

# Challenges and Opportunities in Knowledge Representation and Reasoning

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## INTRODUCTION

Knowledge Representation and Reasoning (KRR) describes real-world information that can be used to explain and solve complicated real-life issues such as human-computer interaction through natural language. The knowledge representation is not only about the data representation but also enables a computer to learn from this representation and act intelligently as a human being. Modern computer applications have led to the generalized use of knowledge representations in various contexts, including information search, simulation, web semantic ontology description (Baral, 2015). Natural language and representation of knowledge are strongly aligned in nature. In any field of science, the intelligent systems highly depend on the representation and reasoning of knowledge. By applying the knowledge representation and reasoning techniques to the data that are already being available on the internet, initiate a revolution in representation, analysis, and use of a huge amount of available data. Moreover, there are numerous problems relating to the use of techniques to represent knowledge, such as important attributes, relations between attributes, the choice of granularity of representation, and the identification of the correct structure as required. The systems are quite passive in current approaches and researchers mainly manage the information and extensions to the knowledge base.

The key factor involved in building intelligent knowledge systems is the representation of knowledge. Knowledge representation and reasoning techniques mentioned in Figure 1 (Malhotra, 2015) deal with knowledge as connecting node at the time of input and processing. There is a need to design state-of-the-art knowledge representation techniques that can integrate innovative and intelligent knowledge representation and reasoning properties into the system.

## BACKGROUND

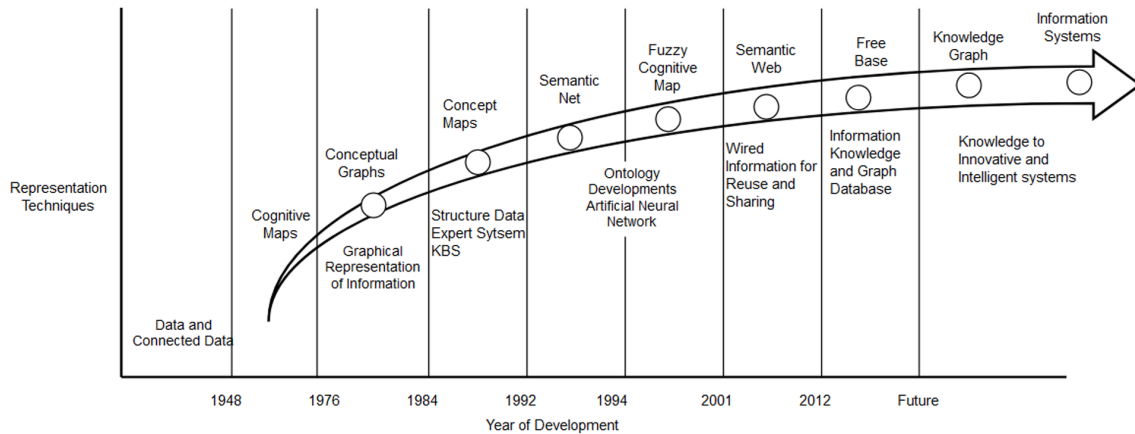
The researchers of the AI community have believed that the knowledge in the human brain, and knowledge in intelligent information processing systems, is considered as a network of interconnected nodes. Moreover, the way nodes are organized, relations between the nodes and the effectiveness with which information is collected vary enormously in human brain networks and human knowledge systems. Network connections in the human brain provide different characteristics that lead to their rapid or slow

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recovery of information (Sandberg, 2013). So, there is a demand to design an intelligent knowledge representation system which ensure that an autonomous node can determine the appropriate connectivity. Furthermore, communication among nodes is not only an appointed string relationship, but also the network intelligence.

Figure 1. Evolution of Knowledge Representation Techniques

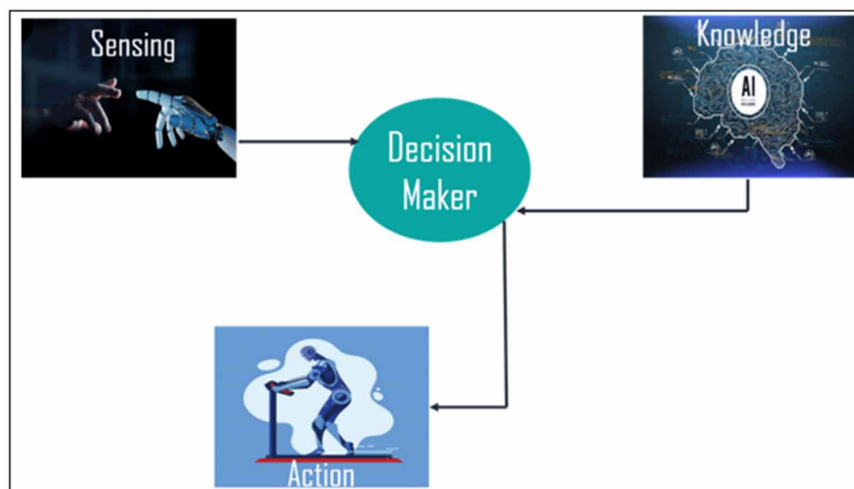


### Relation Between Knowledge and Intelligence

In the modern era, knowledge plays a crucial role and leads to state-of-the-art decision-making techniques of artificial intelligence (Ackerman, 2005). It depicts the smart actions of AI agents or systems. Only with awareness or experience of the input is it possible for an individual or device to act correctly. The key issue of artificial intelligence lies in knowledge representation and reasoning: to recognize the essence of intelligence and cognition so well that computers can be programmed to show human skills.

Let's take an example to understand this relationship:

Figure 2. Decision-maker



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