Republic of the Philippines
Laguna State Polytechnic University
Province of Laguna

Assessment Task No. 4			
Topic:	Monotonic vs. Non-Monotonic Reasoning	**Course Code:**	CSST101
Course Title:	Advance Knowledge Representation and Reasoning	**Academic Year:**	2025-2026
Student Name	Macatangay, Shaine Carla P.	**Section:**	BSCS 3A

"When Logic Changes: Exploring Non-Monotonic Reasoning and Argumentation"

Part I. Conceptual Understanding (20 points) Instruction:

Answer the following questions briefly but clearly. Each question is worth 4 points.

1. Define non-monotonic reasoning in your own words.
   - In my understanding, non-monotonic reasoning is a kind of thinking where conclusions can change when new information appears. It's like when I assume something is true based on what I currently know, but I have to revise it later after learning more facts. For example, I might think it will be sunny all day because the morning is clear, but when clouds form, I change my conclusion. This kind of reasoning is common in human decision-making because we often deal with incomplete knowledge. AI systems also use this reasoning so they can adapt to new data instead of sticking to fixed assumptions. It mirrors how humans stay open-minded and adjust when reality proves their assumptions wrong. For me, this flexibility makes reasoning more realistic and closer to how the world actually works.

2. How does non-monotonic reasoning differ from monotonic reasoning?
   - Monotonic reasoning means that once a conclusion is true, adding more information won't change it. In contrast, non-monotonic reasoning allows conclusions to be withdrawn or updated when new facts appear. I think of it like this: monotonic reasoning is like strict logic in math—once proven, always true—while non-monotonic reasoning is more flexible and realistic. In daily life, people use non-monotonic reasoning because our knowledge changes all the time. AI systems also benefit from it since real-world data is uncertain and constantly evolving. This difference matters because humans and AI need to adjust to unexpected information instead of clinging to old beliefs. I believe that's what makes non-monotonic reasoning more practical and human-like.

3. Give a real-life situation where a conclusion must change after new information is added.
   - A simple example I've experienced is assuming a friend is home because their lights are on. Later, I learn that they left the lights on by accident, so my conclusion changes—they're not home after all. This shows how non-monotonic reasoning works: I made a reasonable guess, but new evidence forced me to revise it. Humans naturally do this when solving problems or making decisions with limited data. Similarly, AI systems like virtual assistants adjust their responses when new inputs or corrections are received. It proves that both humans and AI depend on updating conclusions as new context comes in. I think this kind of reasoning makes decision-making more accurate and realistic.

4. What is the default rule? Provide one example.
   - A default rule is a general assumption we make when there's no evidence to the contrary. For example, I usually assume that "birds can fly" until I find out that the bird is a penguin or an ostrich. In my view, default rules help both humans and AI make quick, practical decisions without needing all the facts first. They act as shortcuts for reasoning in uncertain situations. However, once an exception appears, the rule is overridden to keep the conclusion accurate. This kind of rule helps simplify everyday choices and logical processes. I believe that default rules save time and effort while still allowing room for corrections when new facts appear.

5. How do argumentation frameworks help AI systems decide between conflicting rules?

- Argumentation frameworks allow AI systems to weigh different rules or arguments and determine which one makes the most sense in a given context. It reminds me of how people reason when they have to choose between two valid but opposing opinions. The system evaluates the strength, relevance, and evidence supporting each argument before deciding which to accept. This helps AI handle uncertainty and conflict logically, just like humans do during debates or decision-making. By doing so, the AI becomes more adaptable and fair in reaching conclusions. I think it’s like having an internal debate that leads to the most reasonable outcome. It teaches AI how to reason more ethically and thoughtfully, just as humans try to do.

Part II. Laboratory Application (40 points)

Task 1: Belief Revision Simulation (20 points)

Objective: Implement a simple reasoning program in Python or R that revises conclusions when new information is added.

Instructions:
1. Create a program that starts with the rule: “If an animal is a bird, assume it can fly.”
2. Ask the user to input the animal name.
3. If the animal is a known exception (like penguin or ostrich), revise the conclusion.
4. Display the system’s reasoning process step-by-step

```
# Belief Revision Simulation
# Objective: Demonstrate non-monotonic reasoning
# Rule: If an animal is a bird, assume it can fly.
# Known exceptions: penguin, ostrich, kiwi, dodo

def main():
    # Step 1: Ask for user input
    animal = input("Input an animal: ").strip().lower()

    # Step 2: Initialize knowledge base
    birds = ["penguin", "ostrich", "kiwi", "dodo", "sparrow", "eagle",
"parrot", "crow", "dove"]
    exceptions = ["penguin", "ostrich", "kiwi", "dodo"]

    print("\nReasoning:")

    # Step 3: Check if animal is a bird
    if animal in birds:
        print(f"{animal.capitalize()}s are birds.")
        # Default assumption
        can_fly = True

        # Step 4: Revise if it’s an exception
        if animal in exceptions:
            print(f"However, {animal}s do not fly.")
```

```
            can_fly = False
    else:
        print(f"{animal.capitalize()} is not identified as a bird.")
        can_fly = None

    # Step 5: Print conclusion
    print("\nConclusion:")
    if can_fly is True:
        print(f"{animal}s can fly.")
    elif can_fly is False:
        print(f"{animal}s cannot fly.")
    else:
        print(f"No conclusion can be made about {animal}'s ability to
fly.")


# Run the reasoning program
if __name__ == "__main__":
    main()
```

```
Input an animal: crow

Reasoning:
Crows are birds.

Conclusion:
crows can fly.
```

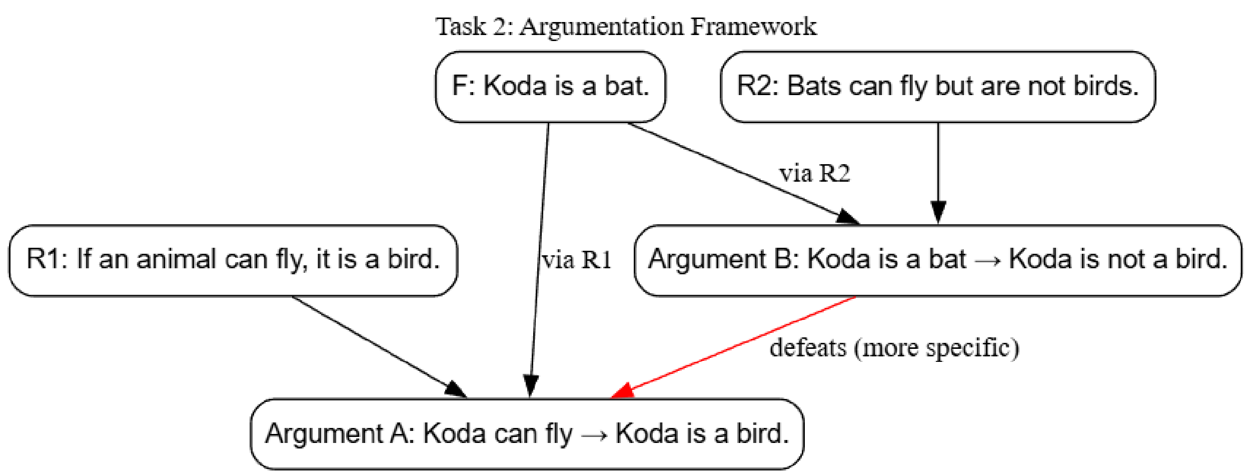
```
Input an animal: cat

Reasoning:
Cat is not identified as a bird.

Conclusion:
No conclusion can be made about cat's ability to fly.
```

Task 2: Argumentation Framework (20 points)

Objective: Create a simple argument diagram showing conflicting knowledge and how the stronger argument prevails.



This argumentation graph illustrates how specific knowledge can override general assumptions in reasoning. The general rule states that animals that can fly are birds, but a more specific rule clarifies that bats, though capable of flight, are not birds. When the fact "Koda is a bat" is introduced, the argument based on the specific rule defeats the general one. This demonstrates non-monotonic reasoning, where new, more precise information leads to a revision of the original conclusion.

Part III. Reflection and Discussion (20 points)

Instruction: Write a short essay (150–200 words) answering the prompt below.

"Think of a time when you changed your conclusion after learning new information. How is this similar to non-monotonic reasoning in AI?"

There was a time when I formed a premature judgment about a short film after seeing only its trailer. The scenes appeared unorganized and unappealing, which led me to assume that the film lacked quality and purpose. I even considered leaving a negative comment online. However, I later recognized that such an opinion would be unfounded without a full understanding of the work. I decided to watch the entire film and examine its background and intended message. Through further research, I discovered that the story addressed complex themes about human struggle and emotional growth. The additional information changed my evaluation completely, and I developed a genuine appreciation for the film's artistic depth and intent.

A similar situation occurred when I misjudged a person I initially viewed as distant and unfriendly. When I eventually interacted with them during a group project, I learned that they were reserved but thoughtful, cooperative, and insightful. We even shared several interests and ways of thinking. This experience demonstrated how conclusions based on incomplete information can be misleading.

In both cases, my perspective shifted once I encountered new evidence. This process reflects non-monotonic reasoning in artificial intelligence, where initial conclusions are revised as new data becomes available. It taught me that sound judgment, whether in human reasoning or AI systems, depends on openness, evidence, and a willingness to reconsider earlier assumptions.