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"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.
    - **Non-monotonic** reasoning is where you get to know new information you will withdraw with your old conclusion.
2. How does non-monotonic reasoning differ from monotonic reasoning?
    - When it comes to **non-monotonic,** they withdraw their old conclusion when the new facts are added. In contrast, the monotonic once you believe in something, it will remain true even when the new facts are added.
3. Give a real-life situation where a conclusion must change after new information is added.
    - I assumed it would be sunny today because the sky was clear in the morning. But when I later saw dark clouds forming, I concluded it might rain instead.
4. What is a **default rule**? Provide one example.
    - **Example:** "Birds can fly." This is true by default, but if new information says the bird is a penguin, the rule no longer applies.
5. How do argumentation frameworks help AI systems decide between conflicting rules?
    - Argumentation frameworks help AI systems compare and evaluate different arguments, determine which ones are stronger or more supported by evidence, and then choose the most reasonable conclusion among conflicting rules.

Part II. Laboratory Application (40 points)

Task 1: Belief Revision Simulation (20 points)

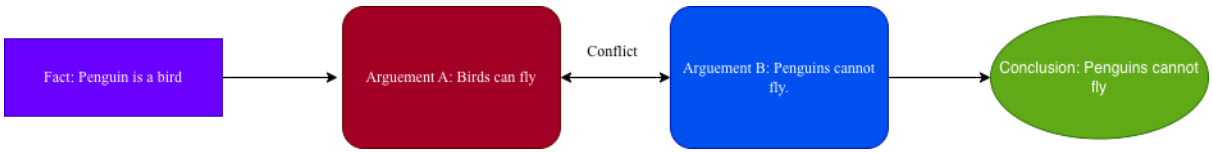
Objective: Implement a simple reasoning program in Python or R that revises conclusions when new information is added.

Output:

Task 2: Argumentation Framework (20 points)

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

Diagram:



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?"

I used to think that product reviews online were the best way to judge the quality of a product. Whenever I needed to get a product, I would only depend on the highest ratings and the most positive remarks to make my choice. After finding out that a large number of online reviews are fake or paid promotions, my view has changed. I recognized that trust in digital information should be supported by critical thinking, thus I no longer rely solely on ratings, but rather I look for verified purchases and balanced feedback. My experience is a perfect example of non-monotonic reasoning in artificial intelligence, where a new or more detailed piece of information leads to a change in the previous conclusion.

At the beginning, both humans and AI systems draw conclusions from the knowledge that is already there, but later, if new facts come up, they have to reconsider their previous assumptions in order to be accurate. In the same way in which I changed my mind after discovering that some of the reviews are fake, an AI system also changes its logic when it gets a piece of information that is against it. This is a demonstration of how the capability of being flexible is a step towards making more rational and reliable decisions.