

Part I. Conceptual Understanding

1. Define non-monotonic reasoning in your own words.

Non-monotonic reasoning is a type of reasoning where conclusions can change if new information is added. Unlike classical logic, previous conclusions are not always final.

2. How does non-monotonic reasoning differ from monotonic reasoning?

In monotonic reasoning, once a conclusion is drawn, it cannot be retracted. In non-monotonic reasoning, conclusions can be revised or withdrawn when new evidence arises.

3. Give a real-life situation where a conclusion must change after new information is added.

I might assume that it will not rain today because the sky is clear. Later, if I learn a storm is approaching, I must revise my conclusion and carry an umbrella.

4. What is a default rule? Provide one example.

A default rule is an assumption made when there is no contrary information.

Example: "Typically, birds can fly" assumes all birds fly unless an exception (like penguins) is known.

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

Argumentation frameworks organize conflicting rules or arguments and evaluate which is stronger, often based on specificity or reliability, allowing AI to choose the most reasonable conclusion.

Task 2: Argumentation Framework

Scenario:

- Rule 1: Birds can fly.
- Rule 2: Penguins are birds that cannot fly.
- Fact: Tweety is a penguin.

Argument Diagram (Text Version):

Argument A: Tweety is a bird → Tweety can fly

Argument B: Tweety is a penguin → Tweety cannot fly

Conflict: A vs B

Resolution: Argument B defeats A (more specific)

Conclusion: Tweety cannot fly

Part III. Reflection and Discussion

There was a time I thought my phone's battery was fully charged because the indicator showed 100%. Later, I noticed the battery drained very quickly after unplugging, which made me revise my conclusion: the battery was actually faulty. This experience is similar to non-

monotonic reasoning in AI, where assumptions or conclusions can change when new information is introduced. Just like I initially assumed the battery was fine, AI might assume a general rule holds true. However, when new, contradicting evidence appears, the AI revises its beliefs or decisions. Non-monotonic reasoning allows systems to be flexible and adapt to changing conditions, making them closer to human reasoning. This process is important in AI applications like expert systems, recommendation engines, or medical diagnosis, where exceptions to rules often exist. It ensures that the AI's conclusions are not rigid, reducing errors and improving decision-making over time.