

Five Big Ideas in Artificial Intelligence

1. Perception

Computers perceive the world using sensors. Perception is the process of extracting meaning from sensory signals. Making computers “see” and “hear” well enough to be practically useful is one of the most significant achievements of AI to date.

2. Representation & Reasoning

Agents maintain models/representations of the world and use them for reasoning. Representation is one of the fundamental problems of intelligence, both natural and artificial. Computers construct representations using data structures, and these representations support reasoning algorithms that derive new information from what is already known. While AI agents can reason about very complex problems, they do not think the way a human does.

3. Learning

Computers can learn from data. Machine learning is a kind of statistical inference that finds patterns in data. Many areas of AI have progressed significantly in recent years thanks to learning algorithms that create new representations. For the approach to succeed, tremendous amounts of data are required. This “training data” must usually be supplied by people, but is sometimes acquired by the machine itself.

5. Societal Impact

AI can impact society in both positive and negative ways. AI technologies are changing the ways we work, travel, communicate, and care for each other. But we must be mindful of the harms that can potentially occur. For example, biases in the data used to train an AI system could lead to some people being less well served than others. Thus, it is important to discuss the impacts that AI is having on our society and develop criteria for the ethical design and deployment of AI-based systems.

4. Natural Interaction

AI developers strive to create agents that interact naturally with humans. Humans are among the hardest things for AI agents to understand. To interact naturally with us they must be able to converse in our language, recognize our facial expressions and emotions, and draw upon knowledge of culture and social conventions to infer our intentions from observed behavior. Today’s AI systems can use language to a limited extent, but lack the general reasoning and conversational capabilities of even a child.

