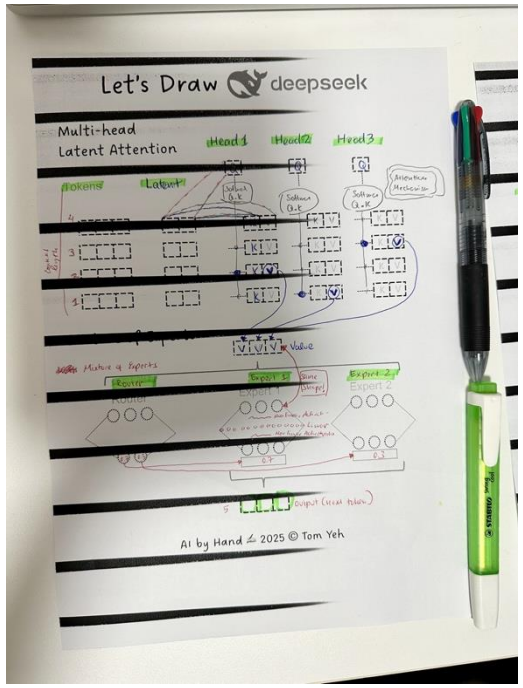


Alex Wang

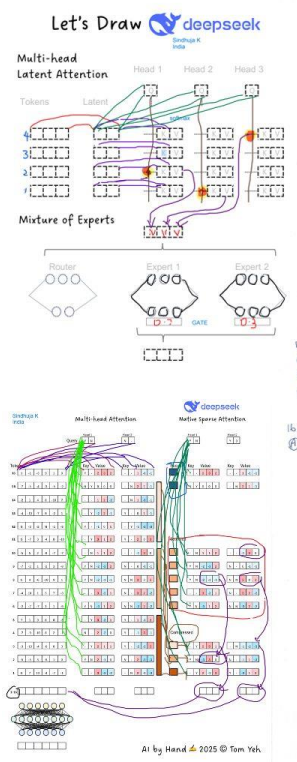


Tom Yeh

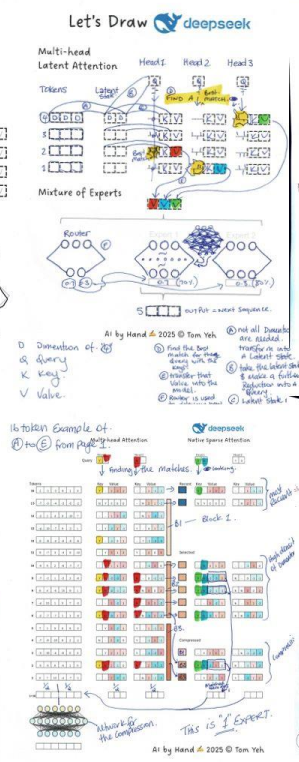




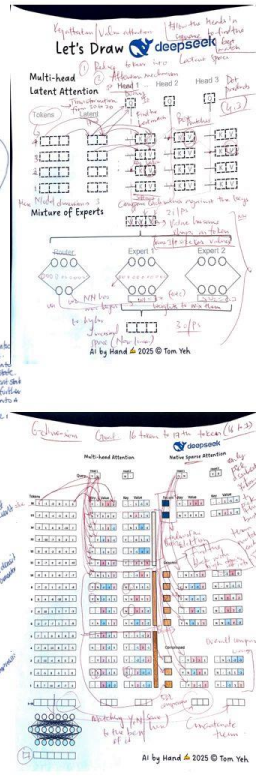
Sindhuja, India

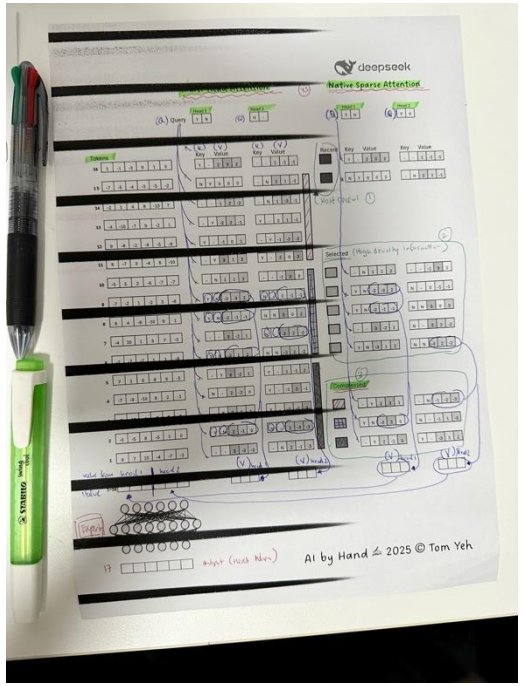


Anand, USA



Phil, Australia





Jaganadh Gopinadhan (Jagan) · 2nd
Associate Director - Engineering @ Cognizant | Trusted AI ...
5d ·

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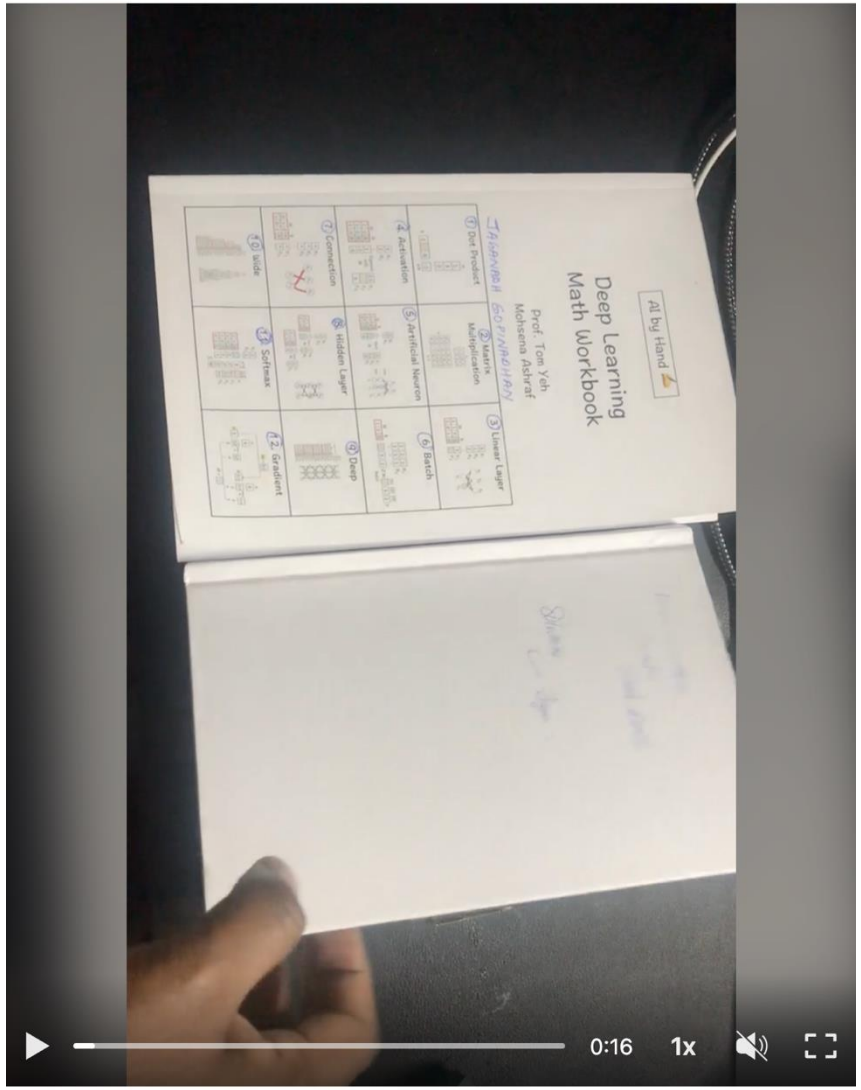
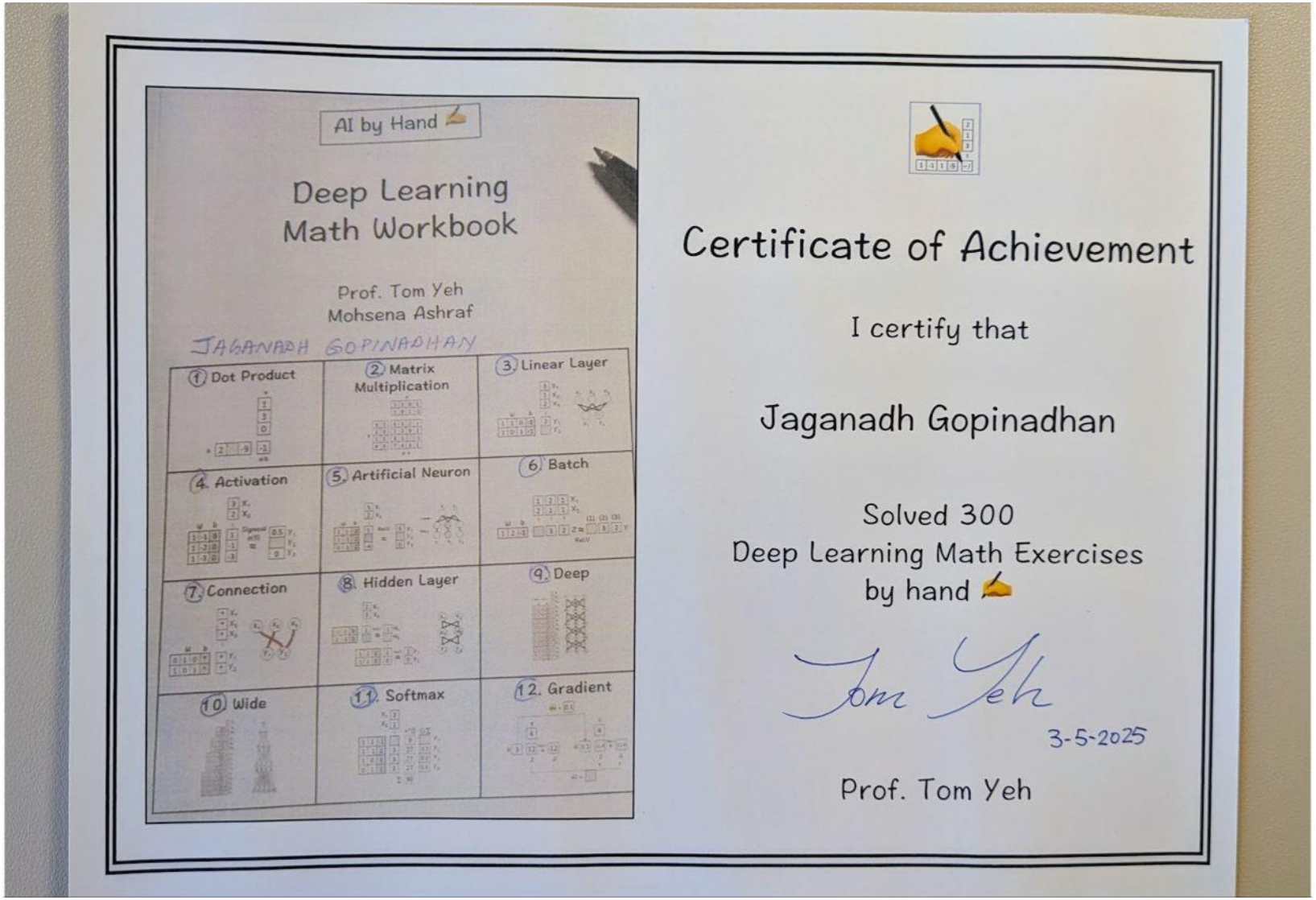
Finally, I completed all 12 chapters from the AI by Hand Deep Learning Math Workbook. Solving each of the problems was a great experience. Thanks to Tom Yeh and Mohsena Ashraf for creating such excellent material.
I'm looking forward to other workbooks, too.

#aibyhand



You and 62 others

3 comments · 3 reposts



Assignment Submissions

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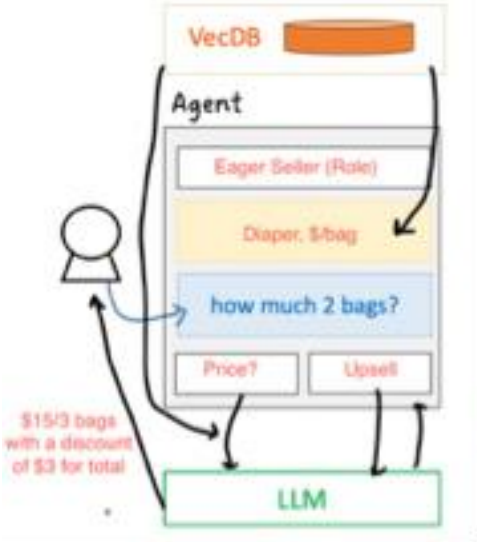
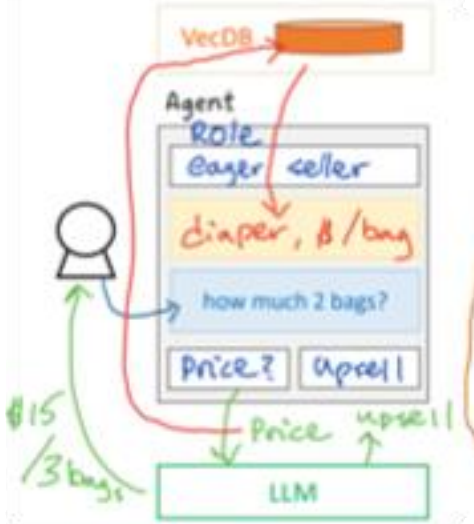


Samiul

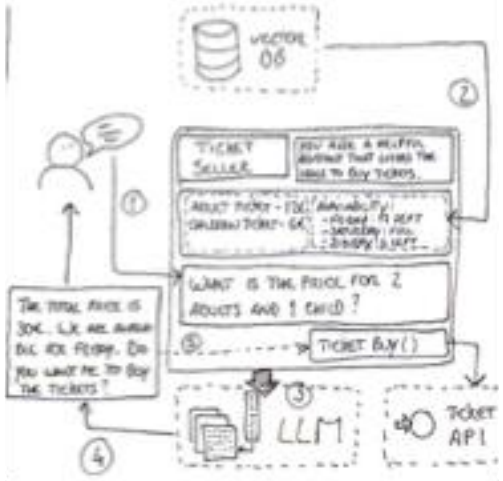


Vicent

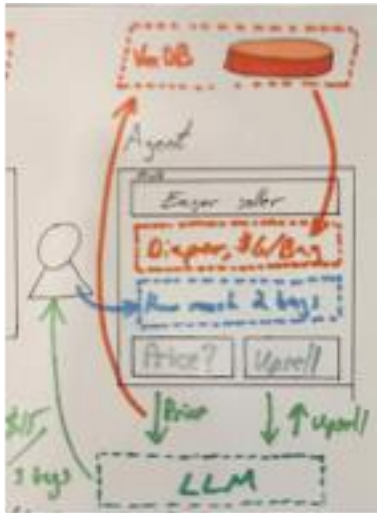
Nishita

Georges

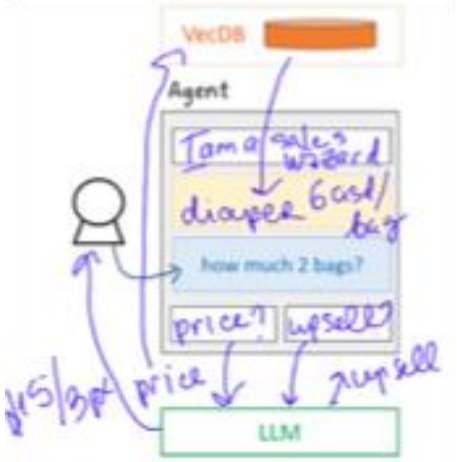
Kedar



Tiago



Mayer



Maria

Certificate

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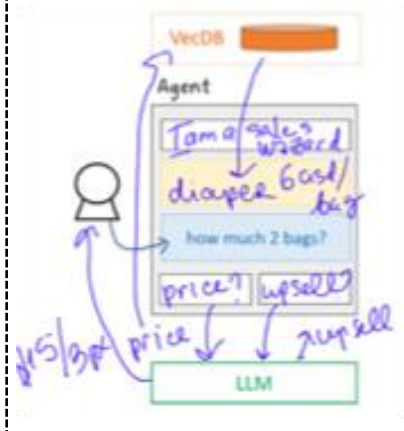

Lesson 2

Lesson 3

Lesson 4

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Certificate of Achievement

I certify that

Maria Petrenko

Completed

Introduction to Agentive AI

by hand ✍️

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Multi-Agents

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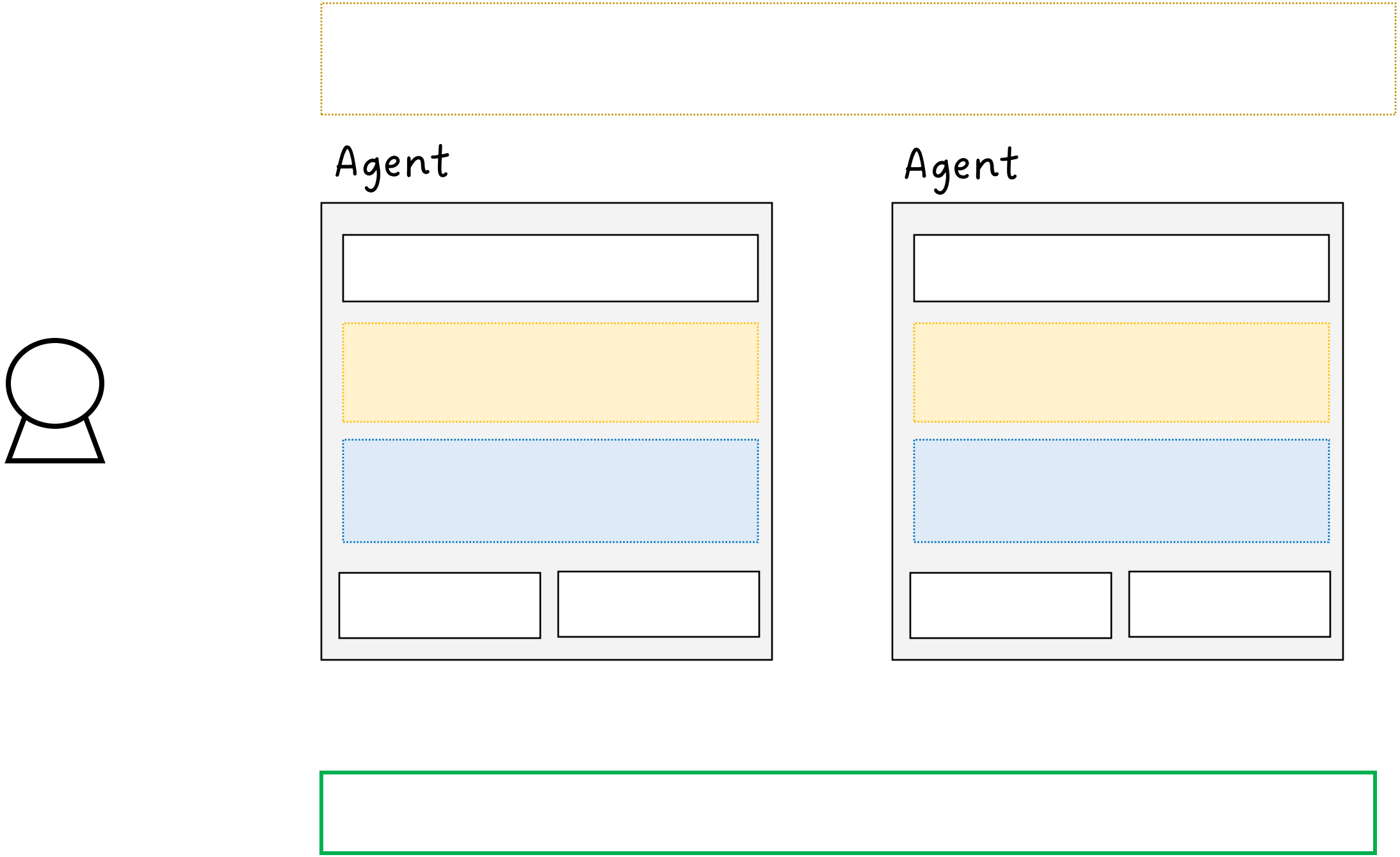
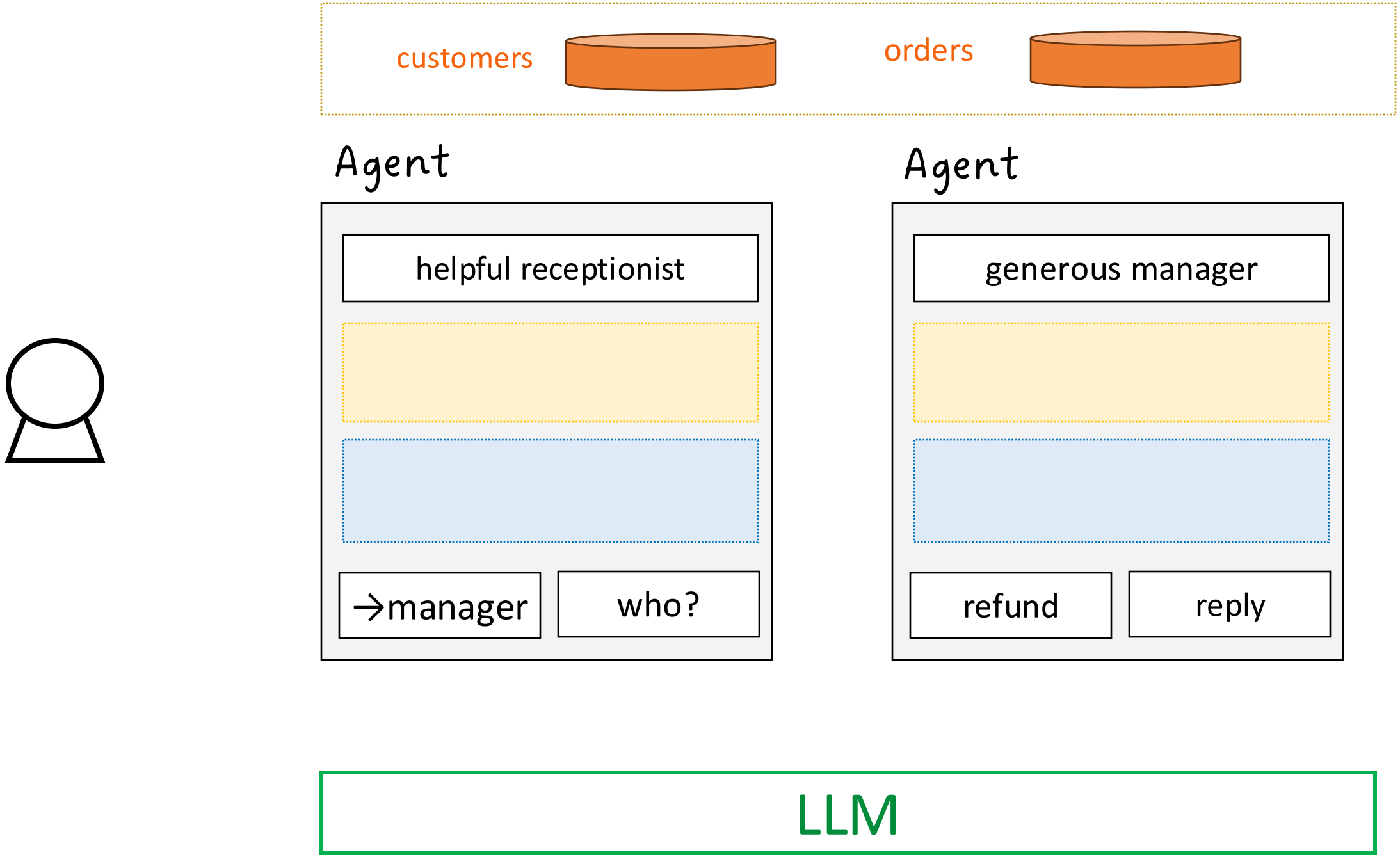

Agent
Agent


customers
orders
Agent
helpful receptionist
→manager
who?
Agent
generous manager
refund
reply
LLM

Swarm

OpenAI Swarm

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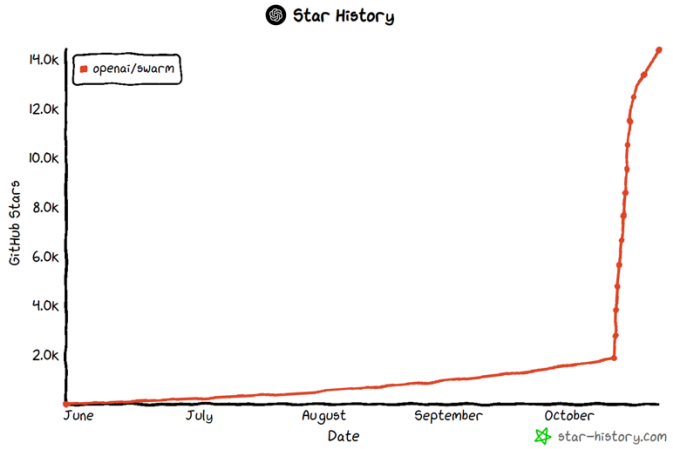
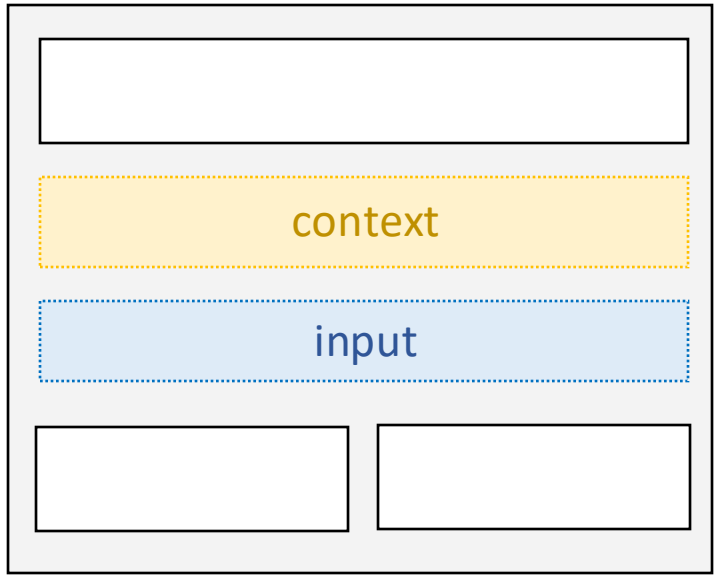
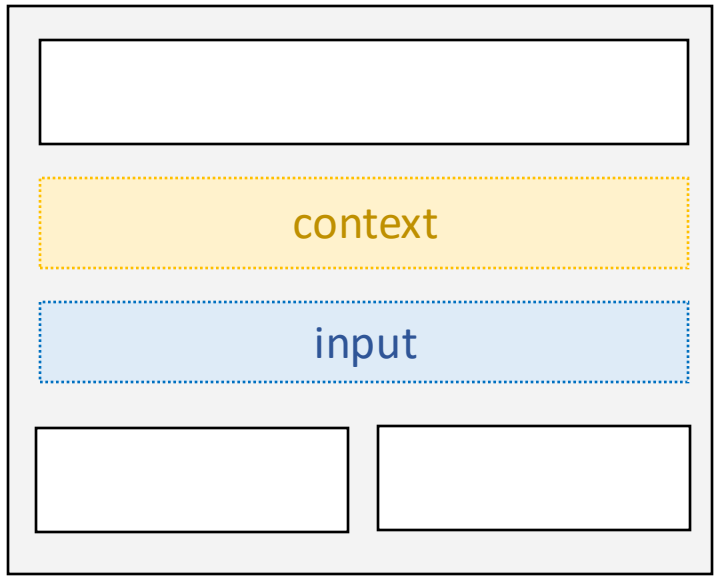
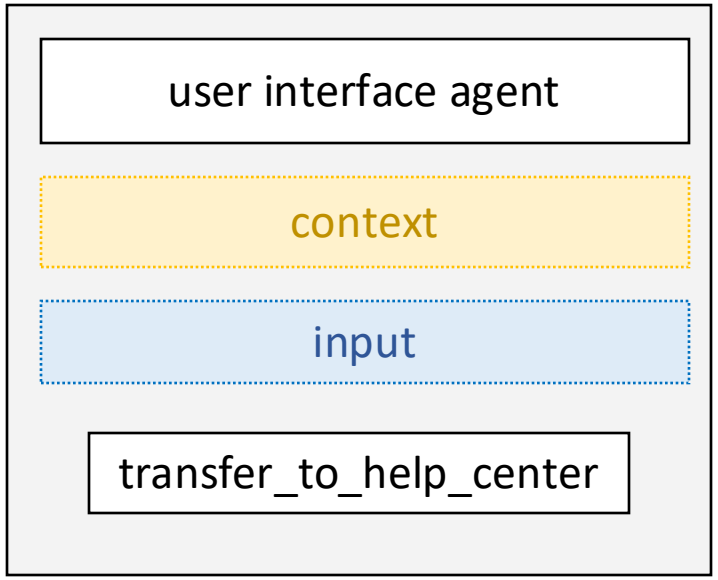
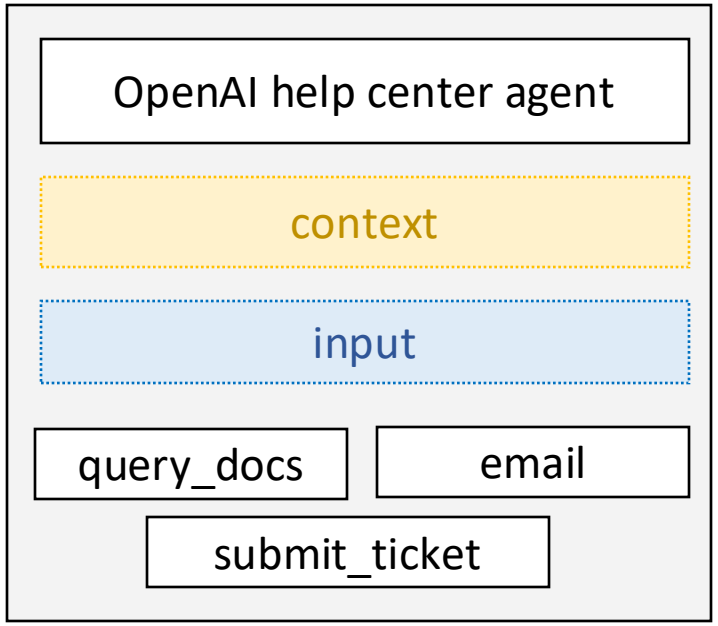


```python
from swarm import Swarm, Agent

client = Swarm()

def transfer_to_agent_b():
    return agent_b


agent_a = Agent(
    name="Agent A",
    instructions="You are a helpful agent.",
    functions=[transfer_to_agent_b],
)

agent_b = Agent(
    name="Agent B",
    instructions="Only speak in Haikus.",
)

response = client.run(
    agent=agent_a,
    messages=[{"role": "user", "content": "I want to talk to agent B."}],
)

print(response.messages[-1]["content"])
```



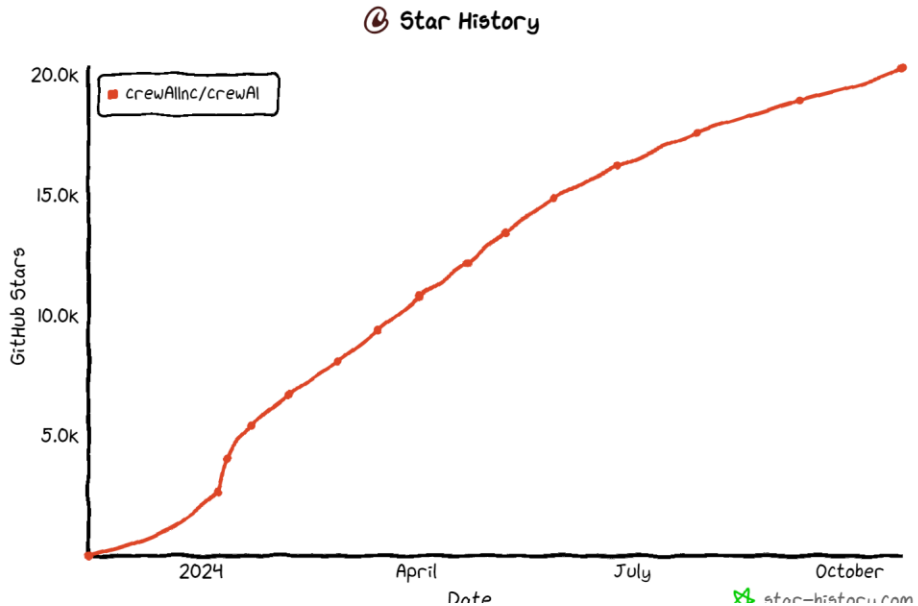







```
user_interface_agent = Agent(
    name="User Interface Agent",
    instructions="You are a user interface agent that handles a
    functions=[transfer_to_help_center],
)

help_center_agent = Agent(
    name="Help Center Agent",
    instructions="You are an OpenAI help center agent who deals
    functions=[query_docs, submit_ticket, send_email],
)
```

CrewAI



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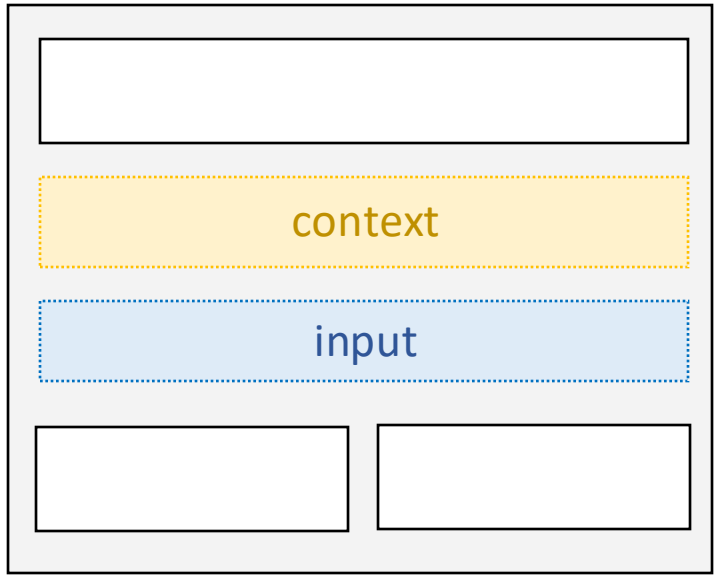
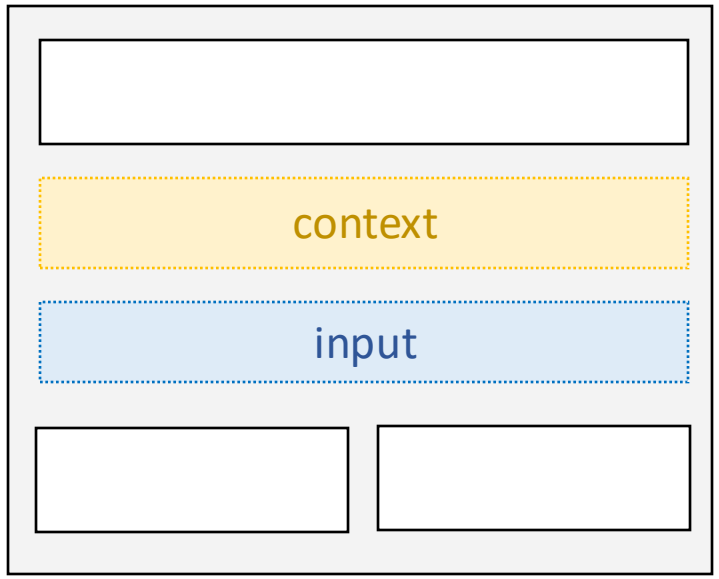
```yaml
# src/my_project/config/agents.yaml
researcher:
  role: >
    {topic} Senior Data Researcher
  goal: >
    Uncover cutting-edge developments in {topic}
  backstory: >
    You're a seasoned researcher with a knack for uncovering the lat
    developments in {topic}. Known for your ability to find the most
    information and present it in a clear and concise manner.

reporting_analyst:
  role: >
    {topic} Reporting Analyst
  goal: >
    Create detailed reports based on {topic} data analysis and resea
  backstory: >
    You're a meticulous analyst with a keen eye for detail. You're k
    your ability to turn complex data into clear and concise reports
    it easy for others to understand and act on the information you
```

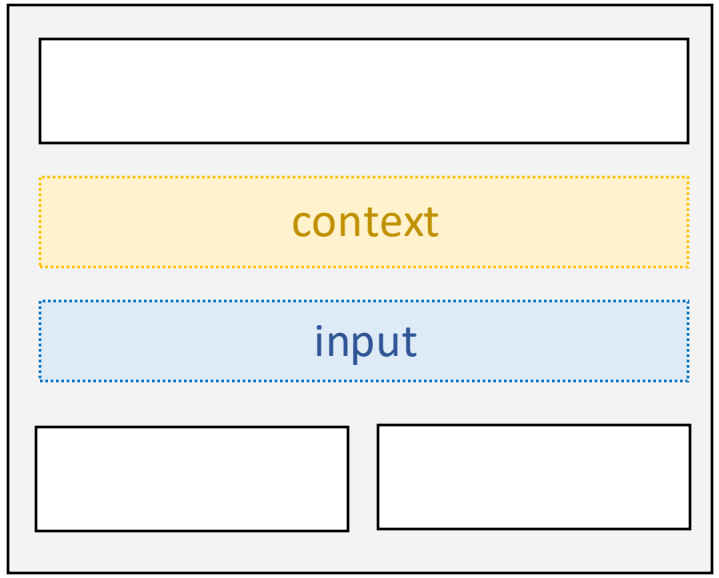




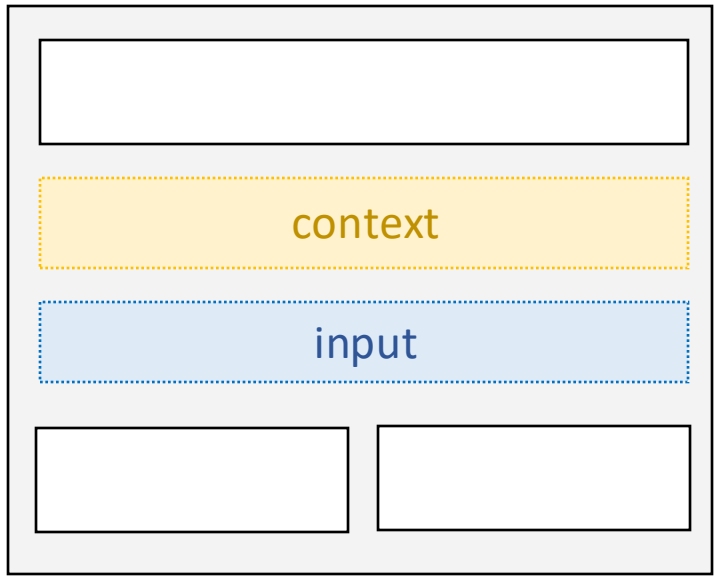
```yaml
# src/my_project/config/tasks.yaml
research_task:
  description: >
    Conduct a thorough research about {topic}
    Make sure you find any interesting and relevant information give
    the current year is 2024.
  expected_output: >
    A list with 10 bullet points of the most relevant information ab
  agent: researcher

reporting_task:
  description: >
    Review the context you got and expand each topic into a full sec
    Make sure the report is detailed and contains any and all releva
  expected_output: >
    A fully fledge reports with the mains topics, each with a full s
    Formatted as markdown without '```'
  agent: reporting_analyst
  output_file: report.md
```

Researcher



Reporting Analyst



Process

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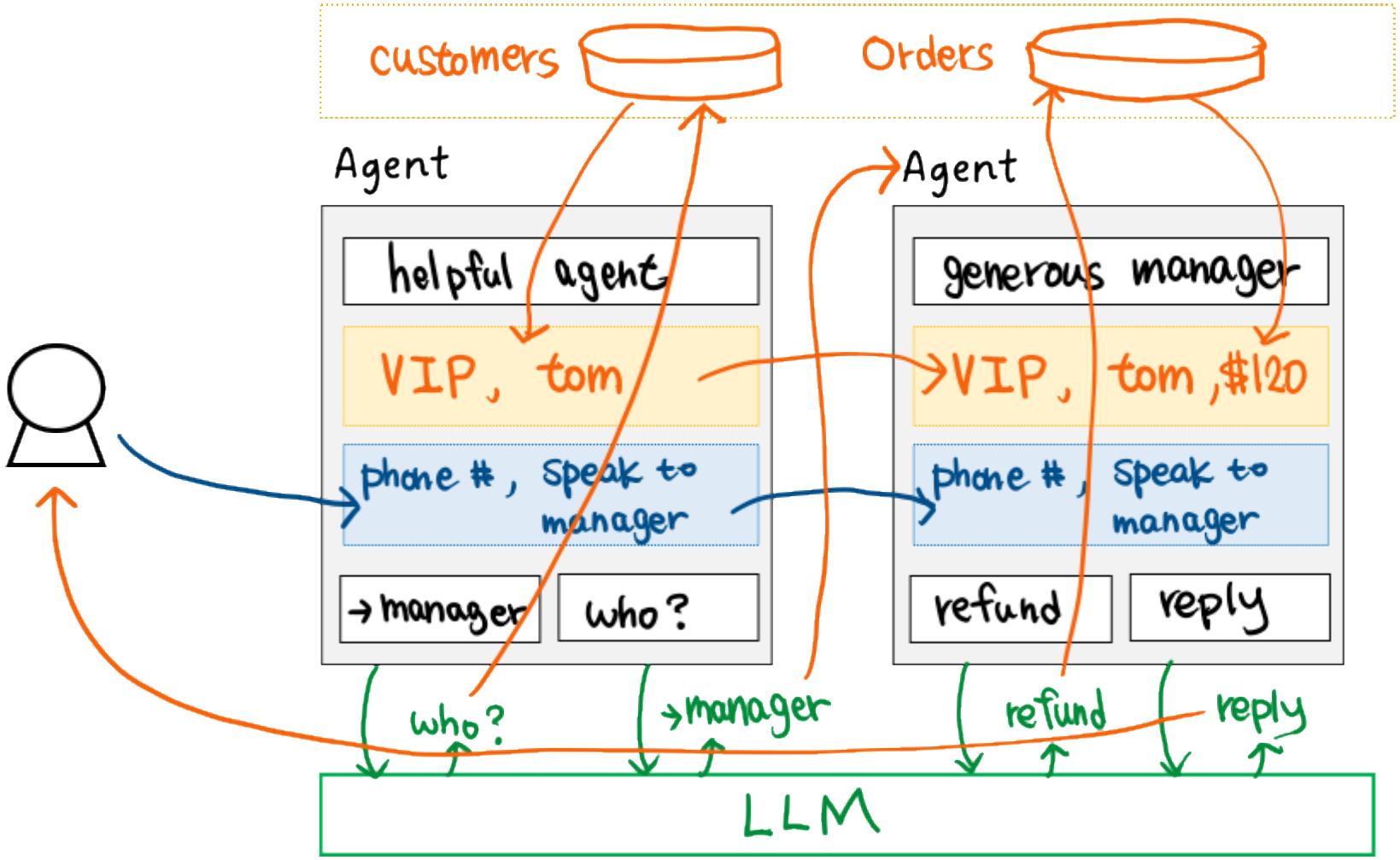
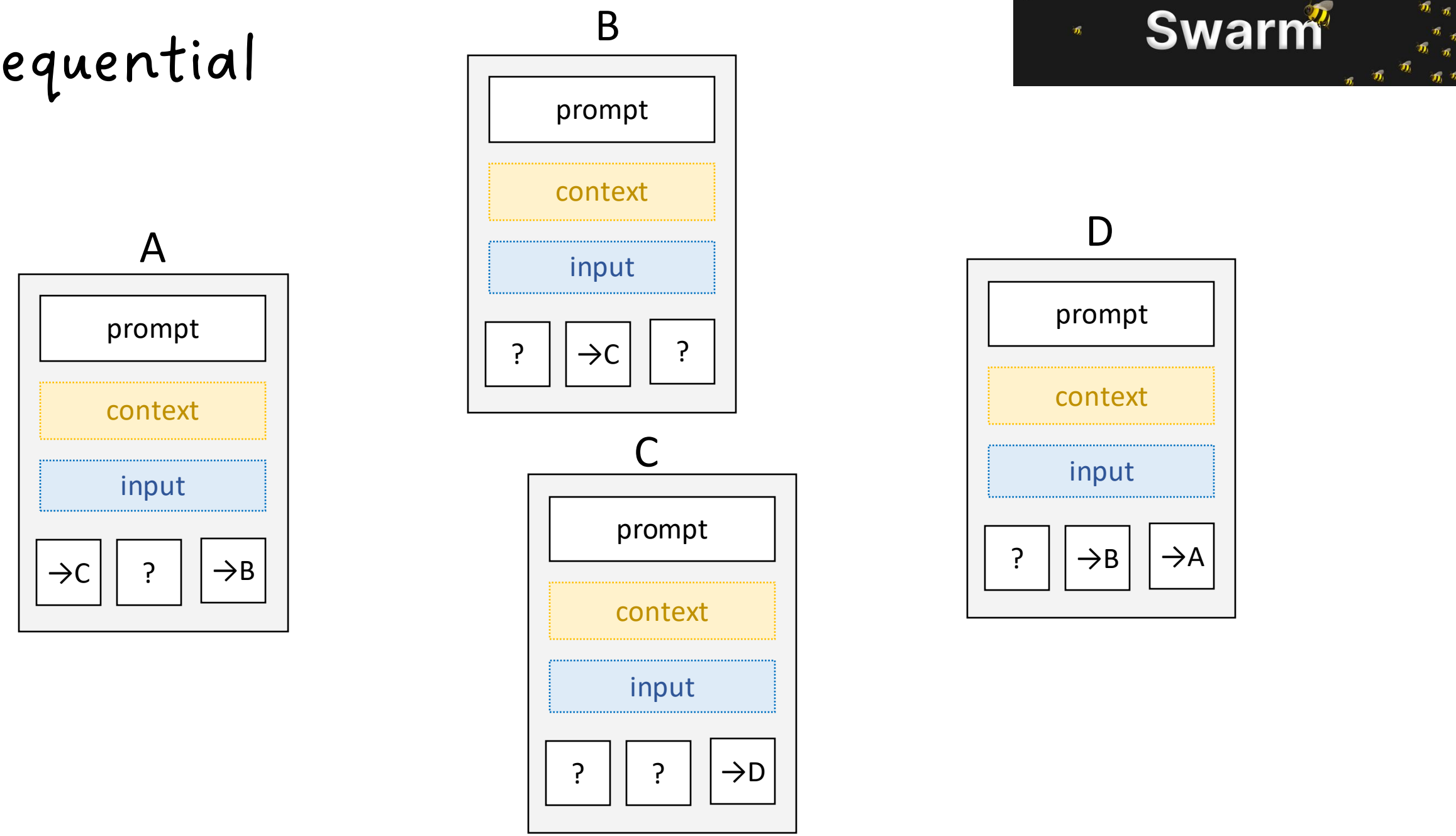
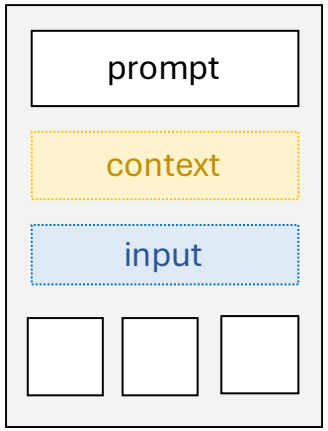

customers
Orders
Agent
helpful agent
VIP, tom
phone #, speak to manager
→manager
who?
Agent
generous manager
VIP, tom, $120
phone #, speak to manager
refund
reply
who?
→manager
refund
reply
LLM

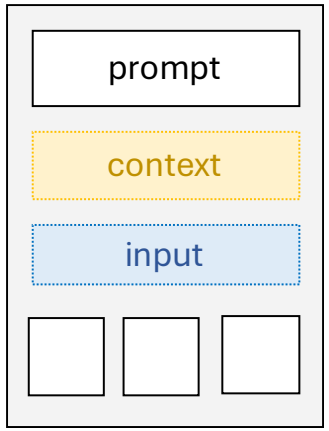
Sequential

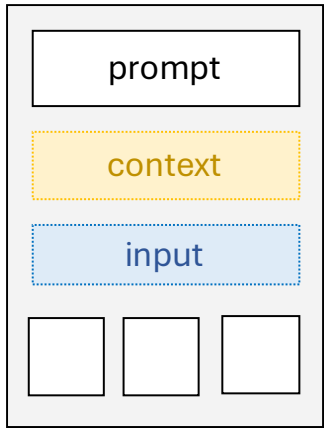
Swarm

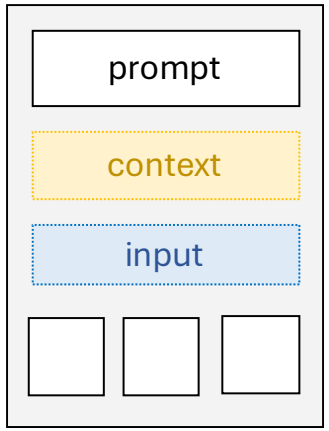


Hierarchical

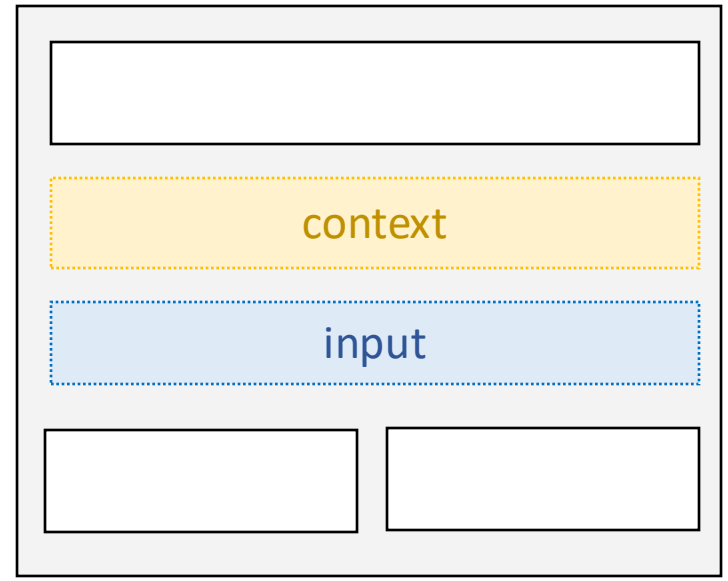




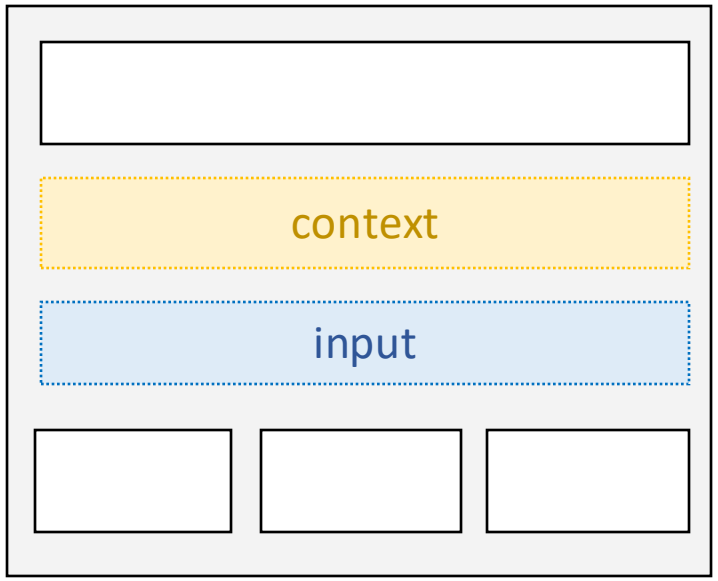




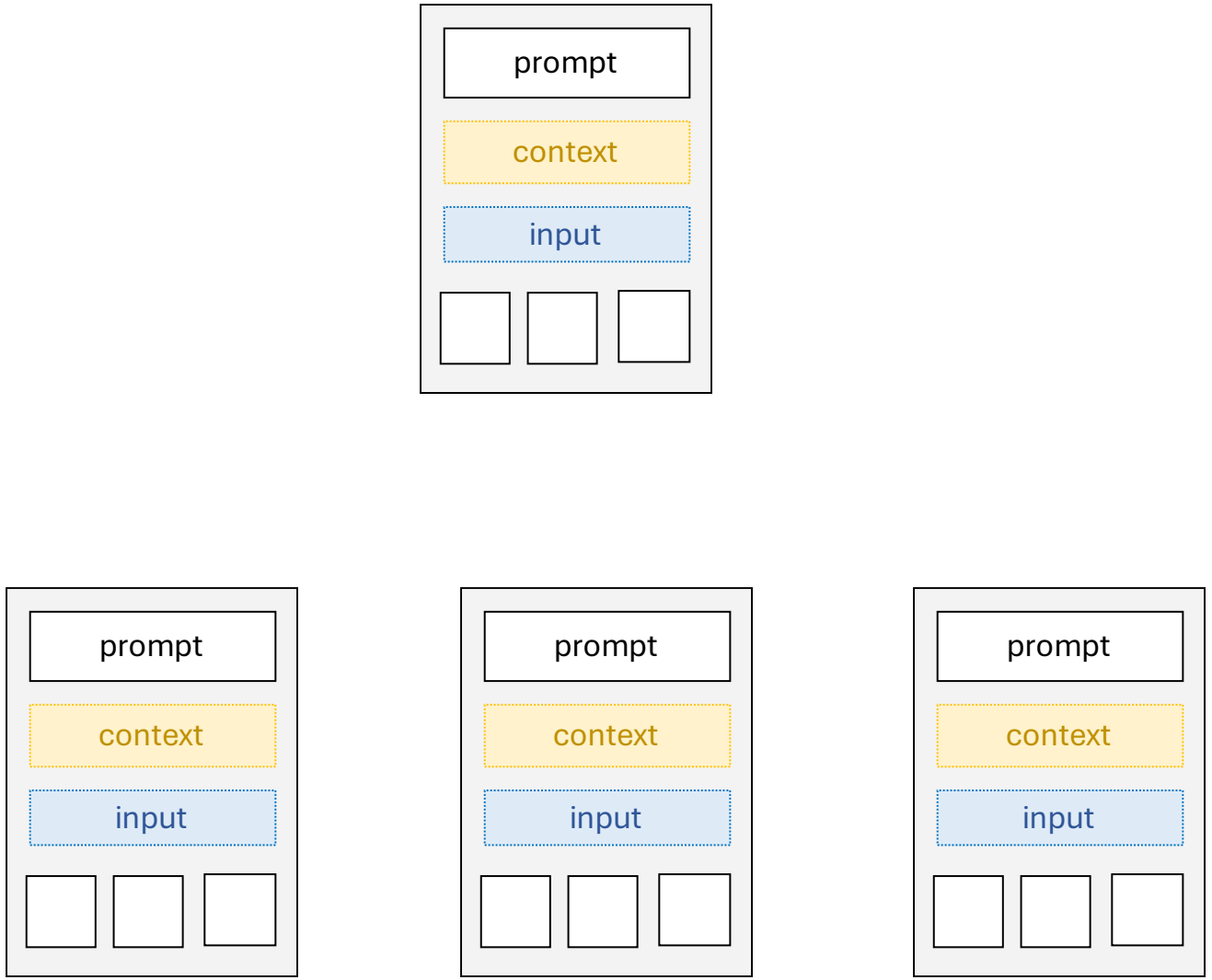
```
"hierarchical_manager_agent": {
  "role": "Crew Manager",
  "goal": "Manage the team to complete the task in the best
    way possible.",
  "backstory": "You are a seasoned manager with a knack for
    getting the best out of your team.\nYou are also known
    for your ability to delegate work to the right people,
    and to ask the right questions to get the best out of
    your team.\nEven though you don't perform tasks by
    yourself, you have a lot of experience in the field,
    which allows you to properly evaluate the work of your
    team members."
},
```



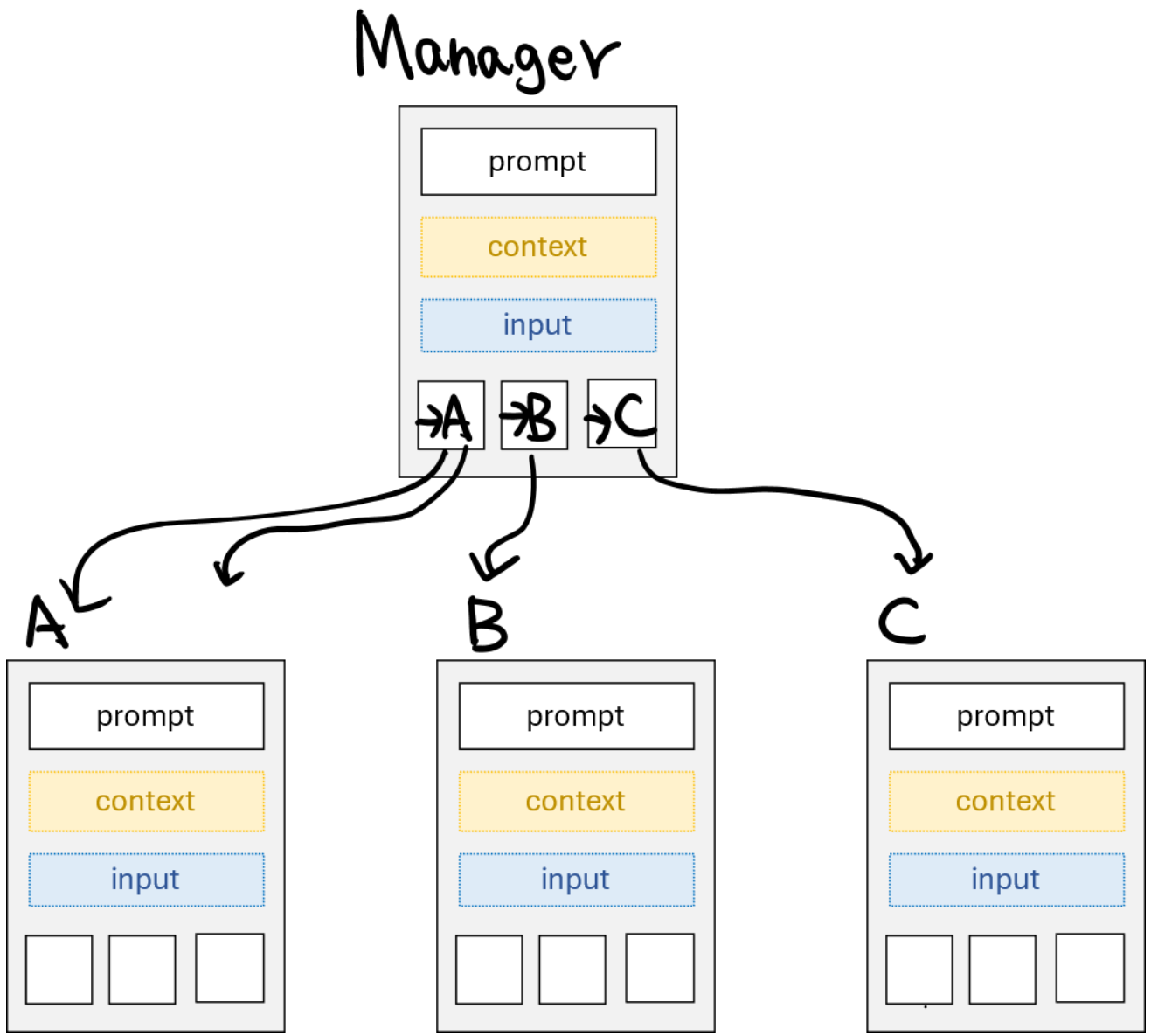
```python
def _create_manager_agent(self):
    i18n = I18N(prompt_file=self.prompt_file)
    if self.manager_agent is not None:
        self.manager_agent.allow_delegation = True
        manager = self.manager_agent
        if manager.tools is not None and len(manager.tools) > 0:
            self._logger.log(
                "warning", "Manager agent should not have tools", color="orange"
            )
            manager.tools = []
            raise Exception("Manager agent should not have tools")
        manager.tools = self.manager_agent.get_delegation_tools(self.agents)
    else:
        self.manager_llm = (
            getattr(self.manager_llm, "model_name", None)
            or getattr(self.manager_llm, "deployment_name", None)
            or self.manager_llm
        )
        manager = Agent(
            role=i18n.retrieve("hierarchical_manager_agent", "role"),
            goal=i18n.retrieve("hierarchical_manager_agent", "goal"),
            backstory=i18n.retrieve("hierarchical_manager_agent", "backstory"),
            tools=AgentTools(agents=self.agents).tools(),
            llm=self.manager_llm,
            verbose=self.verbose,
        )
        self.manager_agent = manager
    manager.crew = self
```



Graph


prompt
context
input
prompt
context
input
prompt
context
input
prompt
context
input

Graph


Manager
prompt
context
input
A
B
C
A
prompt
context
input
B
prompt
context
input
C
prompt
context
input

Communication

Lesson 2: Multi-Agents - by Hand ✍️

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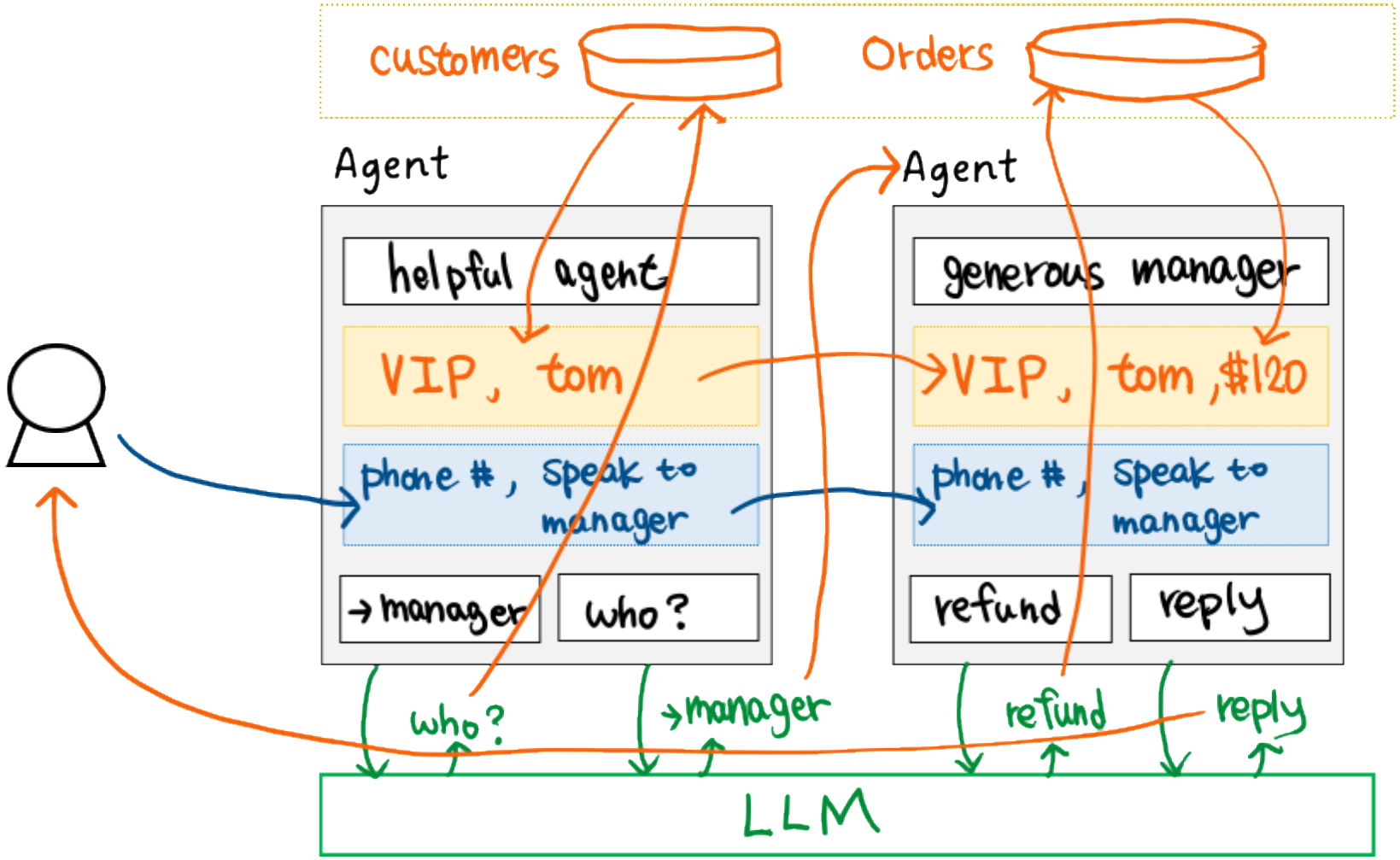
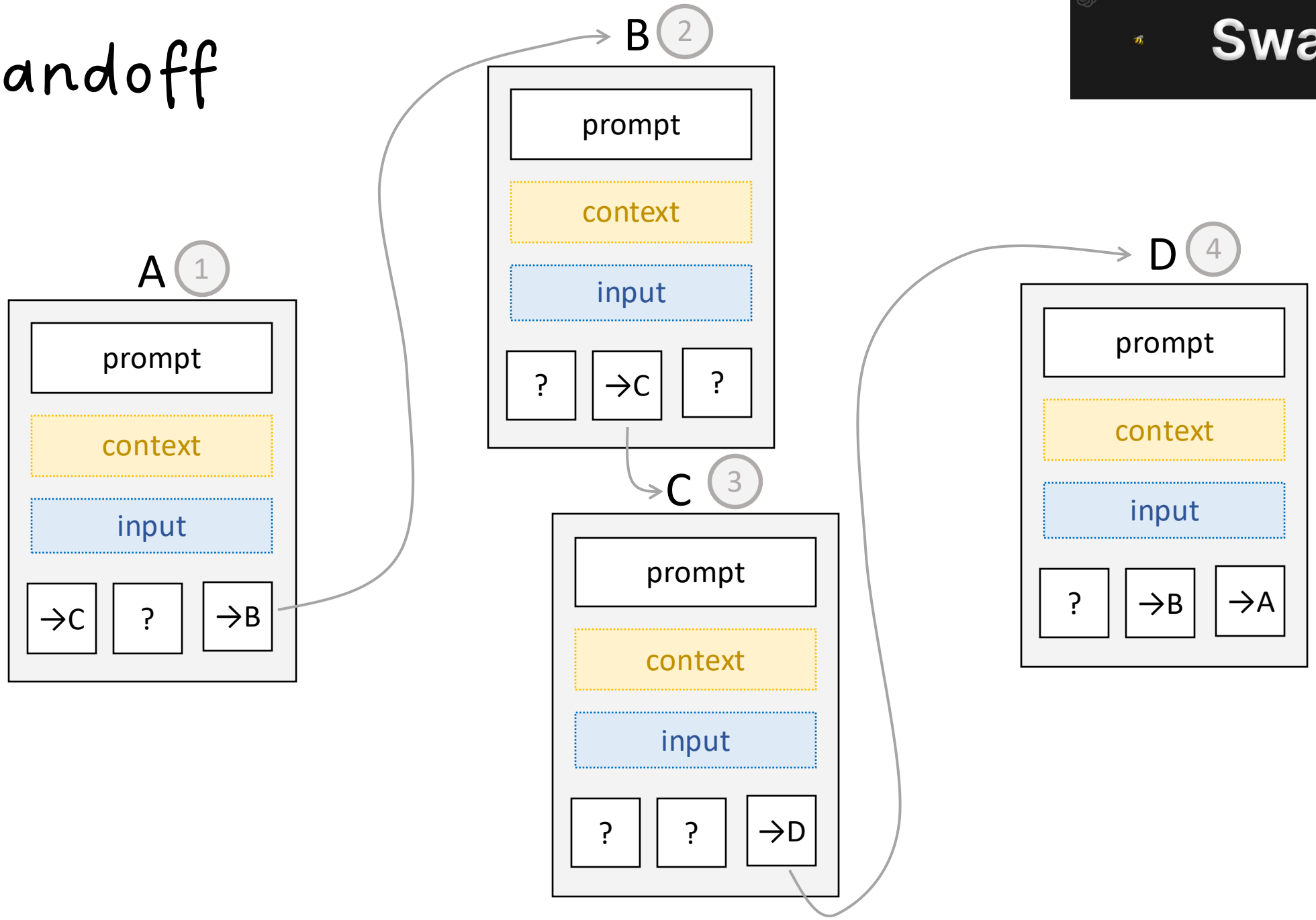
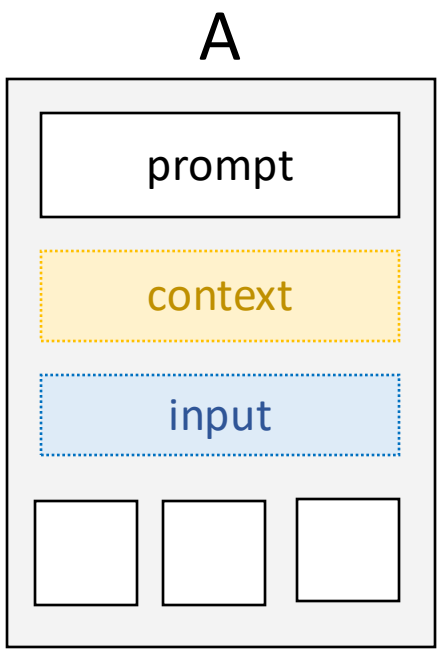

customers
Orders
Agent
helpful agent
VIP, tom
phone #, speak to manager
→manager
who?
Agent
generous manager
VIP, tom, $120
phone #, speak to manager
refund
reply
who?
→manager
refund
reply
LLM

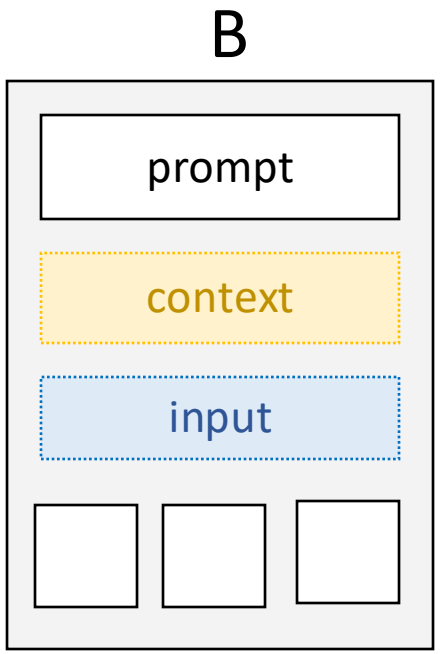
Handoff

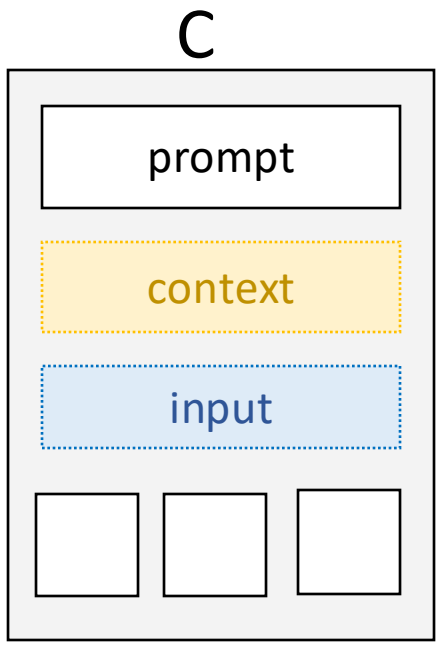
Swarm

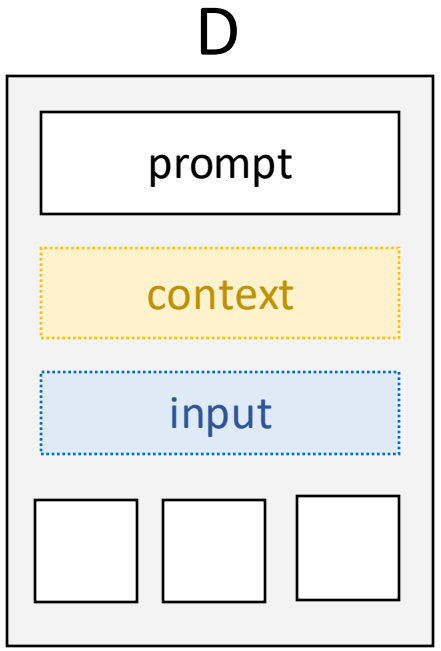


Q/A

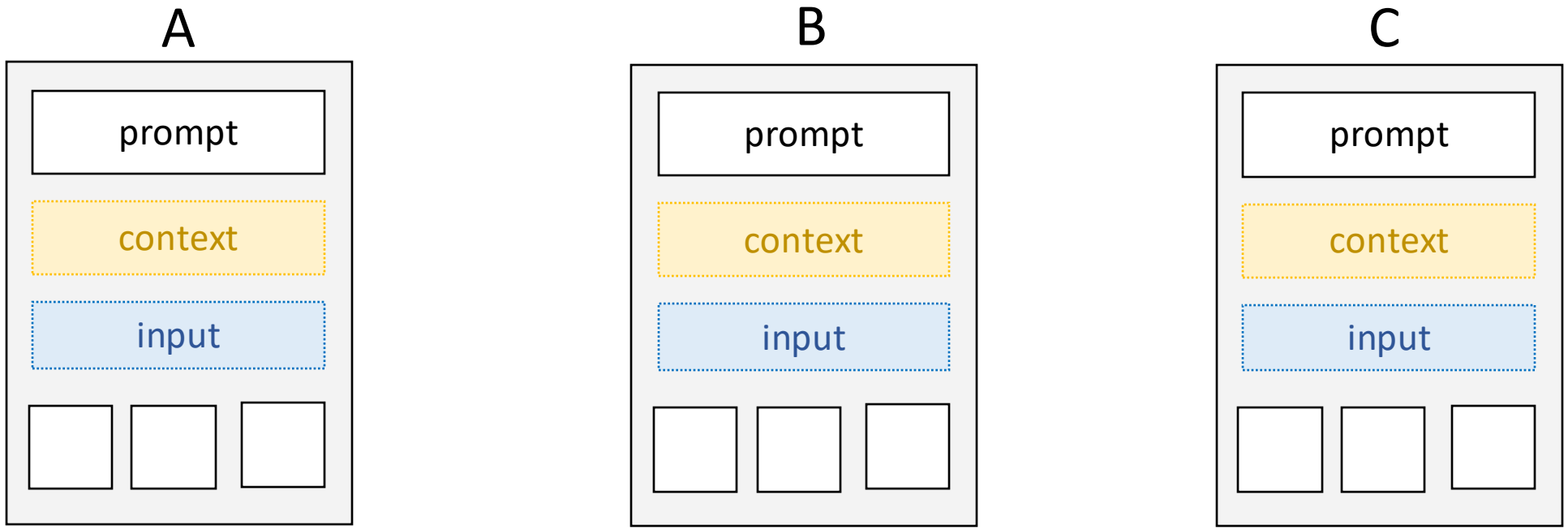

A
prompt
context
input


B
prompt
context
input


C
prompt
context
input


D
prompt
context
input

Messages



Messages Queue

Memory

Lesson 2: Multi-Agents - by Hand ✍️

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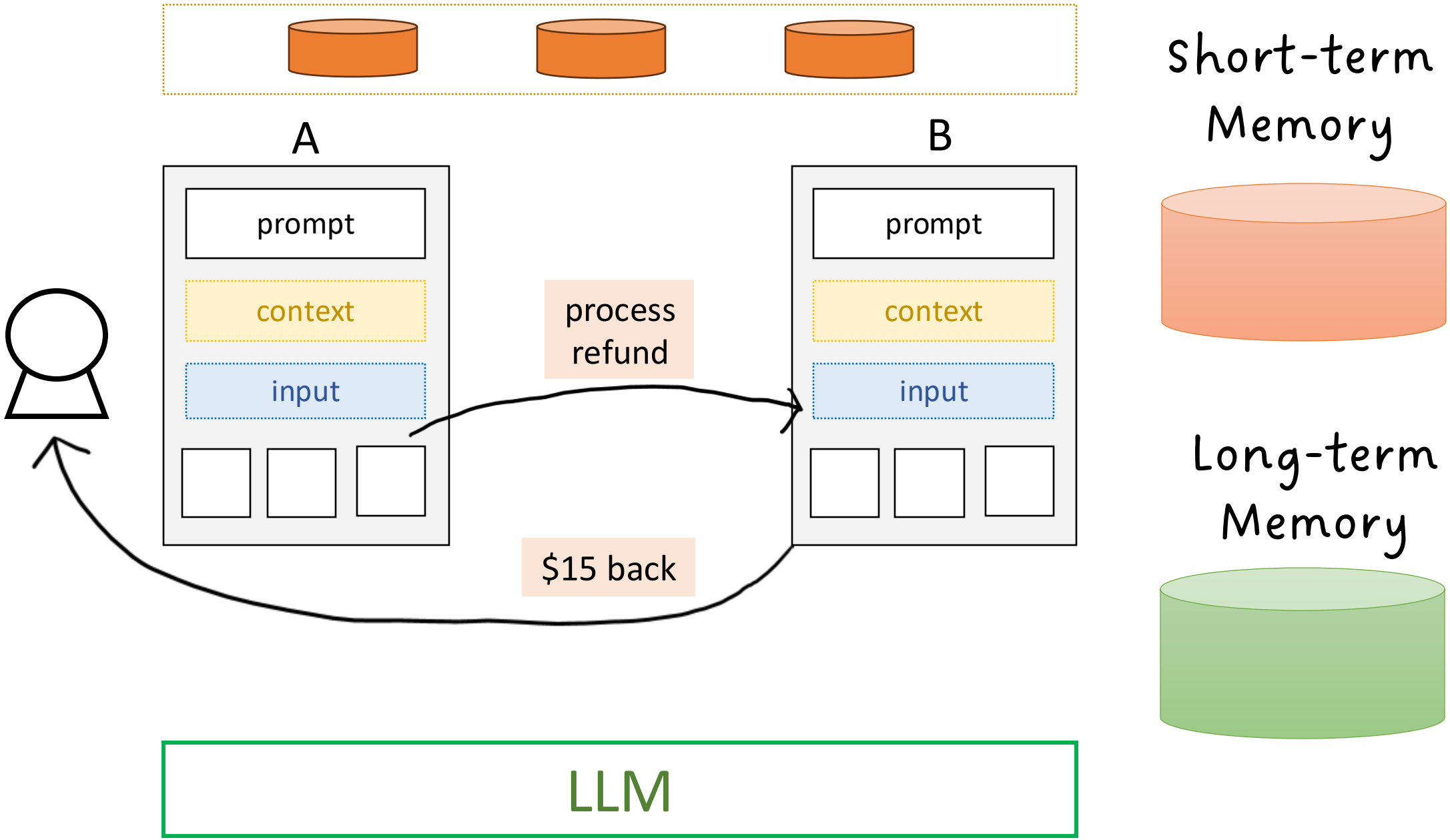
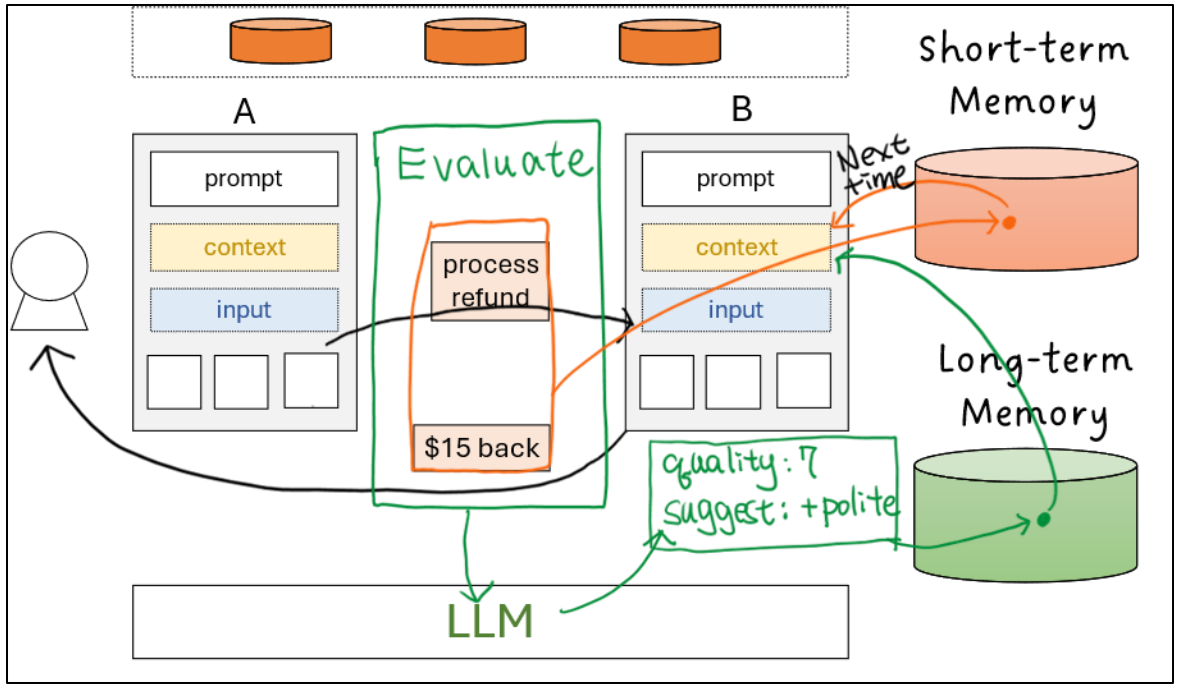
Boulder


A
B
prompt
context
input
prompt
context
input
process refund
$15 back
Short-term Memory
Long-term Memory
LLM

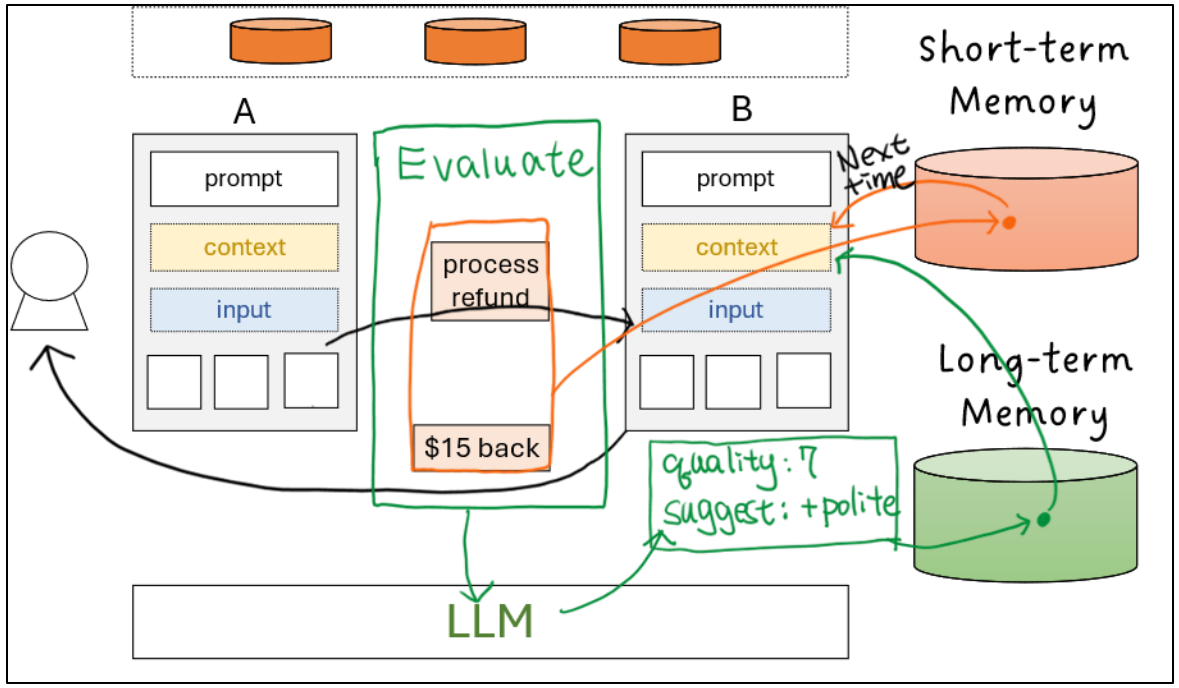
```python
def _create_short_term_memory(self, output) -> None:
    """Create and save a short-term memory item if conditions are met."""
    if (
        self.crew
        and self.agent
        and self.task
        and "Action: Delegate work to coworker" not in output.text
    ):
        try:
            if (
                hasattr(self.crew, "_short_term_memory")
                and self.crew._short_term_memory
            ):
                self.crew._short_term_memory.save(
                    value=output.text,
                    metadata={
                        "observation": self.task.description,
                    },
                    agent=self.agent.role,
                )
        except Exception as e:
            print(f"Failed to add to short term memory: {e}")
            pass
```



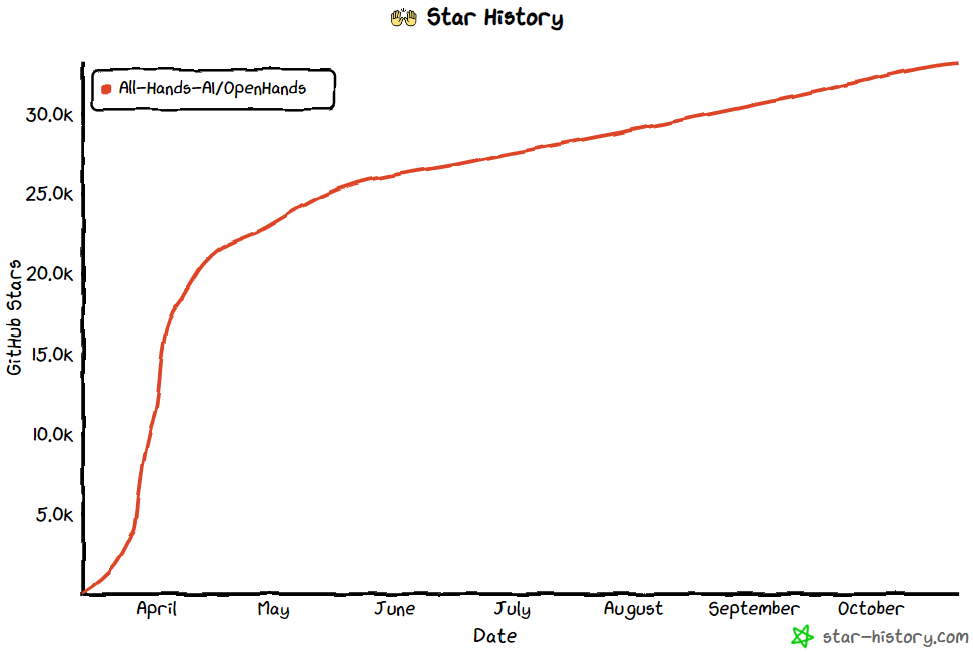
```python
def _create_long_term_memory(self, output) -> None:
    """Create and save long-term and entity memory items based on evaluation."""
    if (
        self.crew
        and self.crew.memory
        and self.crew._long_term_memory
        and self.crew._entity_memory
        and self.task
        and self.agent
    ):
        try:
            ltm_agent = TaskEvaluator(self.agent)
            evaluation = ltm_agent.evaluate(self.task, output.text)

            if isinstance(evaluation, ConverterError):
                return

            long_term_memory = LongTermMemoryItem(
                task=self.task.description,
                agent=self.agent.role,
                quality=evaluation.quality,
                datetime=str(time.time()),
                expected_output=self.task.expected_output,
                metadata={
                    "suggestions": evaluation.suggestions,
                    "quality": evaluation.quality,
                },
            )
            self.crew._long_term_memory.save(long_term_memory)
```



OpenHands



Lesson 2: Multi-Agents - by Hand ✍️

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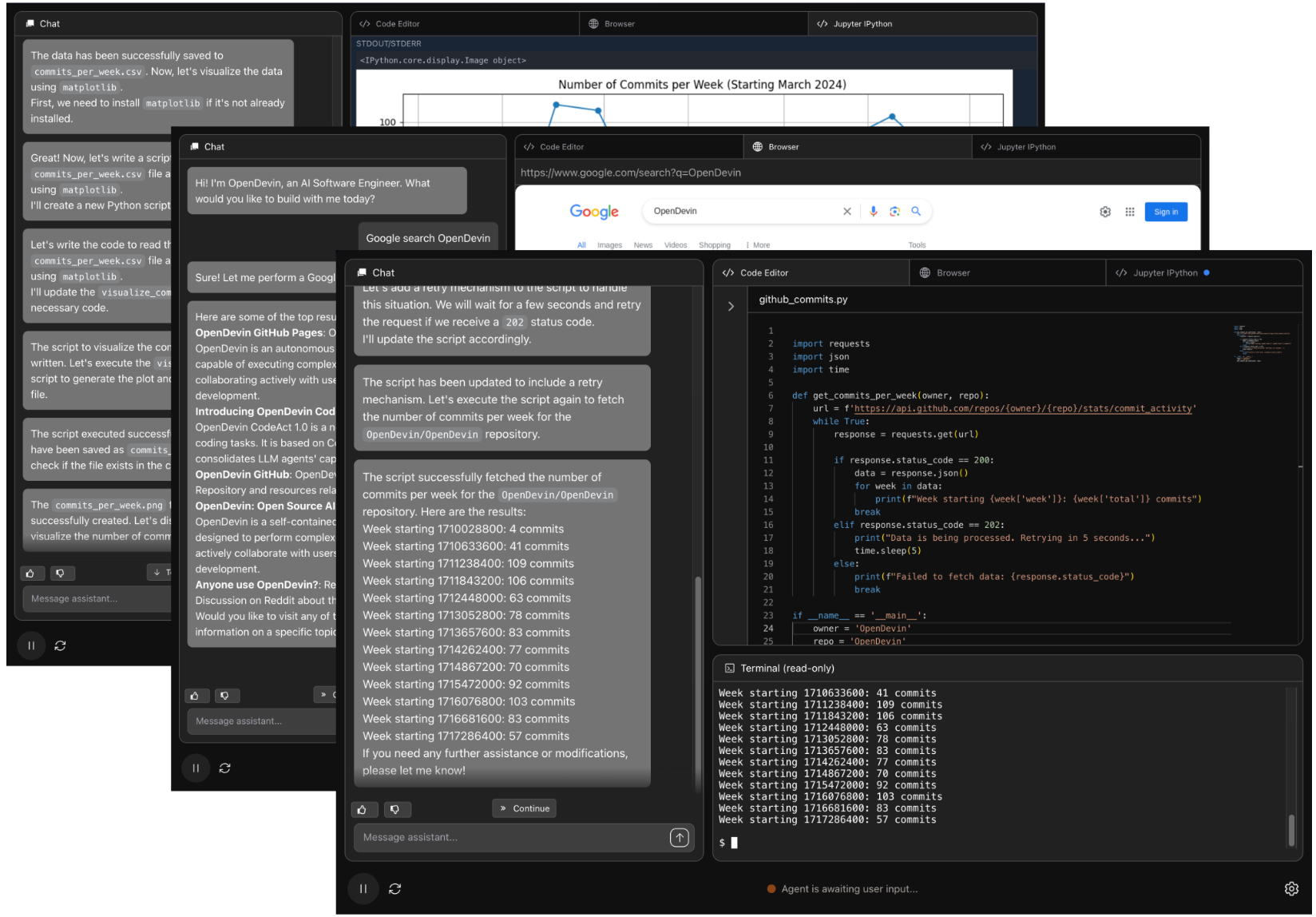
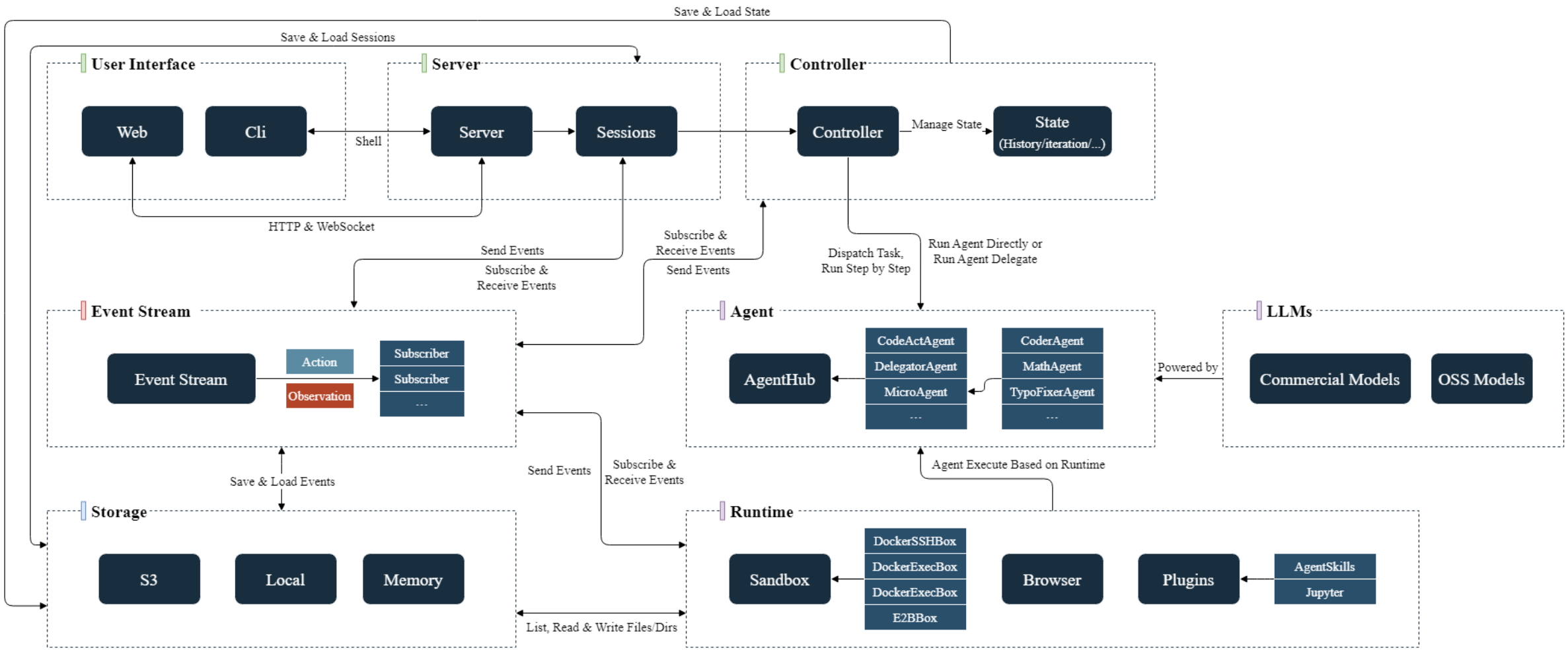

Chat
Code Editor
Browser
Jupyter IPython
STDOUT/STDERR
<IPython.core.display.Image object>
Number of Commits per Week (Starting March 2024)
100
The data has been successfully saved to commits_per_week.csv. Now, let's visualize the data using matplotlib.
First, we need to install matplotlib if it's not already installed.
Hi! I'm OpenDevin, an AI Software Engineer. What would you like to build with me today?
Google search OpenDevin
https://www.google.com/search?q=OpenDevin
Google
OpenDevin
Sign in
All
Images
News
Videos
Shopping
More
Tools
this situation. We will wait for a few seconds and retry the request if we receive a 202 status code.
I'll update the script accordingly.
The script has been updated to include a retry mechanism. Let's execute the script again to fetch the number of commits per week for the OpenDevin/OpenDevin repository.
The script successfully fetched the number of commits per week for the OpenDevin/OpenDevin repository. Here are the results:
Week starting 1710028800: 4 commits
Week starting 1710633600: 41 commits
Week starting 1711238400: 109 commits
Week starting 1711843200: 106 commits
Week starting 1712448000: 63 commits
Week starting 1713052800: 78 commits
Week starting 1713657600: 83 commits
Week starting 1714262400: 77 commits
Week starting 1714867200: 70 commits
Week starting 1715472000: 92 commits
Week starting 1716076800: 103 commits
Week starting 1716681600: 83 commits
Week starting 1717286400: 57 commits
If you need any further assistance or modifications, please let me know!
Continue
Message assistant...
github_commits.py
import requests
import json
import time
def get_commits_per_week(owner, repo):
url = f'https://api.github.com/repos/{owner}/{repo}/stats/commit_activity'
while True:
response = requests.get(url)
if response.status_code == 200:
data = response.json()
for week in data:
print(f"Week starting {week['week']}: {week['total']} commits")
break
elif response.status_code == 202:
print("Data is being processed. Retrying in 5 seconds...")
time.sleep(5)
else:
print(f"Failed to fetch data: {response.status_code}")
break
if __name__ == '__main__':
owner = 'OpenDevin'
repo = 'OpenDevin'
Terminal (read-only)
Week starting 1710633600: 41 commits
Week starting 1711238400: 109 commits
Week starting 1711843200: 106 commits
Week starting 1712448000: 63 commits
Week starting 1713052800: 78 commits
Week starting 1713657600: 83 commits
Week starting 1714262400: 77 commits
Week starting 1714867200: 70 commits
Week starting 1715472000: 92 commits
Week starting 1716076800: 103 commits
Week starting 1716681600: 83 commits
Week starting 1717286400: 57 commits
$
Agent is awaiting user input...

Agents Process Communication Memory LLM



Jul 4, 2024

CodeR

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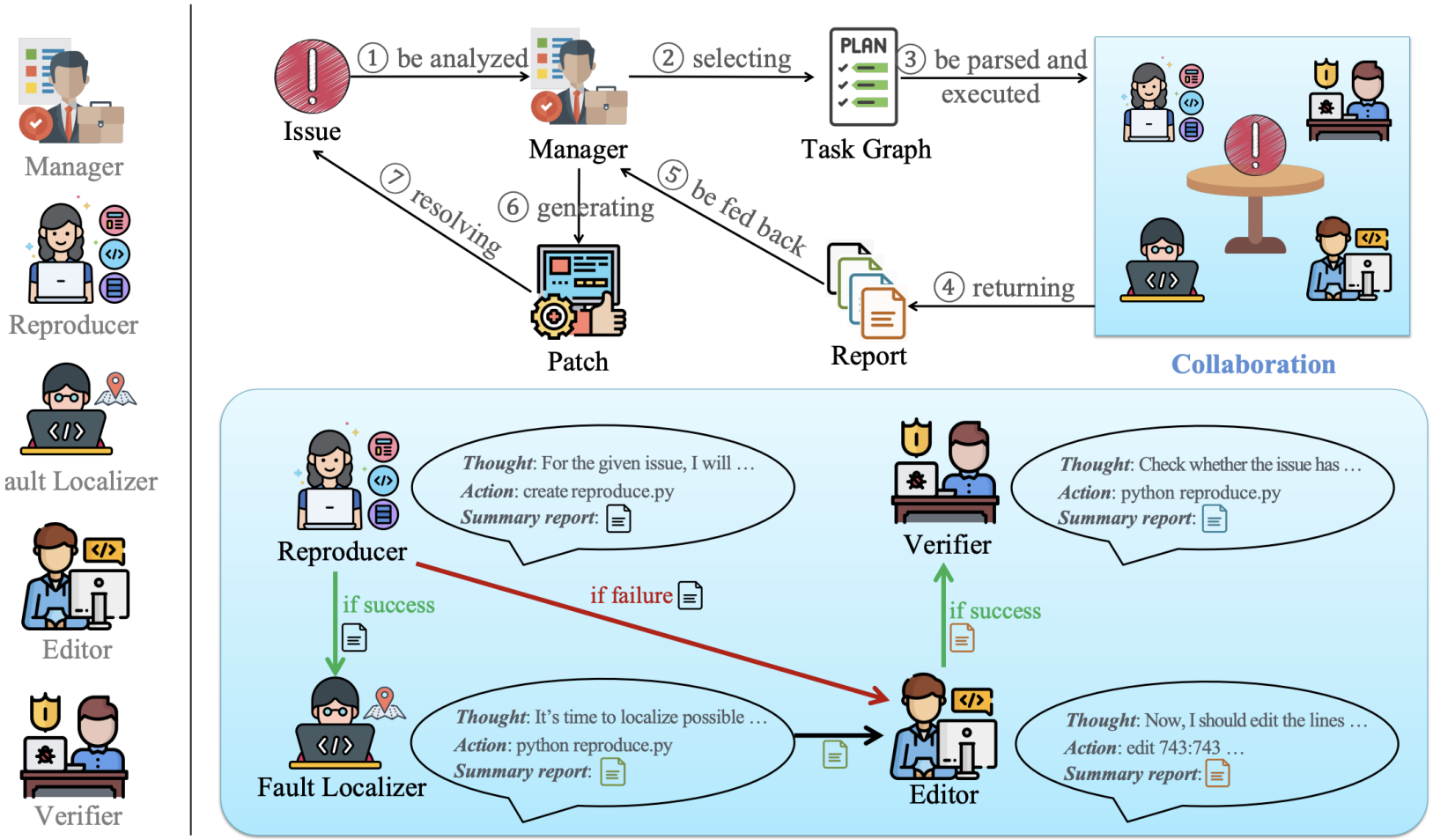
Agents Process Communication Memory LLM



Multi-Agents + Graphs
WhyHow.ai

Lesson 2: Multi-Agents - by Hand ✍️

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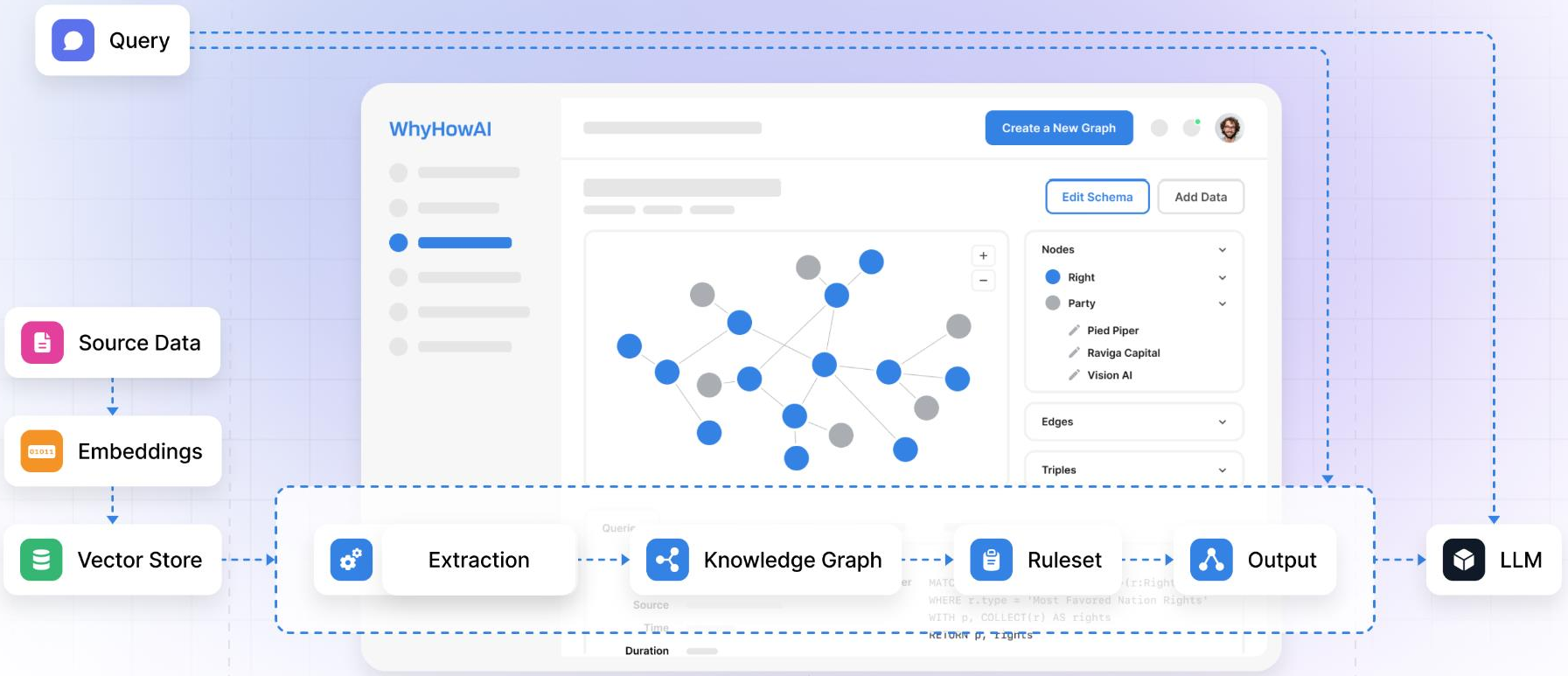

Query
Source Data
Embeddings
Vector Store
Extraction
Knowledge Graph
Ruleset
Output
LLM
WhyHowAI
Create a New Graph
Edit Schema
Add Data
Nodes
Right
Party
Pied Piper
Raviga Capital
Vision AI
Edges
Triples

Legal

The management of control functions by the Board and the Chief Compliance Officer (CCO) involves several key responsibilities as outlined in the compliance document:

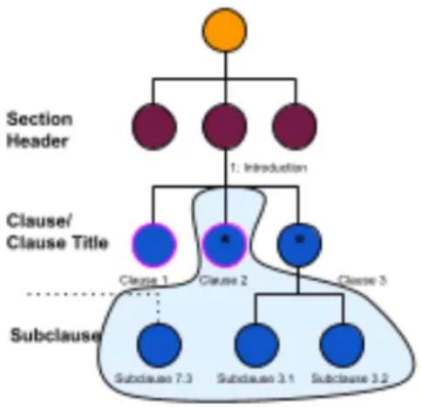
Responsibilities of the Board:
1. Oversight of Compliance Risk Management: The Board is responsible for overseeing the management of compliance risk within the financial institution. T
2. Approval and Support for the Compliance Function: The Board must ensure that the compliance function and the CCO have the appropriate standing, authority, and independence to carry out their duties effectively. The Board must also ensure that the compliance function is adequately resourced.
3.Engagement with the CCO: The Board should engage with the CCO regularly to discuss issues faced by the compliance function and ensure the CCO has direct access to the Board.
4. Annual Evaluation: The Board must evaluate the effectiveness of the institution's management of compliance risk at least annually, considering assessments from senior management, internal audit, and the CCO.

Responsibilities of the Chief Compliance Officer (CCO):
1. Coordination and Management of Compliance Risk: The CCO is responsible for coordinating the identification, management, and monitoring of compliance risk across the institution. This includes ensuring compliance monitoring and testing are consistent across the organization.
2. Reporting and Advising: The CCO must report regularly to senior management on the findings and analysis of compliance risks and must ensure that reports are readily available to internal audit and regulatory authorities. The CCO also advises the Board and senior management on legal and regulatory requirements, keeping them informed of developments and their implications.
3. Independence: The CCO must maintain independence from business lines to effectively carry out the role of a control function. This includes ensuring that there is no conflict of interest in their responsibilities, reporting lines, or remuneration.
4. Resources and Training: The CCO must ensure that the compliance function is sufficiently resourced with officers who have the necessary qualifications and experience. The CCO is also responsible for ensuring that adequate training is provided to officers on relevant legal and regulatory requirements.

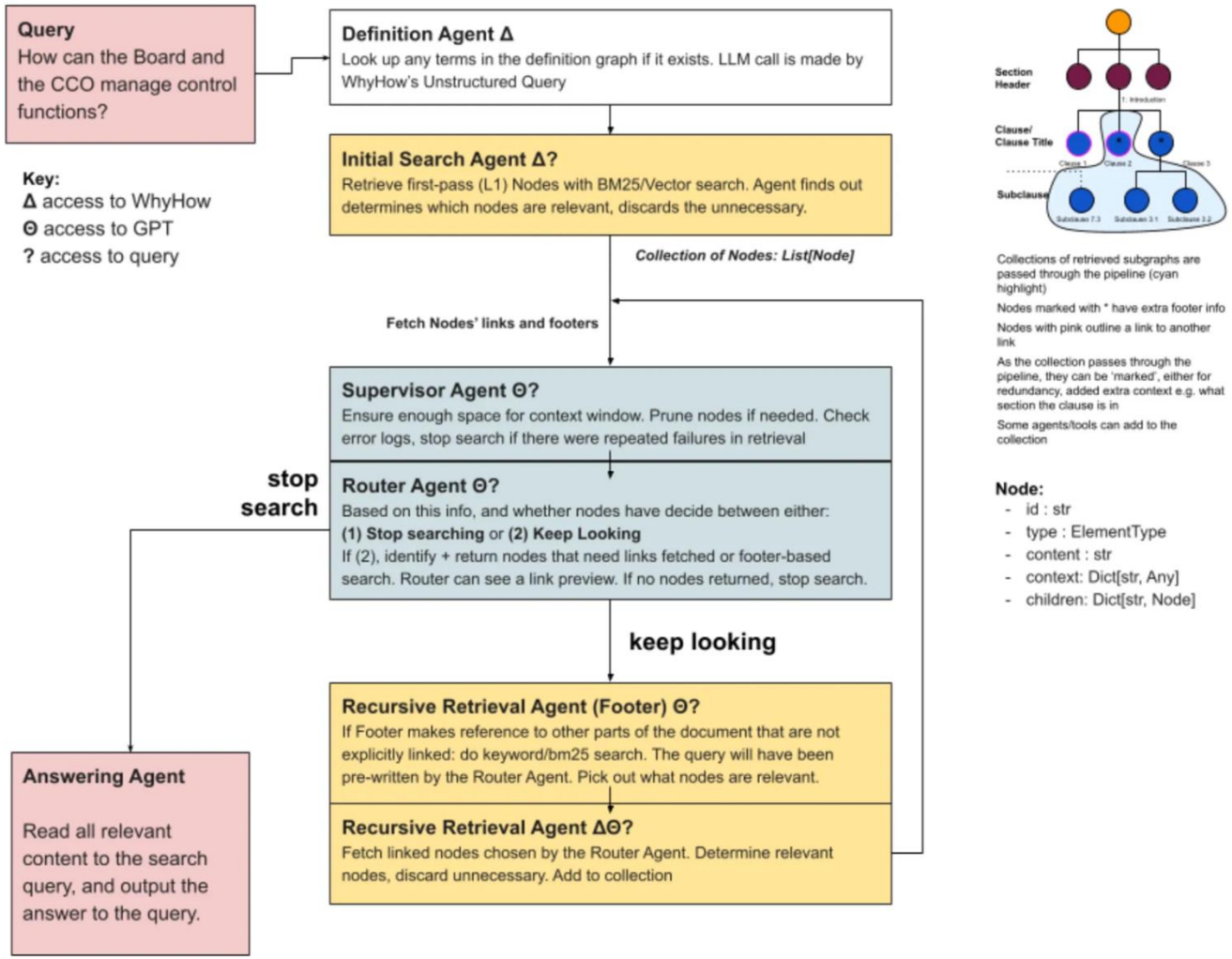
Interaction with Other Control Functions:
The compliance function should be organized in a way that allows effective management of compliance risk, considering the size, nature, and complexity of the financial institution's operations. Where responsibilities are shared between a dedicated compliance unit and other control functions, clear documentation and coordination are required to ensure that the CCO can perform their duties effectively without impairing independence or focus. By fulfilling these responsibilities, the Board and the CCO can ensure that the institution's compliance risks are managed effectively, supporting the overall safety and soundness of the financial institution.

Query

How can the board and the CCO manage control functions?



Agents Process Communication Memory LLM



https://medium.com/enterprise-rag/legal-document-rag-multi-graph-multi-agent-recursive-retrieval-through-legal-clauses-c90e073e0052

Assignment

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Prizes

Lesson 2: Multi-Agents - by Hand ✍️

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Q/A

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