

# Introduction to Artificial Intelligence

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Artificial intelligence (AI) is intelligence demonstrated by machines, as opposed to natural intelligence displayed by humans or animals. Leading AI textbooks define the field as the study of "intelligent agents": any system that perceives its environment and takes actions that maximize its chance of achieving its goals.

## History of AI

The field of AI research was founded at a workshop held on the campus of Dartmouth College in the summer of 1956. The attendees, including John McCarthy, Marvin Minsky, Allen Newell, and Herbert Simon, became the founders and leaders of AI research. They and their students produced programs that were described as "astonishing": computers were learning checkers strategies, solving word problems in algebra, proving logical theorems, and speaking English.

By the middle of the 1960s, research in the U.S. was heavily funded by the Department of Defense and laboratories had been established around the world. AI's founders were optimistic about the future: Herbert Simon predicted, "machines will be capable, within twenty years, of doing any work a man can do."

## AI Approaches

### Machine Learning

Machine learning (ML) is a subset of AI that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. ML focuses on the development of computer programs that can access data and use it to learn for themselves.

Key machine learning algorithms include:

1. Supervised learning (classification, regression)
2. Unsupervised learning (clustering, dimensionality reduction)
3. Reinforcement learning

### Deep Learning

Deep learning is part of a broader family of machine learning methods based on artificial neural networks with representation learning. Learning can be supervised, semi-supervised or unsupervised. Deep learning architectures such as deep neural networks, deep belief networks, recurrent neural networks, and convolutional neural networks have been applied to fields including computer vision, speech recognition, natural language processing, and more.

## AI Applications

### Healthcare

AI in healthcare is used for tasks such as diagnosis of diseases, drug discovery, and personalized medicine. IBM's Watson for Oncology is trained to help doctors treat cancer patients by analyzing patient data and medical literature.

## Finance

AI is revolutionizing the finance industry through algorithmic trading, fraud detection, and customer service chatbots. JP Morgan's COIN program interprets commercial loan agreements in seconds, a task that previously took 360,000 hours of work annually by lawyers.

## Transportation

Self-driving vehicles use various AI techniques including computer vision and decision-making algorithms. Companies like Tesla, Waymo, and many traditional automakers are working on autonomous vehicles.

## Ethical Considerations

The development of AI raises ethical concerns related to privacy, security, and potential job displacement. Issues such as algorithmic bias, accountability, and the long-term impact of AI on human society are actively discussed by researchers, policymakers, and industry leaders.

## Future of AI

While narrow AI is focused on specific tasks, the long-term goal of many researchers is to create artificial general intelligence (AGI) - AI that can perform any intellectual task that a human can. However, experts have varying opinions on when, if ever, AGI will be achieved.