

Reasoning in Artificial Intelligence

Reasoning

The reasoning is the psychological procedure of developing logical conclusion and making likelihoods from existing knowledge, facts, and beliefs. Or we can say that, "**Reasoning is a process to generate new knowledge based on previous knowledge.**" It is a common process of thinking reasonably, to find valid inferences.

In artificial intelligence it is used to main machine think like human.

Types of Reasoning

In artificial intelligence, reasoning can be categorized into the following types:

1. **Deductive reasoning**
2. **Inductive reasoning**
3. **Abductive reasoning**
4. **Common Sense Reasoning**
5. **Monotonic Reasoning**
6. **Non-monotonic Reasoning**

1. Deductive reasoning

- In deductive reasoning, the truth of the premises guarantees the truth of the conclusion.

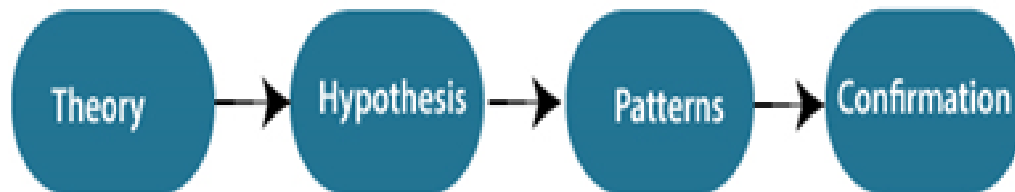
Example:

Premise-1: All the human eats veggies

Premise-2: Suresh is human.

Conclusion: Suresh eats veggies.

- The general process of deductive reasoning is given below:



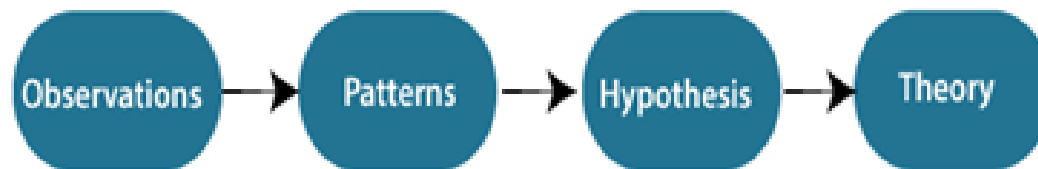
2. Inductive Reasoning:

- Inductive reasoning is a type of propositional logic, which is also known as cause-effect reasoning or bottom-up reasoning.
- In inductive reasoning, premises provide probable supports to the conclusion, so the truth of premises does not guarantee the truth of the conclusion.

- **Example:**

Premise: All of the pigeons we have seen in the zoo are white.

Conclusion: Therefore, we can expect all the pigeons to be white.



3. Abductive reasoning

- Abductive reasoning is a form of logical reasoning which starts with single or multiple observations then seeks to find the most likely explanation or conclusion for the observation.
- Abductive reasoning is an extension of deductive reasoning, but in abductive reasoning, the premises do not guarantee the conclusion.
- **Example:**
 - Implication:** Cricket ground is wet if it is raining
 - Axiom:** Cricket ground is wet.
 - Conclusion:** It is raining.

4. Common Sense Reasoning

- Common sense reasoning is an informal form of reasoning, which can be gained through experiences.
- Common Sense reasoning simulates the human ability to make presumptions about events which occurs on every day.
- It relies on good judgment rather than exact logic and operates on heuristic knowledge and heuristic rules.
- **Example:**
 - One person can be at one place at a time.
 - If I put my hand in a fire, then it will burn.

5. Monotonic Reasoning

- In monotonic reasoning, once the conclusion is taken, then it will remain the same even if we add some other information to existing information in our knowledge base. In monotonic reasoning, adding knowledge does not decrease the set of propositions that can be derived.
- To solve monotonic problems, we can derive the valid conclusion from the available facts only, and it will not be affected by new facts.
- Monotonic reasoning is not useful for the real-time systems, as in real time, facts get changed, so we cannot use monotonic reasoning.
- Monotonic reasoning is used in conventional reasoning systems, and a logic-based system is monotonic. Any theorem proving is an example of monotonic reasoning.

Example:

Earth revolves around the Sun.

- It is a true fact, and it cannot be changed even if we add another sentence in knowledge base like, "The moon revolves around the earth" Or "Earth is not round," etc.

6. Non-monotonic Reasoning

- In Non-monotonic reasoning, some conclusions may be invalidated if we add some more information to our knowledge base.
- Logic will be said as non-monotonic if some conclusions can be invalidated by adding more knowledge into our knowledge base.
- Non-monotonic reasoning deals with incomplete and uncertain models.
- "Human perceptions for various things in daily life, "is a general example of non-monotonic reasoning.

Example: Let suppose the knowledge base contains the following knowledge:

- **Birds can fly**
- **Penguins cannot fly**
- **Pitty is a bird**
- So from the above sentences, we can conclude that **Pitty can fly**.
- However, if we add one another sentence into knowledge base "**Pitty is a penguin**", which concludes "**Pitty cannot fly**", so it invalidates the above conclusion.