

Representation of Knowledge: Knowledge representation issues, *predicate logic* - *logic programming*, semantic nets - frames and inheritance, constraint propagation, representing knowledge using rules, rules-based deduction systems.

Reasoning under uncertainty: Review of probability, Bayes' probabilistic inferences, and Dempster-Shafer theory

## 1. Representation of Knowledge

Human beings are good at understanding, reasoning and interpreting knowledge. And using this knowledge, they are able to perform various actions in the real world. But how do machines perform the same?

What is Knowledge Representation?

Knowledge Representation (KR) describes the representation of knowledge. Basically, it is a study of how the beliefs, intentions, and judgments of an intelligent agent can be expressed suitably for automated reasoning. One of the primary purposes of Knowledge Representation includes modelling intelligent behaviour for an agent.

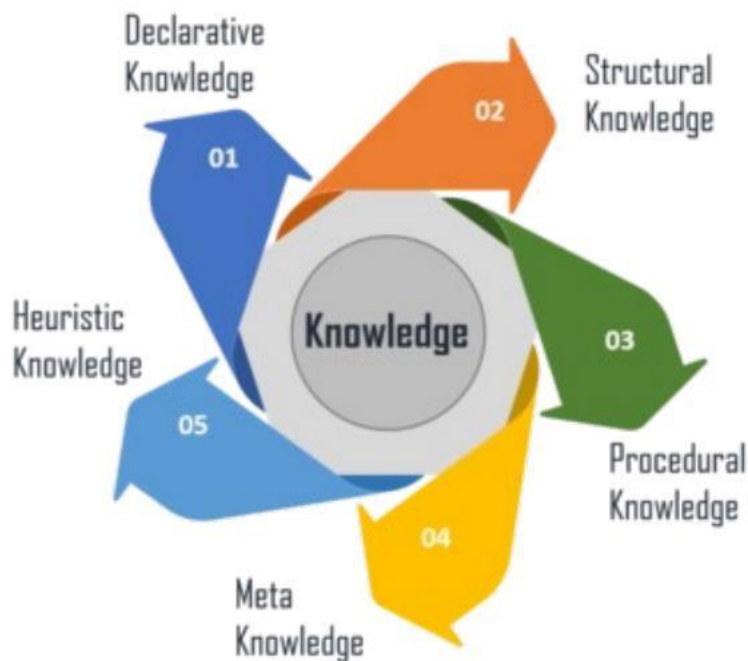
Knowledge Representation and Reasoning (KRR) represents information from the real world for a computer to understand and then utilize this knowledge to solve complex real-life problems like communicating with human beings in natural language.

KRR is not just about storing data in a database, it allows a machine to learn from that knowledge and behave intelligently like a human being.

The different kinds of knowledge that need to be represented in AI include: –

- Objects
- Events
- Performance
- Facts
- Meta-Knowledge
- Knowledge-base

Types of Knowledge



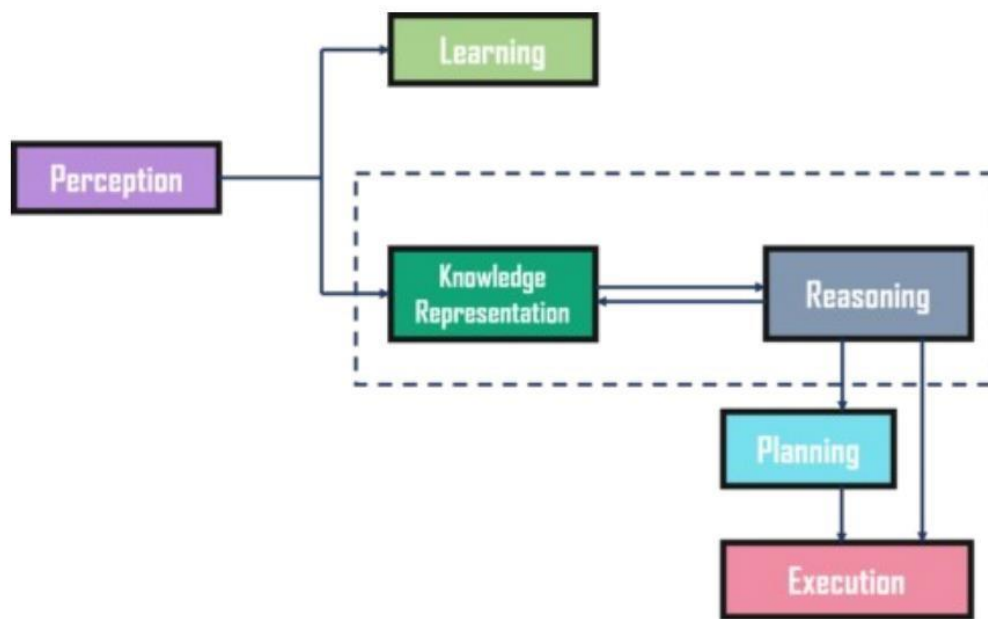
- Declarative Knowledge – It includes concepts, facts, and objects and expressed in a declarative sentence.
- Structural Knowledge – It is a basic problem-solving knowledge that describes the relationship between concepts and objects.
- Procedural Knowledge – This is responsible for knowing how to do something and includes rules, strategies, procedures, etc.
- Meta Knowledge – Meta Knowledge defines knowledge about other types of Knowledge.
- Heuristic Knowledge – This represents some expert knowledge in the field or subject.

#### Cycle of Knowledge Representation in AI

Artificial Intelligent Systems usually consist of various components to display their intelligent behavior. Some of these components include:

- Perception
- Learning
- Knowledge Representation & Reasoning
- Planning
- Execution

Example:



- The Perception component retrieves data or information from the environment.
- with the help of this component, you can retrieve data from the environment, find out the source of noises and check if the AI was damaged by anything.
- Also, it defines how to respond when any sense has been detected. Example
- Then, there is the Learning Component that learns from the captured data by the perception component.
- The goal is to build computers that can be taught instead of programming them. Learning focuses on the process of self-improvement.
- In order to learn new things, the system requires knowledge acquisition, inference, acquisition of heuristics, faster searches, etc.
- The main component in the cycle is Knowledge Representation and Reasoning which shows the humanlike intelligence in the machines.
- Knowledge representation is all about understanding intelligence.
- Instead of trying to understand or build brains from the bottom up, its goal is to understand and build intelligent behavior from the top-down and focus on what an agent needs to know in order to behave intelligently.