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Introduction to Artificial Intelligence Overview

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The idea of artificial intelligence has been around since 1956 beginning with a conference at Dartmouth College where the idea arose of reality being put into symbols then manipulating those symbols and reasoning with them to solve problems. However, before this, in the 1940s, scientists had already been looking into mathematical models of the brain which kickstarted the initial interest. Despite two neural winters, times where AI projects were not funded and there was a lack of interest, the invention of ideas like backpropagation and the era of GPU continued to further research in AI.

There are many definitions of artificial intelligence that have been used over time but it can be most broadly defined as "systems that think and act like humans and systems that think and act rationally." Therefore to design these systems, computer scientists need to look at humans and rationality. In humans, there exists a constant loop of conscious perception, thinking and action in our brains and it needs to be replicated in AI. To do this, the artificial intelligence systems must be capable of rational thinking and rational actions. Rational thinking includes logic which consists of correct preconditions (that are programmed) resulting in a correct conclusion. However, humans are not always able to formalize the preconditions. Often, humans just feel they know things but are not able to verbalize or even actively pinpoint what they are feeling and thinking. Another difficulty is that thinking rationally is different than acting rationally.

Programmers aim to design rational AI agents that can act with no interference and perceive their environments over long periods of time. They want them to be able to use their perceptions to create the best outcome possible. For example, the soccer playing robot shown in class had to decide between passing to a teammate, dribbling and attempting to score based on what it could see in its immediate surroundings. In order to design this, computer scientists must work on "modeling the world" or shrinking the world to a decent model. This is difficult however because of the completeness problem. Programmers categorize problems into ones that are solvable with algorithms that are running in polynomial time and those that aren't (the majority). As humans our brain has the ability to throw away pieces of information effortlessly, but computer vision technology cannot naturally do that. Therefore, programmers need to come up with ideas that shrink the number of dimensions and reduce into something they can handle in real time because one particular modeling function does not work all the time. To succeed, they need to find a balance between integrating the different models and pulling the right ones at the right time. Therefore, probabilities become very important and utilizing filters and filtering techniques that give software agents the opportunity to make decisions over time in real time.

Today's AI connects to nearly all other aspects of cognitive science: linguistics, psychology, philosophy and biology/neurology. Linguistics connects to AI through the study of natural language systems and how intelligent agents process and understand them compared to humans. Philosophy

can connect through logic systems that are utilized in automatic programming and proofs. Psychology connects through looking at vision and identification once again in comparison to humans. Biology connects through looking at patterns of neural networks and also through medicine specifically imaging techniques to detect and pinpoint diseases.