Chapt 3
Knowledge Representation

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Outline

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- What to Represent
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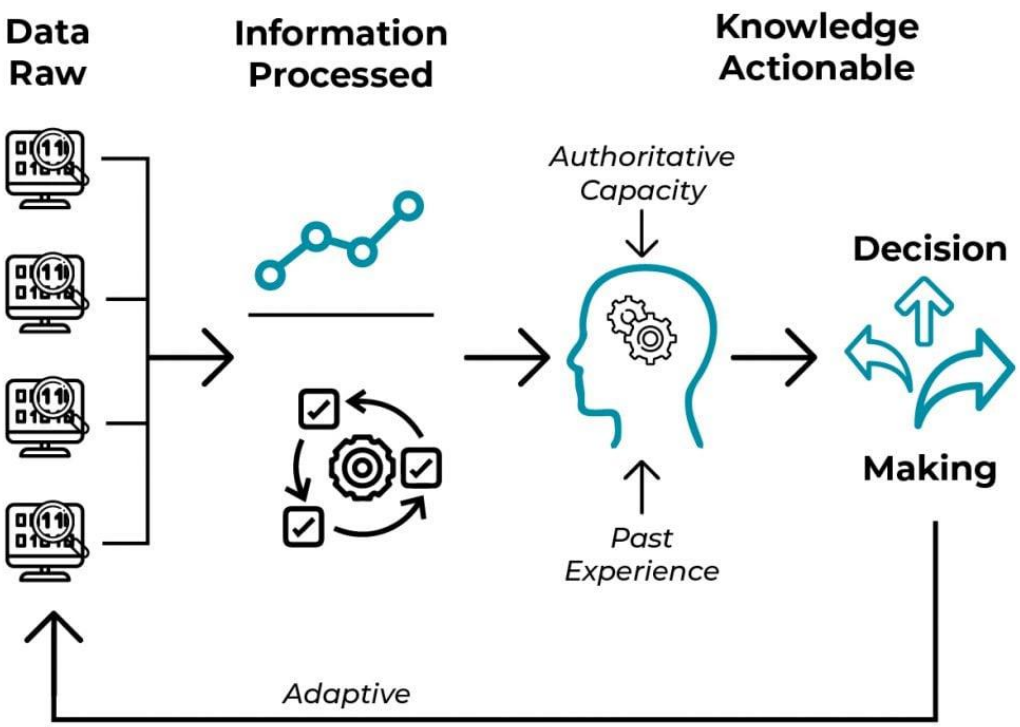
Intro



Humans

- understanding,
- reasoning, and
- interpreting knowledge

But how **machines** do all these things comes under knowledge representation and reasoning.

What is knowledge representation?

- **Knowledge representation and reasoning (KR, KRR)** → how thinking contributes to intelligent behavior of agents.
- A computer can **understand** and can utilize this knowledge to solve the complex real world problems (e.g., diagnosis a medical condition).
- KR is not just storing data into some database, but it also enables an **intelligent machine** to learn from that **knowledge and experiences** so that it can behave intelligently **like a human**.

What to Represent:

- **Object ➔** All the facts about objects in our world domain. E.g., Guitars contains strings, trumpets are brass instruments.
- **Events ➔** Events are the actions which occur in our world.
- **Performance ➔** It describe behavior which involves knowledge about how to do things.
- **Meta-knowledge ➔** It is knowledge about what we know.
- **Facts ➔** Facts are the truths about the real world and what we represent.
- **Knowledge-Base ➔** The central component of the knowledge-based agents is the knowledge base. It is represented as KB.

Knowledge

Knowledge ➔ is awareness or familiarity gained by experiences of facts, data, and situations. Following are the types of knowledge in artificial intelligence:

Types of knowledge

❖ Declarative Knowledge:

- Declarative knowledge is to know about something.
- It includes concepts, facts, and objects.
- It is also called descriptive knowledge and expressed in declarative sentences.
- It is simpler than procedural language.

❖ Procedural Knowledge

- It is also known as imperative knowledge.
- Procedural knowledge is a type of knowledge which is responsible for knowing how to do something.
- It can be directly applied to any task.
- It includes rules, strategies, procedures, agendas, etc.
- Procedural knowledge depends on the task on which it can be applied.

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❖ Meta-knowledge:

- Knowledge about the other types of knowledge is called Meta-knowledge.

❖ Heuristic knowledge:

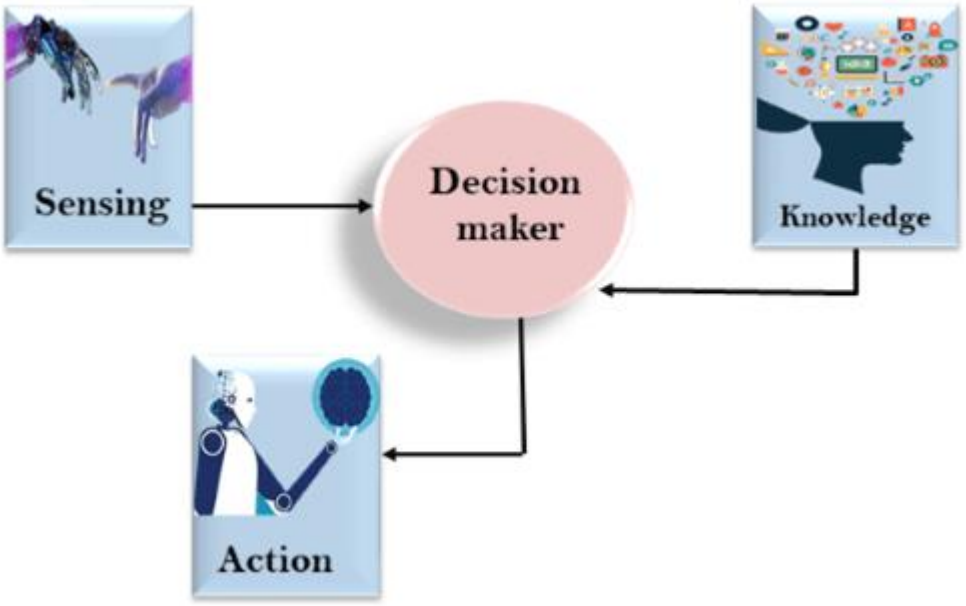
- Heuristic knowledge is representing knowledge of some experts in a filed or subject.
- Heuristic knowledge is rules of thumb based on previous experiences, awareness of approaches, and which are good to work but not guaranteed.

❖ Structural knowledge:

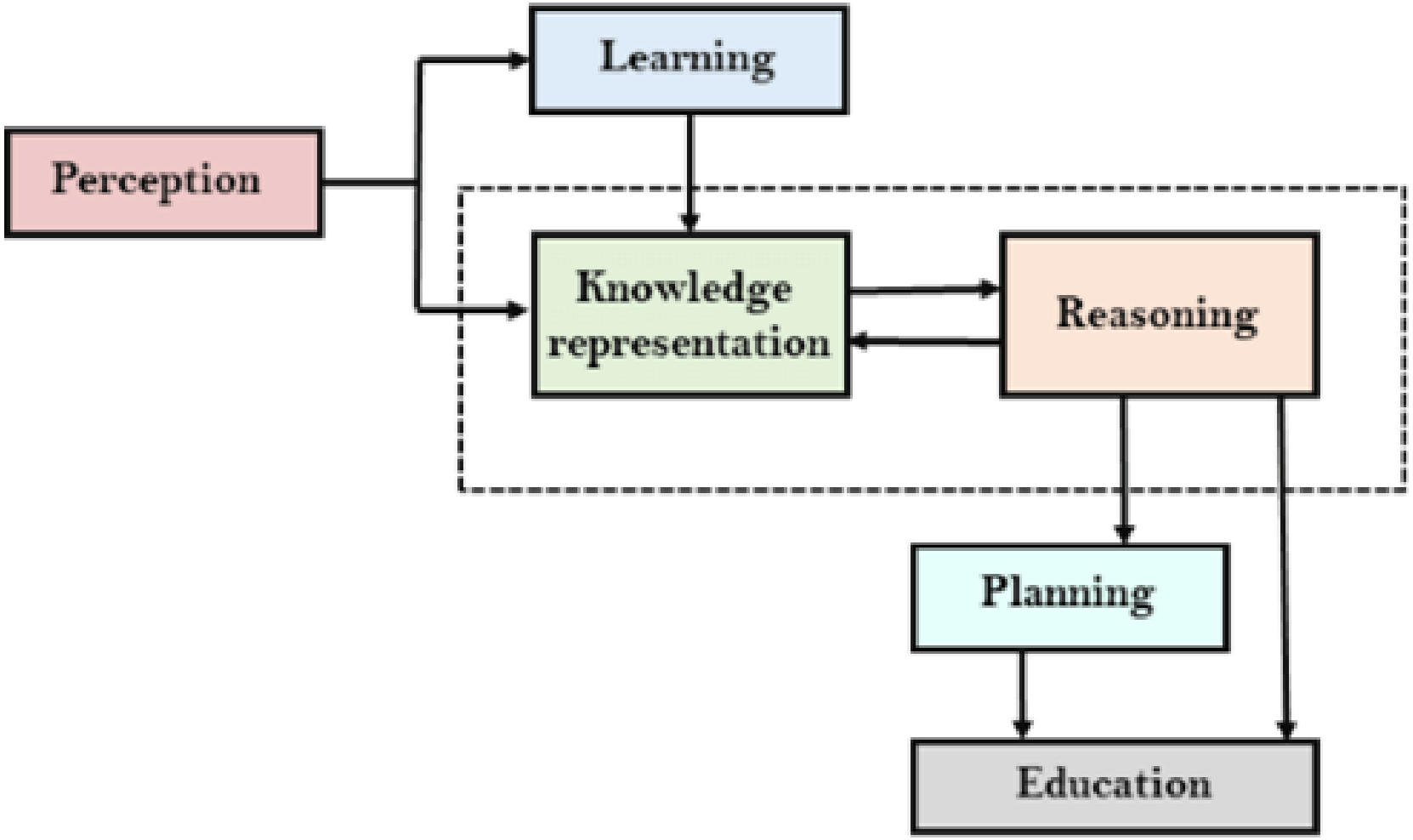
- Structural knowledge is basic knowledge to problem-solving.
- It describes relationships between various concepts such as kind of, part of, and grouping of something.
- It describes the relationship that exists between concepts or objects.

Knowledge and Intelligence

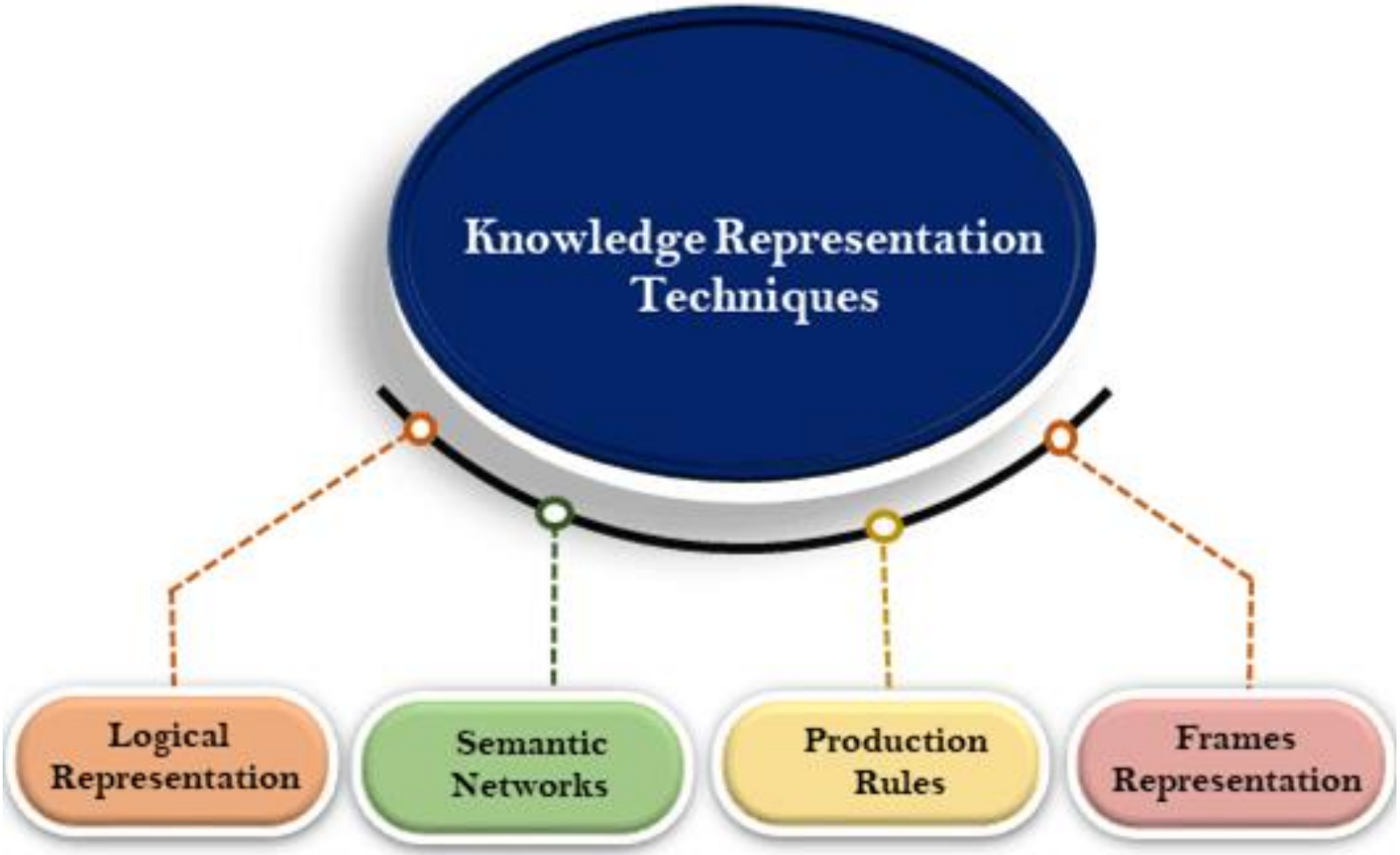
- Knowledge of real-worlds plays a vital role in intelligence and same for creating artificial intelligence.



AI knowledge cycle:



Techniques of knowledge representation



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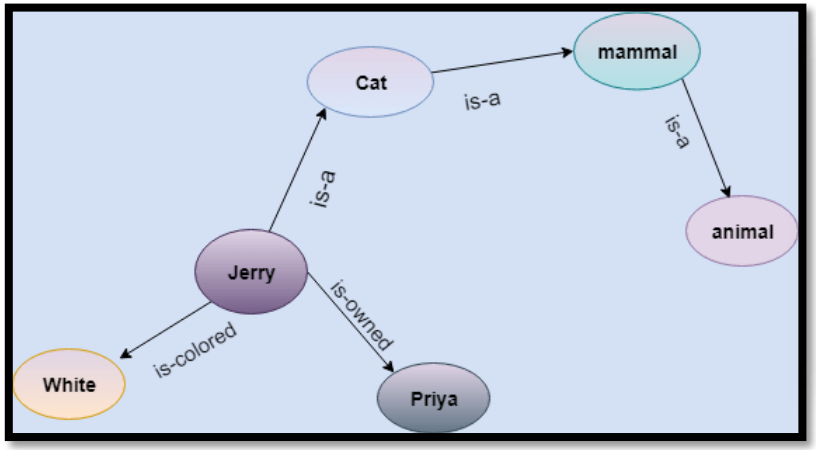

Semantic Network Representation

Slots	Filter
Name	Peter
Profession	Doctor
Age	25
Marital status	Single
Weight	78

Frame Representation

- IF (at bus stop AND bus arrives) THEN action (get into the bus)
- IF (on the bus AND paid AND empty seat) THEN action (sit down).
- IF (on bus AND unpaid) THEN action (pay charges).
- IF (bus arrives at destination) THEN action (get down from the bus).

Production Rules

❖ Thank you