

CrewAI Agent-Based Model Design - Instructions

LEAD 352 – Check In 2

Table of contents

| | |
|---|---|
| 0.1 Team Information..... | 1 |
| 0.2 Project Overview..... | 1 |
| 0.3 Setup and Imports..... | 1 |
| 0.4 Agent Definitions..... | 1 |
| 0.4.1 Agent 1..... | 1 |
| 0.4.2 Agent 2..... | 1 |
| 0.4.3 Agent 3..... | 1 |
| 0.4.4 Additional Agents (Optional)..... | 1 |
| 0.5 Task Definitions..... | 1 |
| 0.5.1 Task 1..... | 1 |
| 0.5.2 Task 2..... | 1 |
| 0.5.3 Task 3..... | 1 |
| 0.5.4 Additional Tasks (Optional)..... | 1 |
| 0.6 Process Flow Design..... | 1 |
| 0.6.1 Crew Setup..... | 1 |
| 0.6.2 Workflow Diagram..... | 1 |
| 0.7 Implementation Considerations..... | 1 |
| 0.7.1 Technical Requirements..... | 1 |
| 0.7.2 Challenges..... | 1 |
| 0.7.3 Future Enhancements..... | 1 |
| 0.8 Submission Checklist..... | 1 |
| 1. Overview..... | 1 |
| 2. Assignment Purpose..... | 1 |
| 3. Assignment Components..... | 1 |
| 3.1 1. Setup and Imports..... | 1 |
| 3.2 2. Agent Definitions..... | 1 |
| 3.3 3. Task Definitions..... | 1 |

| | |
|----------------------------------|---|
| 3.4 4. Crew Setup..... | 1 |
| 4. Grading Criteria..... | 1 |
| 5. Submission Requirements..... | 1 |
| 6. Example Agent Definition..... | 1 |
| 7. Example Task Definition..... | 1 |
| 8. Resources..... | 1 |

0.1 Team Information

Team Name: Skill-Versus-Confidence

Team Members:

1. Lorennny Sanchez (GitHub Username: Lore)
2. Evan Lechowicz (GitHub Username: EvanLecho7)
3. Ethan Kudysch (Github Username: Ekudysch)
4. Yiwen Huang (GitHub Username: gloria731)
5. Yongrae Kim (GitHub Username: YKim28290)
6. Anderson Li (GitHub Username: BingAli186)

GitHub Repository URL: <https://github.com/EvanLecho7/Skill-Versus-Confidence.git>

0.2 Project Overview

In this assignment, you will design a complete CrewAI agent-based simulation. You'll write the actual implementation code for the key components that could be executed in the future.

Describe your overall simulation concept (what problem is your agent-based model addressing?):

We aim to determine whether team success is more influenced by a leader's confidence or their competence. By analyzing team communication, task performance, and member satisfaction across four leadership styles, we hope to reveal how these traits impact group dynamics and outcomes in a collaborative presentation task.

0.3 Setup and Imports

LEAVE THIS SECTION AS IT IS other than team name (you will use this in your code to start):

```
#!/usr/bin/env python3
"""
```

CrewAI Agent-Based Model Design

Team: [Skill-Versus-Confidence]

"""

```
# Import necessary libraries
from crewai import Agent, Task, Crew, Process
from langchain_community.llms import Ollama
# Add any other imports you need

# Define the language model that will power your agents
llm = Ollama(model="llama2")
```

0.4 Agent Definitions

Define your agents with distinct roles, goals, and backstories. You need at least 3 agents, but can create more if needed.

0.4.1 Agent 1

Define four agents with distinct roles, all using the custom LLM

```
HconfHcomp = Agent(
    role='Leader1',
    goal='Lead a team in the creation and presentation of a slidedeck on a topic',
    backstory='You are an extroverted person, who is very knowledgeable in the topic at hand. You believe in your competence without needed validation, are decisive, resilient and calm under pressure. You have strong communication skills, which makes you a great leader who is accountable and assertive. ',
    llm=custom_llm
)
```

Explain this agent's personality traits and other characteristics:

0.4.2 Agent 2

Define your second agent

```
HconfLcomp = Agent(
    role='Leader2',
    goal='Lead a team in the creation and presentation of a slidedeck on a topic',
    backstory='You are an extroverted person, who is empathic and collaborative, you are confident in public speaking but not very knowledgeable about the topic of the presentation. You have strong communication skills and being supportive between others that could help elevate the lack of knowledge about the topic.',
    llm=custom_llm
)
```

```
# Explain this agent's personality traits and other characteristics:
```

0.4.3 Agent 3

```
# Define your third agent
```

```
LconfHcomp = Agent(
```

```
    role='Leader3',
    goal='Lead a team in the creation and presentation of a slidedeck on a topic',
    backstory='You are an introverted person and are not very confident in your leadership skills, however, you are very knowledgeable about the topic of the presentation. You might get a bit overwhelmed with leading and socializing with your team, but you try your best to communicate your knowledge to your team.',
    llm=custom_llm
)
```

```
# Explain this agent's personality traits and other characteristics:
```

0.4.4 Agent 4

```
# Define additional agents as needed
```

```
LconfLcomp= Agent(
```

```
    role='Leader4',
    goal='Lead a team in the creation and presentation of a slidedeck on a topic',
    backstory='You have basic project management skills and basic communication skills; you are also low in confidence, and doubt yourself often feeling unprepared and uncertain. Decision making is hard, you lack confidence which makes you avoid taking risks. You are hesitant, introverted and rather ignorant on this topic. ',
    llm=custom_llm
```

```
# Explain this agent's personality traits and other characteristics:
```

0.4.5 Agent 5

```
# Define additional agents as needed
```

```
Team member 1 = Agent(
```

```
    role='Researcher',
    goal='collect and analyze the data, and derive meaning insights',
    backstory='You are an analytical and detail-oriented researcher with strong expertise in data analysis and technical writing. While you prefer working independently, your reliability and precision make you a trusted expert in your field. You may feel overwhelmed by collaboration or
```

leadership roles, but you strive to communicate your insights effectively, ensuring that data-driven decisions are well-founded',

```
llm=custom_llm
```

```
# Explain this agent's personality traits and other characteristics:
```

0.4.6 Agent 6

```
# Define additional agents as needed
```

```
Team member 2 = Agent(
```

```
    role='Strategist',
```

```
    goal='Develop and implement innovative design and marketing strategies',
```

```
    backstory='You are a highly adaptable and innovative executor, excelling in design, user experience, and marketing. You thrive in fast-paced environments, quickly adjusting to new challenges and bringing fresh ideas to the table. While you focus on execution, your creativity ensures that every project is both functional and visually compelling.',
```

```
    llm=custom_llm
```

```
# Explain this agent's personality traits and other characteristics:
```

0.4.7 Agent 7

```
# Define additional agents as needed
```

```
Team member 3 = Agent(
```

```
    role='Executor',
```

```
    goal='Implement the plan and ensure completion',
```

```
    backstory='You are efficient at executing tasks. You are detail oriented and highly organized. You ensure that deadlines are met and resources are used effectively. you thrive on structure and problem solving, keeping everything on track',
```

```
    llm=custom_llm
```

```
# Explain this agent's personality traits and other characteristics:
```

0.5 Task Definitions

Define the tasks that your agents will perform. Create at least one task for each agent.

0.5.1 Task 1

```
# Define your first task
```

```
main_task = Task(
```

```
description='Measure how each leader (based on confidence and competence levels)
influences the team's ability to collaboratively create and deliver a high-quality presentation',
expected_output='An initial study plan detailing objectives, methods, measurement tools,
and a basic implementation schedule.',
agent=leaderX )
```

```
# Explain any dependencies this task has:
```

0.5.2 Task 2

```
# Define your second task
```

```
research_task = Task(
```

```
description='Research information for the presentation, and gives the information to the rest
of the team, follows how the leader directs the research direction',
expected_output='A concise breakdown of necessary information for the presentation.'
agent=researcher )
```

```
# Explain any dependencies this task has:
```

0.5.3 Task 3

```
# Define your third task
```

```
strategist_task = Task(
```

```
description='Develop a creative and engaging design and communication strategy for clearly
presenting the team's content to the audience.',
expected_output='A detailed strategy outlining visual design elements, messaging approach,
and effective marketing techniques to maximize audience engagement.'
agent=strategist )
```

```
# Explain any dependencies this task has:
```

0.5.4 Task 4

```
# Define additional tasks as needed
```

```
organization_task = Task(
```

```
description='Organize the presentation preparation, help the leader define task
responsibilities, manage timelines, and ensure successful completion of all elements.',
expected_output='A structured, detailed project plan and schedule clearly outlining roles,
deadlines, and deliverables for efficient task execution.'
agent=executor )
```

```
# Explain any dependencies this task has:
```

0.6 Process Flow Design

0.6.1 Crew Setup

```
# Set up your crew with the defined agents and tasks
crew = Crew(

    agents1=[leader1, researcher, strategist, executor],
    agents2=[leader2, researcher, strategist, executor],
    agents3=[leader3, researcher, strategist, executor],
    agents4=[leader4, researcher, strategist, executor],
    tasks=[main_task, research_task, strategist_task, organization_task ],
    process='sequential', # Agents work one after another
    verbose=True         # Prints detailed logs of agent interactions
)

# Start the collaboration and execute the tasks
result = crew.kickoff()

# Print the final output
print("Final Output:", result)
```

```
# Explain why you chose this process type:
```

0.6.2 Workflow Diagram

Sketch or describe the workflow of your simulation (how tasks and agents interact):

The assigned **Leader (Leader1,Leader2,Leader3,Leader 4)** clearly defines the initial presentation objectives, overall plan, and basic timeline. Output: Initial study plan and schedule clearly defining objectives, methods, and timelines

Research Phase (Researcher)

- **Researcher** collects, analyzes, and synthesizes detailed, accurate information related to the topic to support the presentation.

Strategy Development Phase (Strategist)

- **Strategist** creates a compelling and effective communication/design strategy to ensure the content is engaging and visually appealing.

Execution Phase (Executor)

- **Executor** organizes and implements the finalized presentation plan, assigning specific tasks, managing deadlines, and coordinating team members

. Presentation Delivery (All Agents, Led by Leader)

- The entire team collaboratively delivers the final presentation, with the leader facilitating.

Reporting & Conclusion (Leader & Researcher)

- **Leader** and **Researcher** finalize the findings, providing clear insights about leader confidence and competence effects on team success.

0.7 Implementation Considerations

Sequential Processing:

- Confirm the sequential workflow is correctly enforced to simulate realistic interactions and dependencies among tasks.

Clear Metrics:

Define explicit, measurable indicators for confidence, competence, satisfaction, and communication quality.

Conflict Resolution:

Decide upfront how the simulation handles disagreements or decision-making impasses between agents.

0.7.1 Challenges

What challenges do you anticipate in implementing this simulation?

Agent Realism & Behavior Consistency

- **Challenge:**
Ensuring agents consistently behave according to their confidence and competence traits.
- **Solution:**
Clearly define and continuously validate agent traits; run multiple tests and refine their backstories and instructions iteratively.

Measuring Abstract Qualities

- **Challenge:**
Difficulty accurately measuring abstract qualities such as leader confidence, competence, member satisfaction, and morale.

- **Solution:**
Establish clear, explicit metrics (e.g., survey scales, interaction logs), and use multiple assessment methods to enhance reliability.

Realistic Time Management

- **Challenge:**
Balancing realistic timelines with simulation constraints and computational resources.
- **Solution:**
Predefine realistic but practical task deadlines, carefully manage simulation pace, and incorporate contingency buffers.

0.7.2 Future Enhancements

Describe potential future enhancements to your simulation:

Enhanced Agent Complexity and Realism

- **Description:**
Develop more nuanced personality traits, emotional intelligence, and adaptability in agents for richer, more authentic interactions.

Cultural and Demographic Variability

- **Description:**
Introduce agent backgrounds reflecting diverse cultural, demographic, or professional experiences to analyze their influence on group dynamics.

Longitudinal Simulations

- **Description:**
Extend simulation duration to observe long-term leadership impacts on team development, morale, performance trends, and relationship dynamics.

0.8 Submission Checklist (confirm these are completed)

- ✓ Completed all required agent definitions (minimum 3)
- ✓ Created at least one task for each agent
- ✓ Designed the process flow and team structure
- ✓ Considered implementation challenges and future enhancements

1. Overview

In this assignment, you will design a complete CrewAI agent-based simulation. You'll write the actual implementation code for the key components while focusing on thoughtful design of agents, tasks, and their interactions.

2. Assignment Purpose

The purpose of this assignment is to:

1. Demonstrate your understanding of agent-based modeling concepts
2. Gain hands-on experience with the CrewAI framework's code structure
3. Design a well-thought-out simulation with multiple agents and tasks
4. Practice writing code that defines agent personalities and behaviors

3. Assignment Components

3.1 1. Setup and Imports

Your code should include the proper imports (LEAVE THIS AS IS FOR NOW):

```
from crewai import Agent, Task, Crew, Process
from langchain_community.llms import Ollama
```

```
# Set up the language model
llm = Ollama(model="llama2")
```

3.2 2. Agent Definitions

Define at least 3 agents for your simulation. For each agent, implement the Agent class with:

```
agent = Agent(
    role="", # The agent's function or position
    goal="", # What the agent aims to accomplish
    backstory="", # Background that shapes perspective
    verbose=True,
```

```
    llm=llm
)
```

Focus on creating distinctive personalities by crafting detailed backstories and clear goals that would influence how the agent would approach its tasks.

3.3 3. Task Definitions

For each agent, define at least one task using the Task class:

```
task = Task(
    description="", # What the task involves
    expected_output="", # The desired result
    agent=agent, # Which agent performs this task
    context="" # Optional additional information
)
```

Be specific about what each task involves and what output it should produce. Consider any dependencies between tasks (e.g., if one task needs the output from another).

3.4 4. Crew Setup

Define your crew, which organizes your agents and tasks:

```
crew = Crew(
    agents=[agent1, agent2, agent3],
    tasks=[task1, task2, task3],
    verbose=2,
    process=Process.sequential # or Process.hierarchical
)
```

Explain your choice of process type (sequential or hierarchical) and how it suits your simulation.

4. Grading Criteria

Your submission will be evaluated on:

- **Agent Design**
- **Task Design**
- **Process Flow**

5. Submission Requirements

Submit your completed worksheet as a Word document by **[DEADLINE DATE]**.

6. Example Agent Definition

```
financial_advisor = Agent(  
    role="Financial Planning Specialist",  
    goal="Develop comprehensive financial plans tailored to clients' needs  
and goals",  
    backstory="""You are an experienced financial advisor with over 15 years  
in the industry.  
You have helped hundreds of clients achieve financial security through  
careful planning  
and strategic investment advice. You have certifications in financial  
planning and  
retirement planning. You take a conservative approach to risk but  
understand that some  
calculated risks are necessary for growth. You pride yourself on  
explaining complex  
financial concepts in simple, understandable terms.""",  
    verbose=True,  
    llm=llm  
)
```

7. Example Task Definition

```
create_financial_plan = Task(  
    description="""Create a comprehensive financial plan for a middle-aged  
couple with two  
children planning for retirement and college expenses. Include investment  
recommendations,  
savings strategies, risk management, and a timeline for implementation.  
Consider their  
current assets, income, and future financial goals.""",  
    expected_output="""A detailed financial plan document with sections for  
retirement planning,  
college funding, investment strategy, risk management, and implementation  
timeline. The plan  
should include specific investment recommendations, monthly savings  
targets, insurance needs,  
and key milestones.""",  
    agent=financial_advisor,  
    context="""The clients are: John (45) and Mary (43) with children ages 12  
and 14. Combined  
annual income: $175,000. Current savings: $250,000 in 401(k)s, $50,000 in  
college funds,  
$30,000 emergency fund. They want to retire at 65 with $2M and fully fund  
their children's  
public university education.""",  
)
```

8. Resources

- CrewAI Documentation: <https://docs.crewai.com/>
- CrewAI GitHub Repository: <https://github.com/joaomdmoura/crewAI>