Knowledge Representation

Thus two important aspects of AI or AI systems are:

- Knowledge Acquisition
- Knowledge Representation

In early AI systems this knowledge was acquired from domain experts.

Knowledge Acquisition

But acquisition of knowledge from experts have many difficulties:

- Expert may not be available

  Eg. Accident Prediction, Dengue spread prediction, Share Price Prediction

- Experts may differ in opinion

  Eg. Legal systems, Medical systems

- Experts may not be able to articulate knowledge

  Eg. From Intuition, Experience

And more interestingly

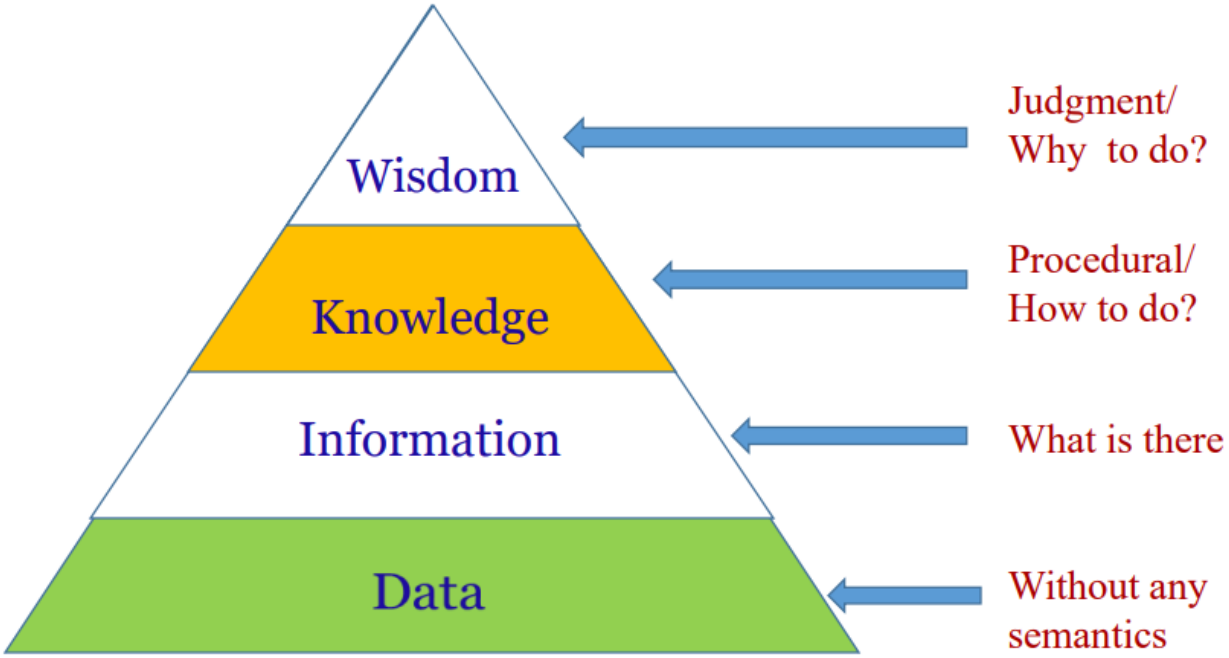
Expert may not even exist!!

Knowledge Acquisition

Hence question is :

"Where from the knowledge required for developing Modern AI systems may be acquired"

The solution comes from a novel perspective – viz. data



Knowledge Representation

- Humans are good at understanding, reasoning, and interpreting knowledge.
- Using this knowledge, humans are able to take perform various actions in the real world.
- **But how machines do all these things? How do machines take decisions and perform actions?**
- **This comes under knowledge representation and reasoning**.

Knowledge Representation

- Knowledge representation in AI is responsible for representing information about the real world in a way that a computer can understand and can utilize this knowledge to solve the complex real world problems such as diagnosis a medical condition or communicating with humans in natural language.
- Knowledge representation 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.

Knowledge Representation

- It refers to the process of designing and structuring information in a way that a computer or an AI system can understand and manipulate it.
- It involves creating models and formats to capture, store, and organize knowledge so that AI systems can reason, make decisions, and perform tasks based on that knowledge.
- Effective knowledge representation is crucial because it allows AI systems to work with complex information, learn from it, and use it to solve problems.

What to represent?

The type of knowledge which needs to be represented in AI systems are:

- **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.
- **Facts:** Facts are the truths about the real world and what we represent.

What to represent?

The type of knowledge which needs to be represented in AI systems are:

- **Meta-knowledge:** It is knowledge about what we know.
- **Knowledge-Base:** The central component of the knowledge-based agents is the knowledge base. It is represented as KB. The Knowledgebase is a group of the Sentences (Here, sentences are used as a technical term and not identical with the English language).

Type of Knowledge

Type of Knowledge

- **Declarative knowledge**
  - To know about something
  - Includes concepts, facts, and objects
  - Also called descriptive knowledge
  - Expressed in declarative sentences
- **Procedural Knowledge**
  - Also known as imperative knowledge
  - Responsible for knowing how to do something
  - Includes rules, strategies, procedures, etc.
  - Depends on the task on which it can be applied

Type of Knowledge

- **Meta knowledge**
  - Knowledge about other type knowledge
- **Heuristic knowledge**
  - Representing knowledge of some expert in a field or subject
  - Rule of thumb based on previous experiences, awareness of approaches, good to go but not guaranteed
- **Structural knowledge**
  - Describes relationship that exists between various concepts or objects, such as kind of, part of, group of, etc.
  - It is the basic knowledge of problem solving