

ARTIFICIAL INTELLIGENCE

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What is Artificial Intelligence?

It is a branch of Computer Science that pursues creating the computers or machines as intelligent as human beings.

It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable Definition:

Artificial Intelligence is the study of how to make computers do things, which, at the moment, people do better.

According to the father of Artificial Intelligence, John McCarthy, it is “The science and engineering of making intelligent machines, especially intelligent computer programs”.

Artificial Intelligence is a way of making a computer, a computer-controlled robot, or a software think intelligently, in the similar manner the intelligent humans think.

AI is accomplished by studying how human brain thinks and how humans learn, decide, and work while trying to solve a problem, and then using the outcomes of this study as a basis of developing intelligent software and systems. It has gained prominence recently due, in part, to big data, or the increase in speed, size and variety of data businesses are now collecting. AI can perform tasks such as identifying patterns in the data more efficiently than humans, enabling businesses to gain more insight out of their data.

Artificial Intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think and act like humans. It involves the development of algorithms and computer programs that can perform tasks that typically require human intelligence such as visual perception, speech recognition, decision-making, and language translation. AI has the potential to revolutionize many industries and has a wide range of applications, from virtual personal assistants to self-driving cars.

Brief history

- 1943 McCulloch & Pitts: Boolean circuit model of brain
- 1950 Turing's "Computing Machinery and Intelligence"
- 1956 Dartmouth meeting: "Artificial Intelligence" adopted
- 1950s Early AI programs, including Samuel's checkers program, Newell & Simon's Logic Theorist, Gelernter's Geometry Engine
- 1965 Robinson's complete algorithm for logical reasoning
- 1966—73 AI discovers computational complexity, neural network research almost disappears
- 1969—79 early development of knowledge-based systems
- 1980-- AI becomes an industry
- 1986-- Neural networks return to popularity
- 1987-- AI becomes a science
- 1995-- The emergence of intelligent agents

Artificial Intelligence Terminologies

Intelligence relates to tasks involving higher mental processes, e.g. creativity, solving problems, pattern recognition, classification, learning, induction, deduction, building analogies, optimization, language processing, knowledge and many more. Intelligence is the computational part of the ability to achieve goals.

Intelligent behavior is depicted by perceiving one's environment, acting in complex environments, learning and understanding from experience, reasoning to solve problems and discover hidden knowledge, applying knowledge successfully in new situations, thinking abstractly, using analogies, communicating with others and more.

Science based goals of AI pertain to developing concepts, mechanisms and understanding biological intelligent behavior. The emphasis is on understanding intelligent behavior.

Engineering based goals of AI relate to developing concepts, theory and practice of building intelligent machines. The emphasis is on system building.

AI Techniques depict how we represent, manipulate and reason with knowledge in order to solve problems. Knowledge is a collection of 'facts'. To manipulate these facts by a program, a suitable representation is required. A good representation facilitates problem solving.

Learning means that programs learn from what facts or behavior can represent. Learning denotes changes in the systems that are adaptive in other words, it enables the system to do the same task(s) more efficiently next time.

Applications of AI refers to problem solving, search and control strategies, speech recognition, natural language understanding, computer vision, expert systems, etc.

Applications of AI

AI has applications in all fields of human study, such as finance and economics, environmental engineering, chemistry, computer science, and so on. Some of the applications of AI are listed below:

Perception

- ✓ Machine vision
- ✓ Speech understanding
- ✓ Touch (tactile or haptic) sensation

Robotics

Natural Language Processing

- ✓ Natural Language Understanding
- ✓ Speech Understanding
- ✓ Language Generation
- ✓ Machine Translation

Planning

Expert Systems

Machine Learning

Theorem Proving

Symbolic Mathematics

Game Playing

Many tools are used in AI, including versions of search and mathematical optimization, logic, and methods based on probability and economics. The AI field draws upon computer science, mathematics, psychology, linguistics, philosophy, neuroscience, artificial psychology, and many others.

The main focus of artificial intelligence is towards understanding human behavior and performance. This can be done by creating computers with human-like intelligence and capabilities. This includes natural language processing, facial analysis and robotics. The main applications of AI are in military, healthcare, and computing; however, it's expected that these applications will start soon and become part of our everyday lives.

Uses of Artificial Intelligence :

Artificial Intelligence has many practical applications across various industries and domains, including:

Healthcare: AI is used for medical diagnosis, drug discovery, and predictive analysis of diseases.

Finance: AI helps in credit scoring, fraud detection, and financial forecasting.

Retail: AI is used for product recommendations, price optimization, and supply chain management.

Manufacturing: AI helps in quality control, predictive maintenance, and production optimization.

Transportation: AI is used for autonomous vehicles, traffic prediction, and route optimization.

Customer service: AI-powered chatbots are used for customer support, answering frequently asked questions, and handling simple requests.

Security: AI is used for facial recognition, intrusion detection, and cybersecurity threat analysis.

Marketing: AI is used for targeted advertising, customer segmentation, and sentiment analysis.

Education: AI is used for personalized learning, adaptive testing, and intelligent tutoring systems.

This is not an exhaustive list, and AI has many more potential applications in various domains and industries.

Need for Artificial Intelligence

To create expert systems that exhibit intelligent behavior with the capability to learn, demonstrate, explain, and advise its users.

Helping machines find solutions to complex problems like humans do and applying them as algorithms in a computer-friendly manner.

Improved efficiency: Artificial intelligence can automate tasks and processes that are time-consuming and require a lot of human effort. This can help improve efficiency and productivity, allowing humans to focus on more creative and high-level tasks.

Better decision-making: Artificial intelligence can analyze large amounts of data and provide insights that can aid in decision-making. This can be especially useful in domains like finance, healthcare, and logistics, where decisions can have significant impacts on outcomes.

Enhanced accuracy: Artificial intelligence algorithms can process data quickly and accurately, reducing the risk of errors that can occur in manual processes. This can improve the reliability and quality of results.

Personalization: Artificial intelligence can be used to personalize experiences for users, tailoring recommendations, and interactions based on individual preferences and behaviors. This can improve customer satisfaction and loyalty.

Exploration of new frontiers: Artificial intelligence can be used to explore new frontiers and discover new knowledge that is difficult or impossible for humans to access. This can lead to new breakthroughs in fields like astronomy, genetics, and drug discovery.

Forms of AI:

1) Weak AI:

- Weak AI is an AI that is created to solve a particular problem or perform a specific task.
- It is not a general AI and is only used for specific purpose.
- For example, the AI that was used to beat the chess grandmaster is a weak AI as that serves only 1 purpose but it can do it efficiently.

2) Strong AI:

- Strong AI is difficult to create than weak AI.
- It is a general purpose intelligence that can demonstrate human abilities.
- Human abilities such as learning from experience, reasoning, etc. can be demonstrated by this AI.

3) Super Intelligence

- As stated by a leading AI thinker Nick Bostrom, “Super Intelligence is an AI that is much smarter than the best human brains in practically every field”.
- It ranges from a machine being just smarter than a human to a machine being trillion times smarter than a human.
- Super Intelligence is the ultimate power of AI.

AI has developed a large number of tools to solve the most difficult problems in computer science, like:

- ✓ Search and optimization
- ✓ Logic
- ✓ Probabilistic methods for uncertain reasoning
- ✓ Classifiers and statistical learning methods
- ✓ Neural networks
- ✓ Control theory
- ✓ Languages

High-profile examples of AI include autonomous vehicles (such as drones and self-driving cars), medical diagnosis, creating art (such as poetry), proving mathematical theorems, playing games (such as Chess or Go), search engines (such as Google search), virtual assistants (such as Siri), image recognition in photographs, spam filtering, prediction of judicial decisions[204] and targeted online advertisements. Other applications include Healthcare, Automotive, Finance, Video games, etc

Drawbacks of Artificial Intelligence:

Bias and unfairness: AI systems can perpetuate and amplify existing biases in data and decision-making.

Lack of transparency and accountability: Complex AI systems can be difficult to understand and interpret, making it challenging to determine how decisions are being made.

Job displacement: AI has the potential to automate many jobs, leading to job loss and a need for reskilling.

Security and privacy risks: AI systems can be vulnerable to hacking and other security threats, and may also pose privacy risks by collecting and using personal data.

Ethical concerns: AI raises important ethical questions about the use of technology for decision-making, including issues related to autonomy, accountability, and human dignity.

Regulation: There is a need for clear and effective regulation to ensure the responsible development and deployment of AI. It's crucial to address these issues as AI continues to play an increasingly important role in our lives and society.

Technologies Based on Artificial Intelligence:

Machine Learning: A subfield of AI that uses algorithms to enable systems to learn from data and make predictions or decisions without being explicitly programmed.

Natural Language Processing (NLP): A branch of AI that focuses on enabling computers to understand, interpret, and generate human language.

Computer Vision: A field of AI that deals with the processing and analysis of visual information using computer algorithms.

Robotics: AI-powered robots and automation systems that can perform tasks in manufacturing, healthcare, retail, and other industries.

Neural Networks: A type of machine learning algorithm modeled after the structure and function of the human brain.

Expert Systems: AI systems that mimic the decision-making ability of a human expert in a specific field.

Chatbots: AI-powered virtual assistants that can interact with users through text-based or voice-based interfaces.