



ARTIFICIAL INTELLIGENCE APPLICATION IN HEALTHCARE

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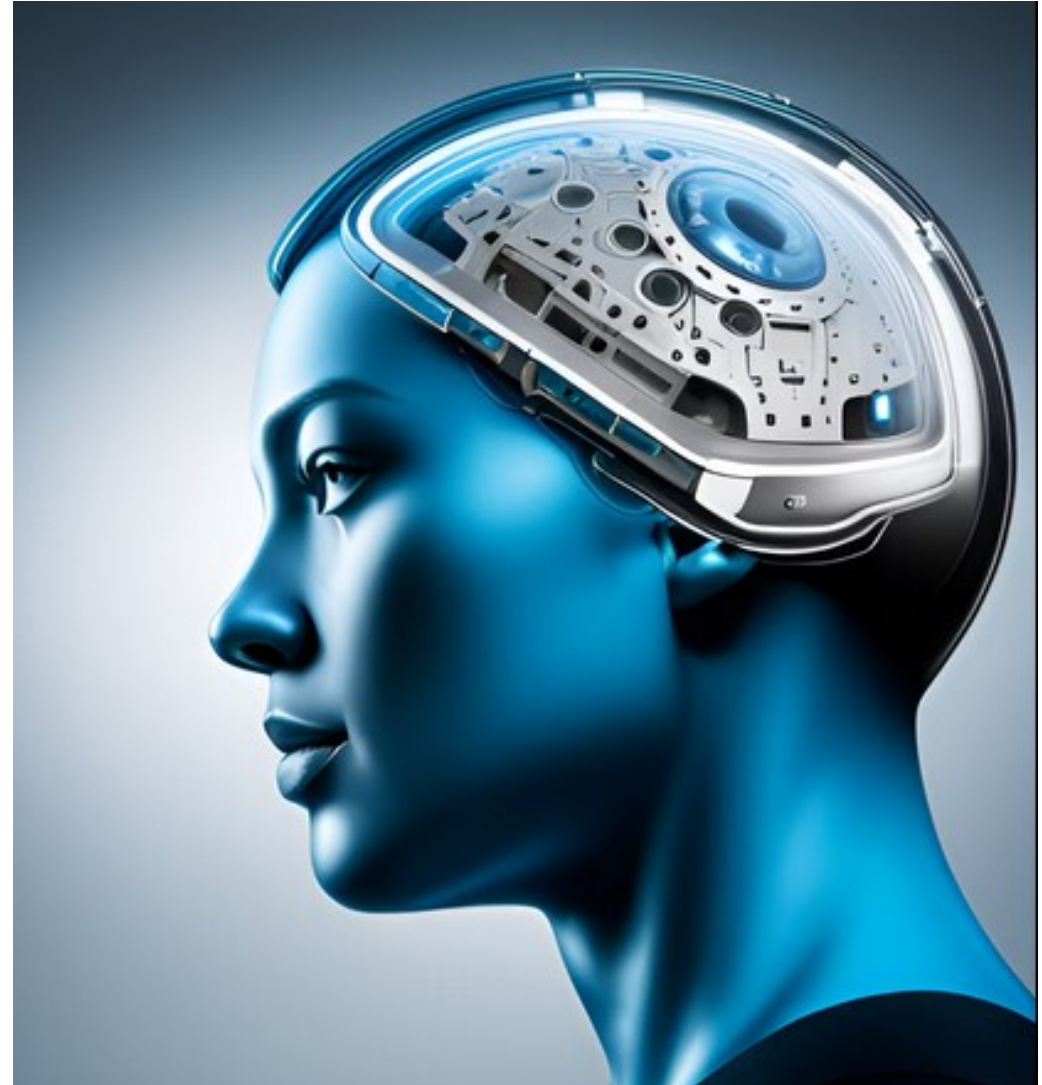


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What is Artificial intelligence?

- Artificial intelligence (AI) is the simulation of human intelligence in machines that are programming to think and learn like humans. It involves the development of algorithms and computer programs that can perform tasks that usually require human intelligence, such as **visual perception, speech recognition, decision making and language translations**. AI is rapidly growing field that has the potential to revolutionize the way we live and work.



Definition of AI and its basic concept

- Artificial Intelligence is a method of making a computer, a computer-controlled robot, or a software think intelligently like the human mind. AI is accomplished by studying the patterns of the human brain and by analyzing the cognitive process. The outcome of these studies develops intelligent software and systems.



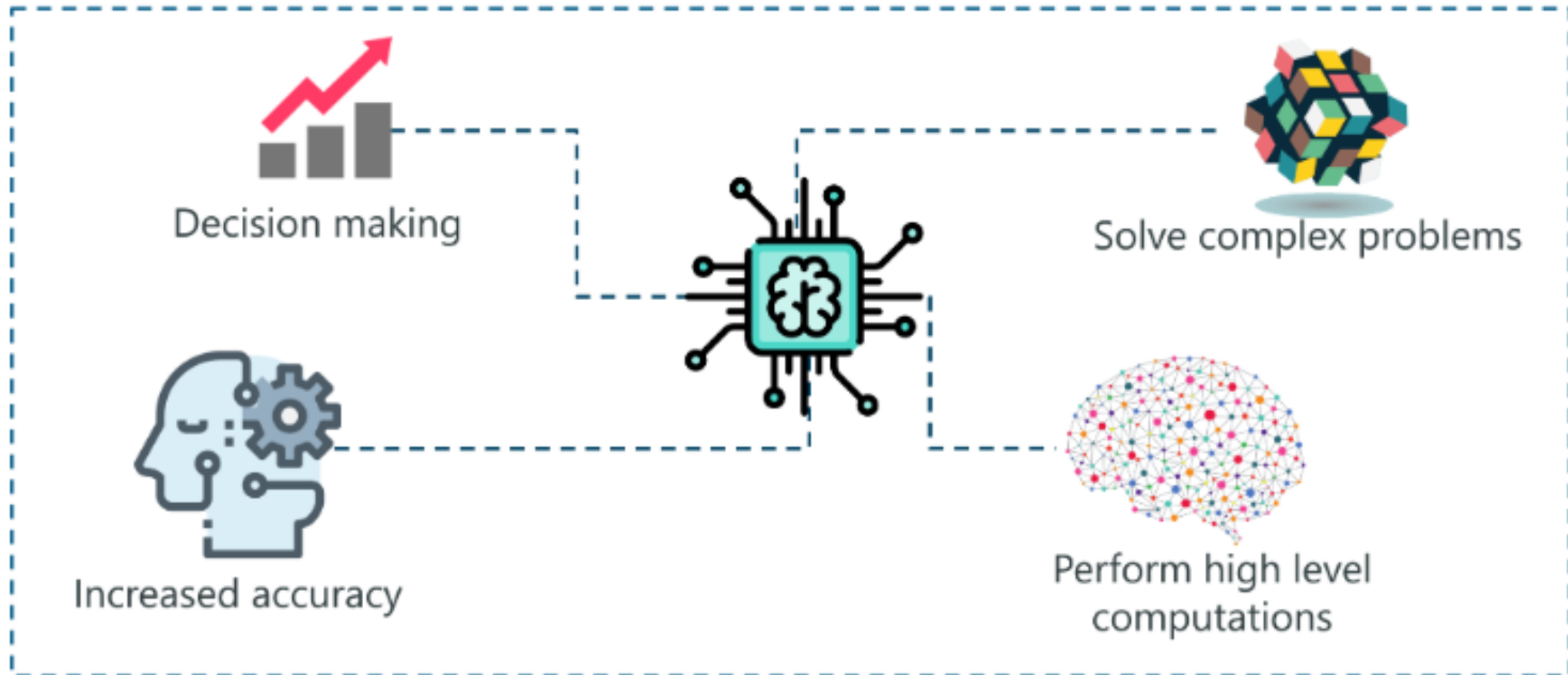


Definition of AI and its basic concept

- Intelligence: “the capacity to learn and solve problems”
- Artificial intelligence is the simulation of human intelligence by machines
 - ❑ The ability to solve problems
 - ❑ The ability to act rationally
 - ❑ The ability to act like humans

John McCarthy: 1956

‘The science and engineering of making intelligent machines’

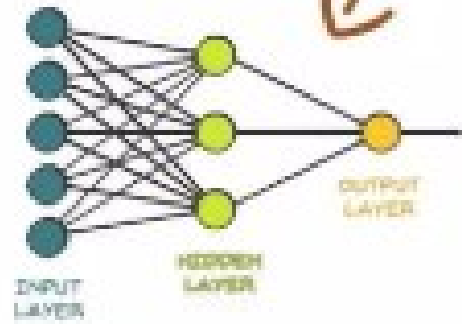
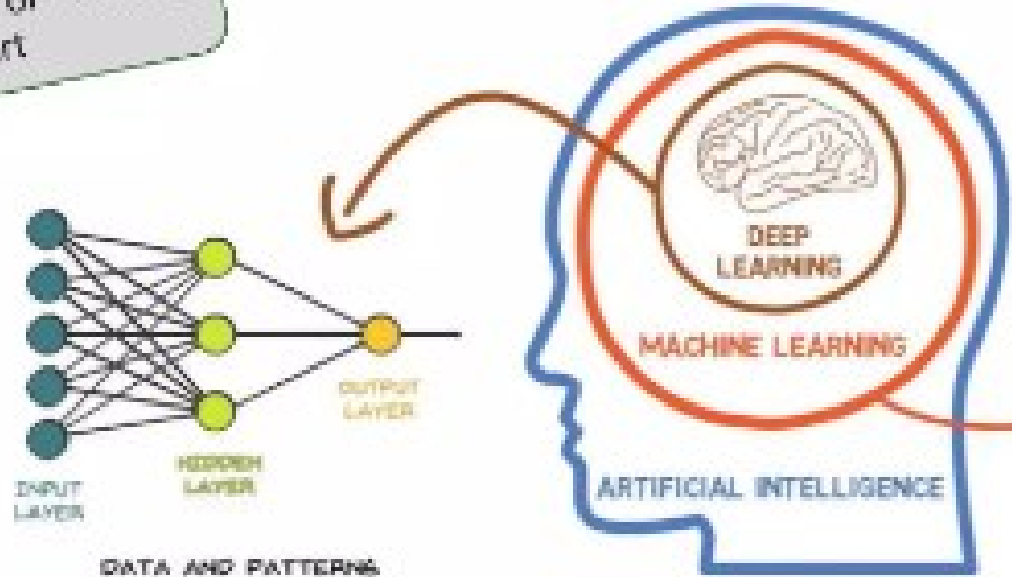




Definition of AI and its basic concept

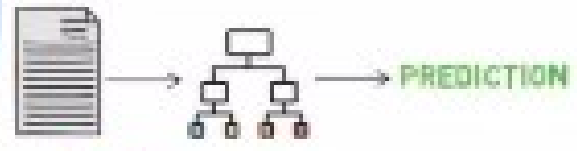
- The basic concept of AI involves the creation of intelligent systems that can perceive and interpret their environment, learn from experience or data, make decisions or predictions, and take actions based on their understanding.

Artificial Intelligence (AI) is the science of making machines smart



DATA AND PATTERNS
CAN BE BETTER PERCEIVED

AI can process data and make certain kinds of predictions faster and more accurately than humans



Artificial Intelligence focuses on learning, reasoning, problem solving, perceiving, and understanding human language



Perception: AI systems should be able to perceive and interpret their environment using various input sources such as sensors, cameras, or microphones. This involves tasks like image recognition, speech recognition, and natural language processing.

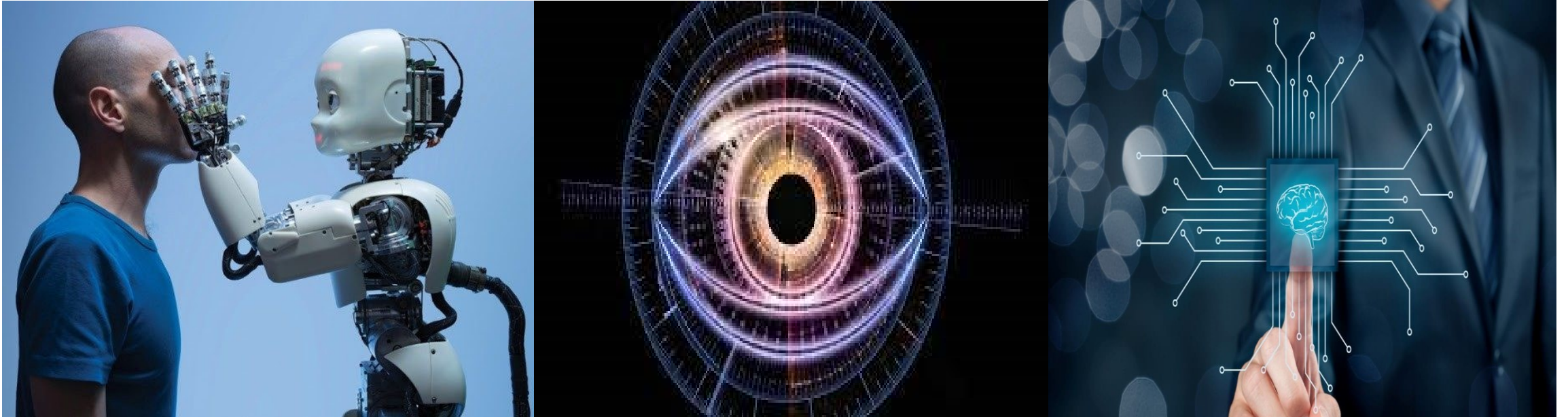
Learning: AI systems are designed to learn from data or experiences. Machine learning is a common approach where algorithms are trained on large datasets to identify patterns and make predictions or decisions. Deep learning, a subset of machine learning, uses neural networks with multiple layers to process complex data and extract meaningful insights.

Reasoning and Decision Making: AI systems should be able to reason, analyze information, and make decisions based on their understanding. This involves techniques such as logical reasoning, probabilistic reasoning, and optimization algorithms.

Natural Language Processing (NLP): NLP enables AI systems to understand and generate human language. It involves tasks like language translation, sentiment analysis, chatbots assistants.

Some key components and concepts associated with AI:

Some key components and concepts associated with AI:



Robotics: AI is often integrated with robotics to create intelligent machines capable of physical tasks. Robotic systems can use AI to perceive their environment, make decisions, and perform actions accordingly.

Machine Vision: AI systems can be equipped with computer vision capabilities to analyze and understand visual information. This is used in applications like object recognition, image classification, and autonomous vehicles.

Expert Systems: AI can be used to create expert systems that emulate the knowledge and decision-making capabilities of human experts in specific domains. These systems are trained on vast amounts of expert knowledge and can provide valuable insights and recommendations.



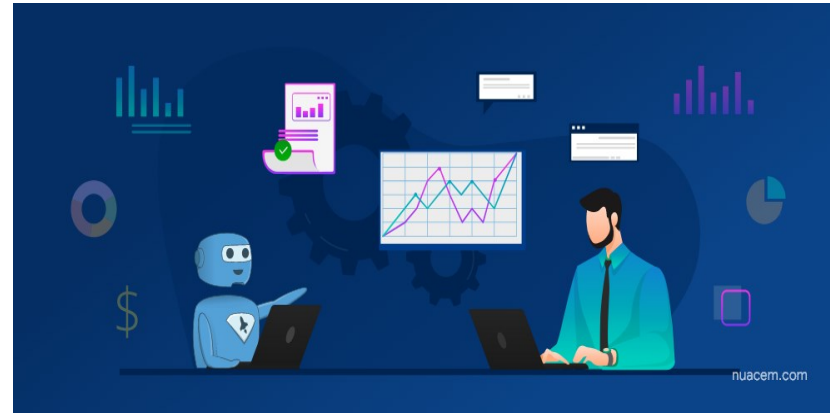
Overall, the fundamental goal of AI is to develop intelligent systems that can **mimic human cognitive abilities**, automate tasks, enhance decision-making processes, and **provide innovative solutions** to complex problems.

Some examples of AI in use today

Self-driving cars



Virtual assistants



Social media recommendation systems



Medical diagnosis systems



Differentiate between AI and human intelligence





Differentiate between AI and human intelligence

- **Origin:** Human intelligence is a product of the complex biological structure and cognitive capabilities of the human brain. AI, on the other hand, is a result of human-designed algorithms and computer systems.
- **Learning Process:** Humans acquire intelligence through a combination of genetic inheritance, sensory perception, social interaction, education, and personal experiences. AI systems learn through data-driven approaches, such as machine learning, where algorithms process large datasets to identify patterns and make predictions.
- **Consciousness and Subjectivity:** Human intelligence is associated with consciousness, self-awareness, emotions, and subjective experiences. AI systems, currently, lack these subjective qualities and operate purely based on algorithms and data processing.



Differentiate between AI and human intelligence

- **Creativity and Imagination:** Human intelligence exhibits creative thinking, imagination, and the ability to generate novel ideas and solutions. While AI can be programmed to generate new outputs, it lacks the depth and richness of human creativity.
- **Generalization and Transfer Learning:** Human intelligence possesses the capability to generalize knowledge acquired in one domain to solve problems in different contexts. AI systems often require specific training and struggle with transferring knowledge from one domain to another.
- **Contextual Understanding:** Humans possess a deep understanding of the contextual nuances of language, situations, and social interactions. AI systems, although improving, may struggle to grasp the full context and may misinterpret information without explicit guidance.
- **Adaptability and Flexibility:** Human intelligence is highly adaptable and flexible, allowing individuals to quickly learn and adjust to new circumstances. AI systems typically require retraining or significant modifications to adapt to new situations or tasks.
- **Physical embodiment:** Human intelligence is intrinsically linked to the physical body and the ability to interact with the world through sensory perception and motor skills. AI, while integrated with robotics, lacks the same level of physical embodiment and often operates in a virtual or limited physical environment.

History of Artificial Intelligence

1950

The time when it all started.

1955

John McCarthy coined term 'Artificial intelligence'.

1974

Computers became faster & affordable

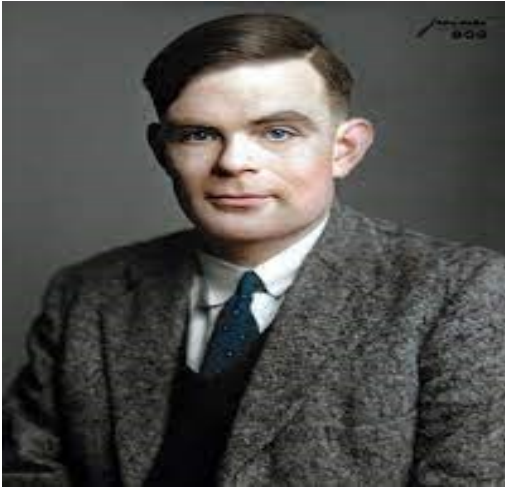
1980

The year of Artificial Intelligence.

2000

Landmark of AI establishment achieved.

Contributions of pioneers in AI research



Alan Turing: Turing is considered one of the founding fathers of computer science and artificial intelligence. He proposed the concept of the "Turing machine," a theoretical device that could simulate any algorithmic computation. Turing also developed the idea of the "Turing test" as a measure of a machine's ability to exhibit intelligent behavior.

John McCarthy: McCarthy coined the term "artificial intelligence" in 1956 and organized the Dartmouth Conference, which marked the birth of AI as a field of study. He is credited with developing the programming language LISP, which became one of the primary languages for AI research.

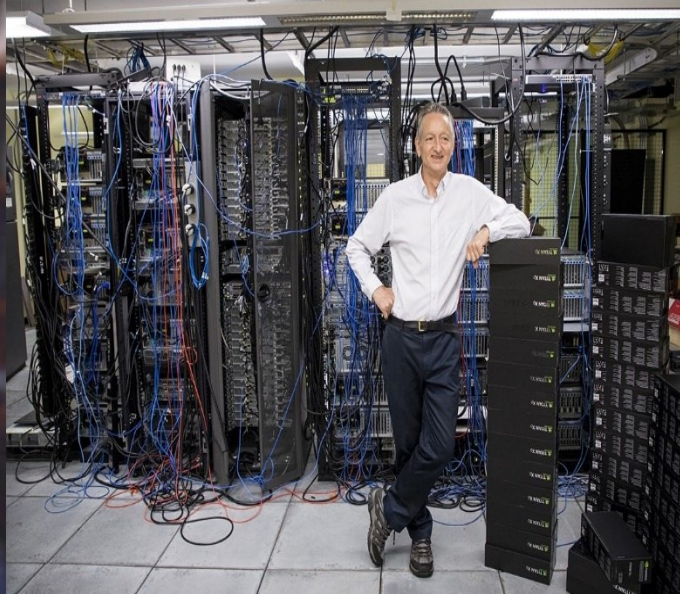
Marvin Minsky: Minsky was a cognitive scientist and co-founder of the Massachusetts Institute of Technology's AI Laboratory. He made significant contributions to the understanding of human cognition and perception and developed theories on neural networks and machine learning.

Arthur Samuel: Samuel is known for his work on machine learning and is considered one of the pioneers of the field. He developed a program that could play checkers at a high level by learning from its own gameplay, which demonstrated the potential of machine learning algorithms.

Contributions of pioneers in AI research



Herbert Simon: Simon, along with Allen Newell, developed the Logic Theorist, a computer program capable of proving mathematical theorems. Their work on problem-solving and symbolic reasoning laid the foundation for the development of expert systems and cognitive architectures.



Geoffrey Hinton: Hinton is a key figure in the advancement of neural networks and deep learning. He developed the backpropagation algorithm, a crucial technique for training deep neural networks, and played a pivotal role in popularizing the use of convolutional neural networks (CNNs) for image recognition tasks.



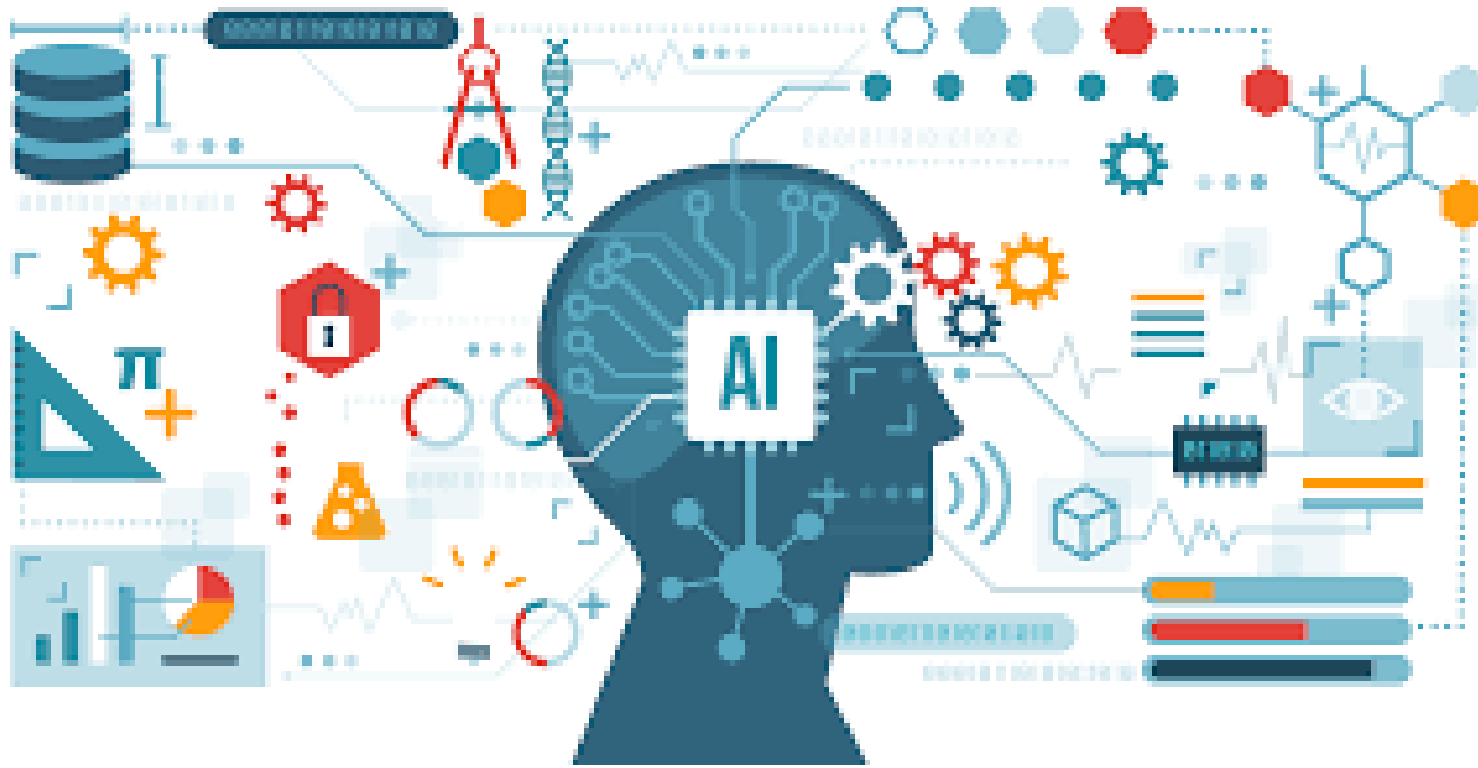
Yann LeCun: LeCun is a renowned AI researcher who made significant contributions to the field of computer vision and deep learning. He is the pioneer of convolutional neural networks and played a crucial role in the development of the LeNet-5 architecture, which revolutionized handwriting recognition and laid the foundation for modern CNNs.

Dartmouth Conference in 1956

- The Dartmouth Conference, also known as the Dartmouth Summer Research Project on Artificial Intelligence, took place in the summer of 1956. It was a seminal event in the history of artificial intelligence (AI) and marked the birth of the field as a distinct discipline.
- The conference was held at Dartmouth College in Hanover, New Hampshire.
- During the six-week conference, the attendees discussed and formulated the initial goals and scope of AI research. They aimed to develop programs and machines that could simulate human intelligence and perform tasks that required intelligence, such as problem-solving, language processing, and learning.
- The Dartmouth Conference is notable for coining the term "artificial intelligence" and establishing AI as a distinct research field.



Applications and potential benefits of AI





Healthcare

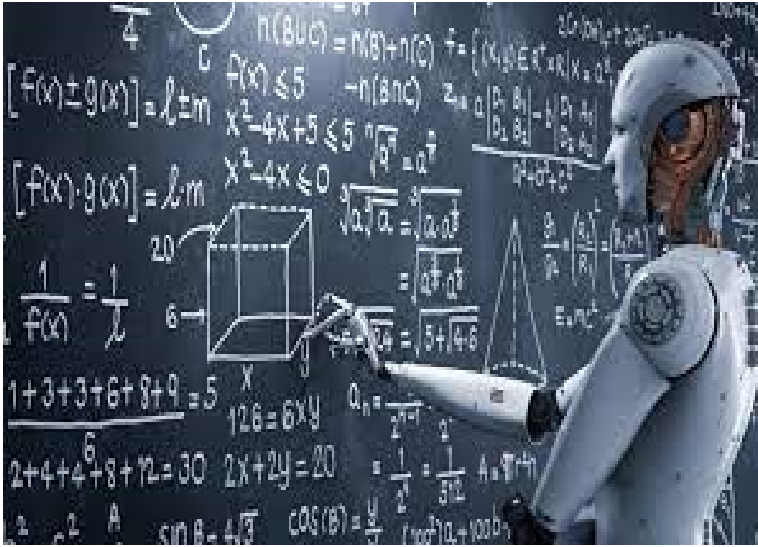
AI can be used for medical image analysis, early disease detection, personalized treatment recommendations, drug discovery, virtual nursing assistants, and remote patient monitoring. It has the potential to improve diagnostics, enhance patient outcomes, and optimize healthcare operations.

Financial Services

AI is being used in the financial services industry for fraud detection, risk assessment, and investment management. Machine learning algorithms are being developed to analyze market trends and predict future stock prices.

Retail and E-commerce

AI is being used in the retail and e-commerce industry for personalized recommendations, inventory management, and supply chain optimization. Machine learning algorithms are being developed to analyze customer behavior and preferences.



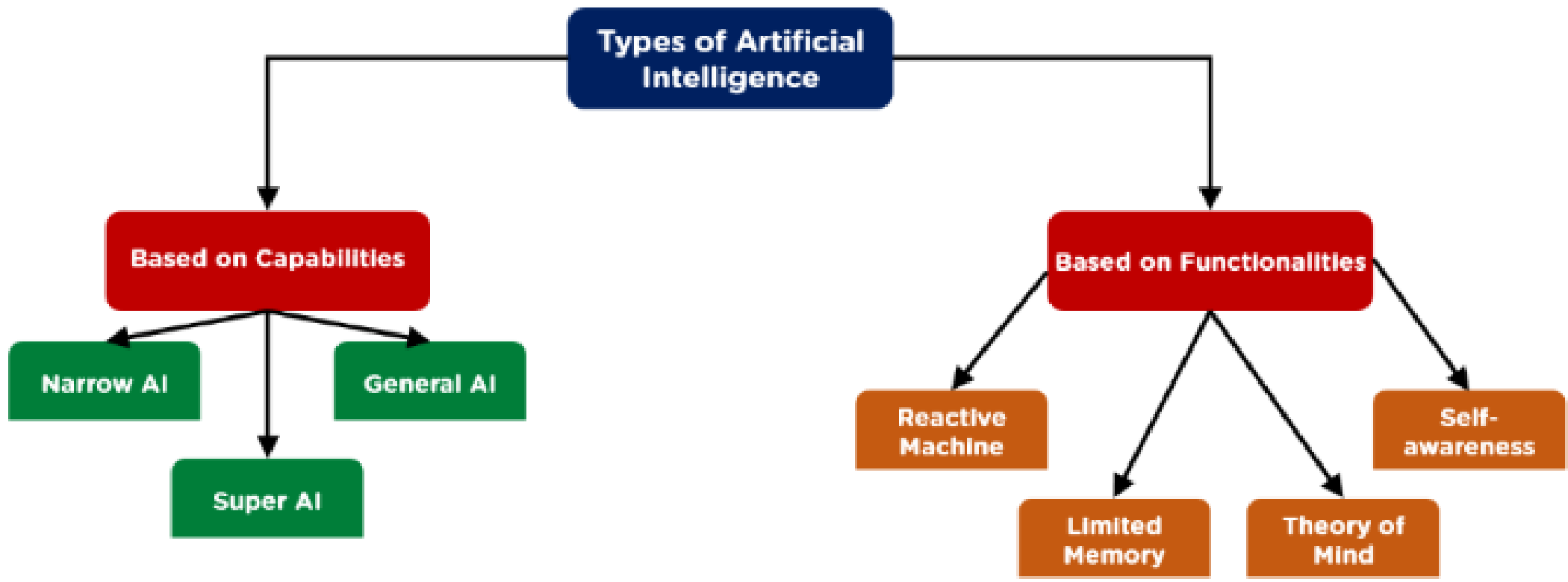
Education: AI can facilitate personalized learning experiences, adaptive tutoring, intelligent content creation, and educational data analysis. It enables customized learning paths, improves educational outcomes, and assists teachers in providing targeted instruction.



Cybersecurity: AI can detect and mitigate cybersecurity threats by analyzing patterns, identifying anomalies, and responding to attacks in real-time. It enhances security measures, protects sensitive data, and strengthens overall cybersecurity defenses.

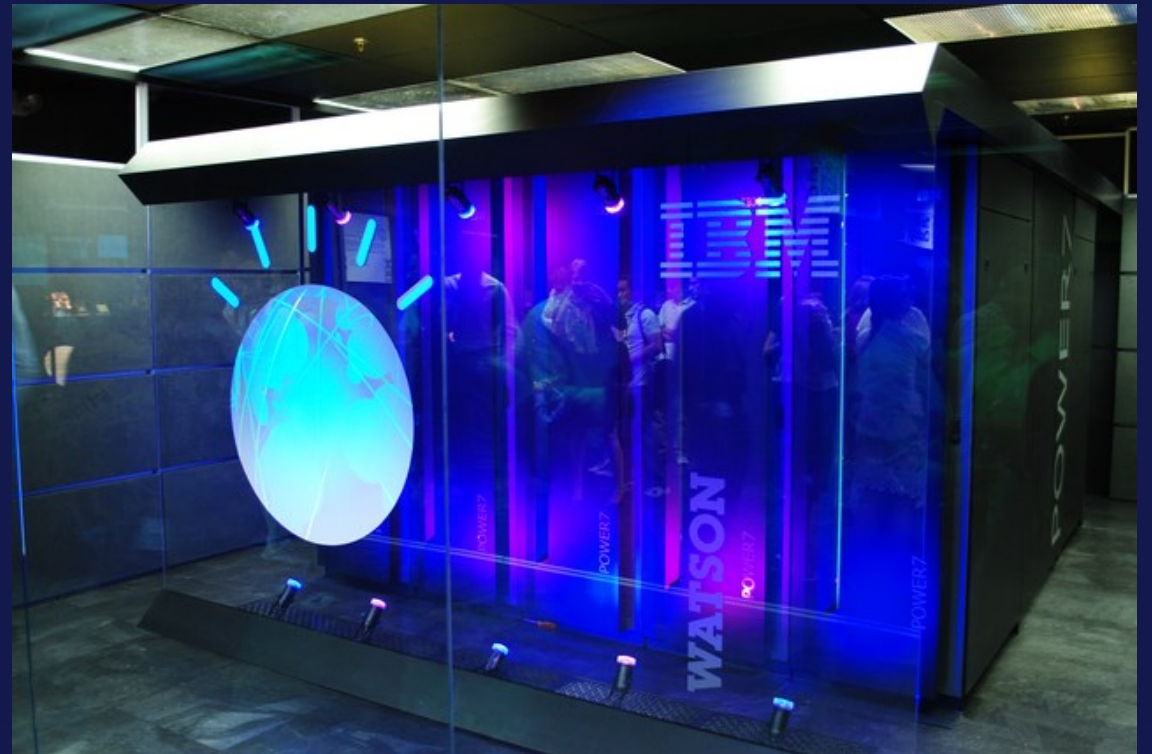


Research and Development: AI accelerates scientific research, data analysis, and hypothesis generation. It aids in identifying patterns, making predictions, and discovering insights in complex datasets.



Weak AI vs. Strong AI

- Weak AI : systems that are designed to perform specific tasks and are limited to those tasks only. It targets a single subset of cognitive abilities and advances in that spectrum.



Weak AI vs. Strong AI

- Strong AI (general AI): AI systems that possess human-level intelligence or even surpass human intelligence across a wide range of tasks.
- General AI has received a \$1 billion investment from Microsoft through OpenAI.

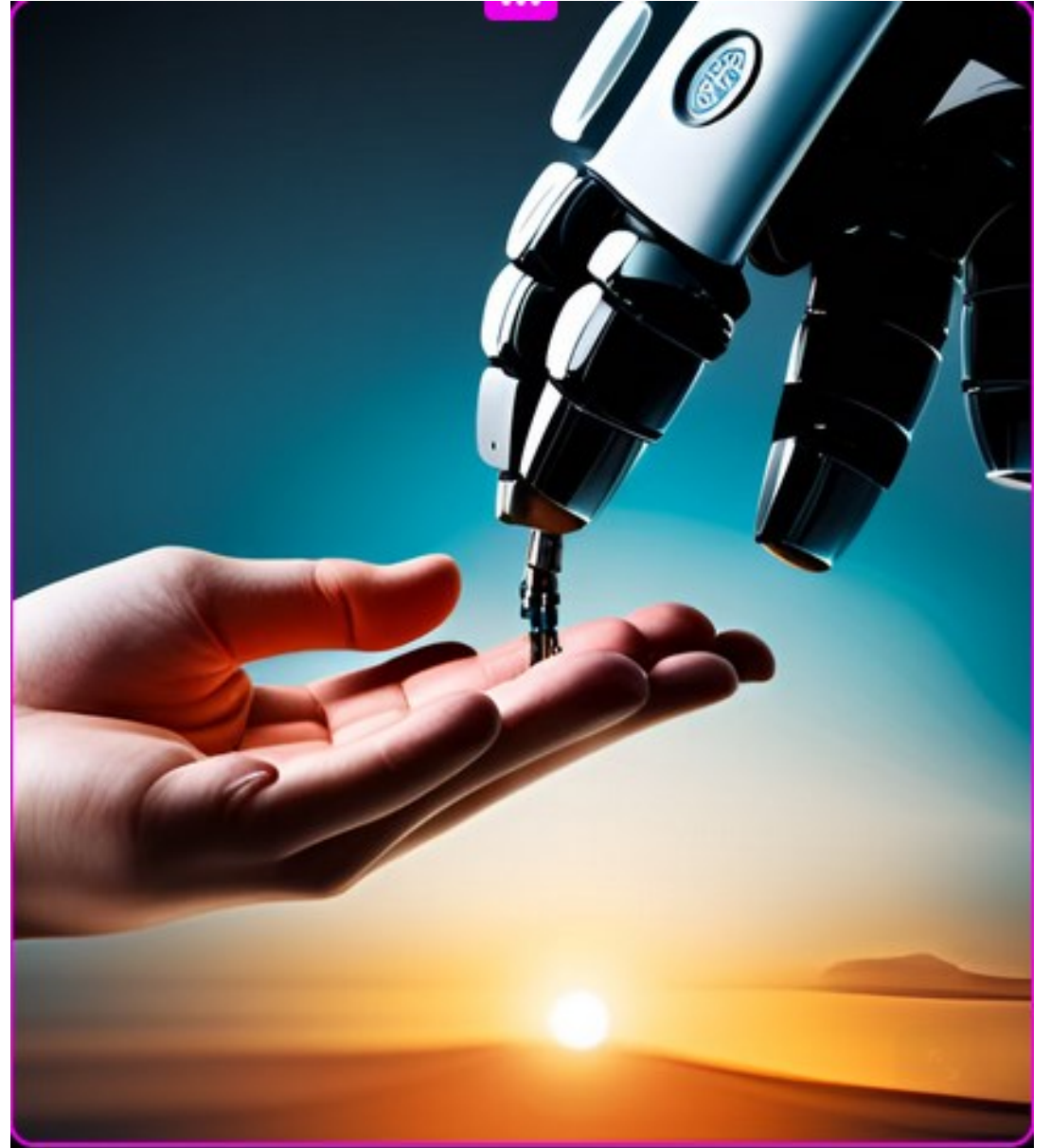




Super AI

- Super AI surpasses human intelligence and can perform any task better than a human. The concept of artificial superintelligence sees AI evolved to be so akin to human sentiments and experiences that it doesn't merely understand them; **it also evokes emotions, needs, beliefs, and desires of its own.** Its existence is still hypothetical. Some of the critical characteristics of super AI include thinking, solving puzzles, making judgments, and decisions on its own.

ARTIFICIAL
INTELLIGENCE
APPLICATION IN
HEALTHCARE





Applications and potential benefits of AI in healthcare

- 1. Disease diagnosis:** By analyzing potential data such as clinical symptoms, medical history, test results, and medical images, AI can help physicians in accurate and faster disease diagnosis.
- 2. Prediction and prevention:** AI can examine the risk of various diseases using prediction algorithms. By analyzing large datasets related to medical history, genetics, environmental factors, and behavioral factors, AI can provide individuals with information about the risk of developing diseases and offer recommendations for prevention and healthcare.
- 3. Data integration and intelligent processing:** AI can be used to combine and analyze medical data from various sources such as electronic health records, medical images, scientific articles, and large databases. This data integration and intelligent processing can assist physicians in making better decisions regarding the diagnosis and treatment of patients.



Applications and potential benefits of AI in healthcare

4. Support for physician decision-making: AI can provide tools and intelligent systems to assist physicians in medical decision-making. Examples include treatment recommendation systems, medical image interpretation tools, and intelligent surgical robots.

5. Improvement of hospital management: AI can play an effective role in improving the management and performance of hospitals. By using intelligent management algorithms and systems, AI can help in resource planning, operation scheduling, prediction of hospital needs, and optimization of various hospital processes.

6. Support for public health care: AI can contribute to improving public health care and enhancing community health. By analyzing public health data, behavioral information, and environmental factors, AI can assist health organizations and authorities in providing optimal solutions for disease management, prevention, and community health promotion.



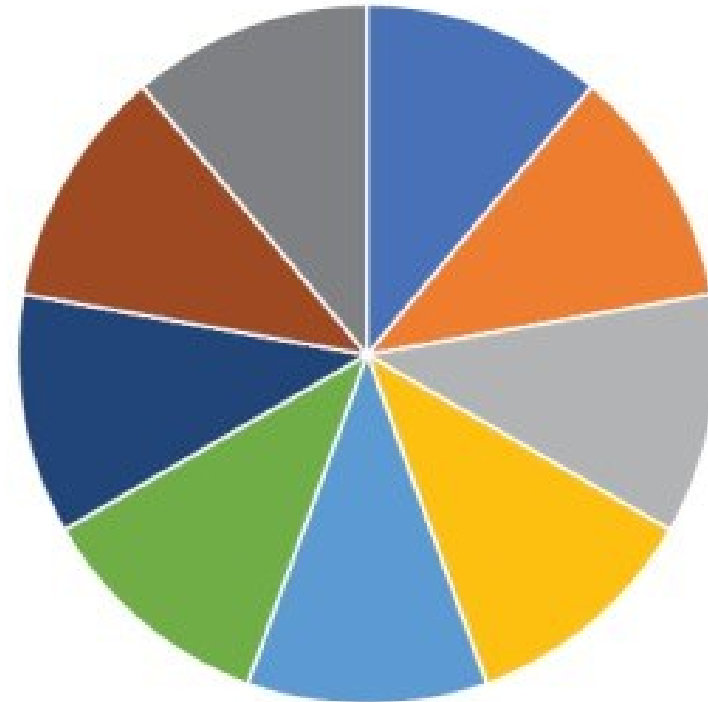
Applications and potential benefits of AI in healthcare

7. Mobile healthcare and electronic health: AI can have a significant role in the development of mobile health and electronic health applications and platforms. Through algorithms and data analysis, these applications can help individuals in health issue diagnosis, disease tracking, medication management, and health guidance.

8. Drug research and development: AI can accelerate the process of drug research and development and the discovery of new effective molecules. By using algorithms and neural networks, AI can assist pharmaceutical researchers in analyzing large datasets related to molecular structures, drug efficacy, and effectiveness.

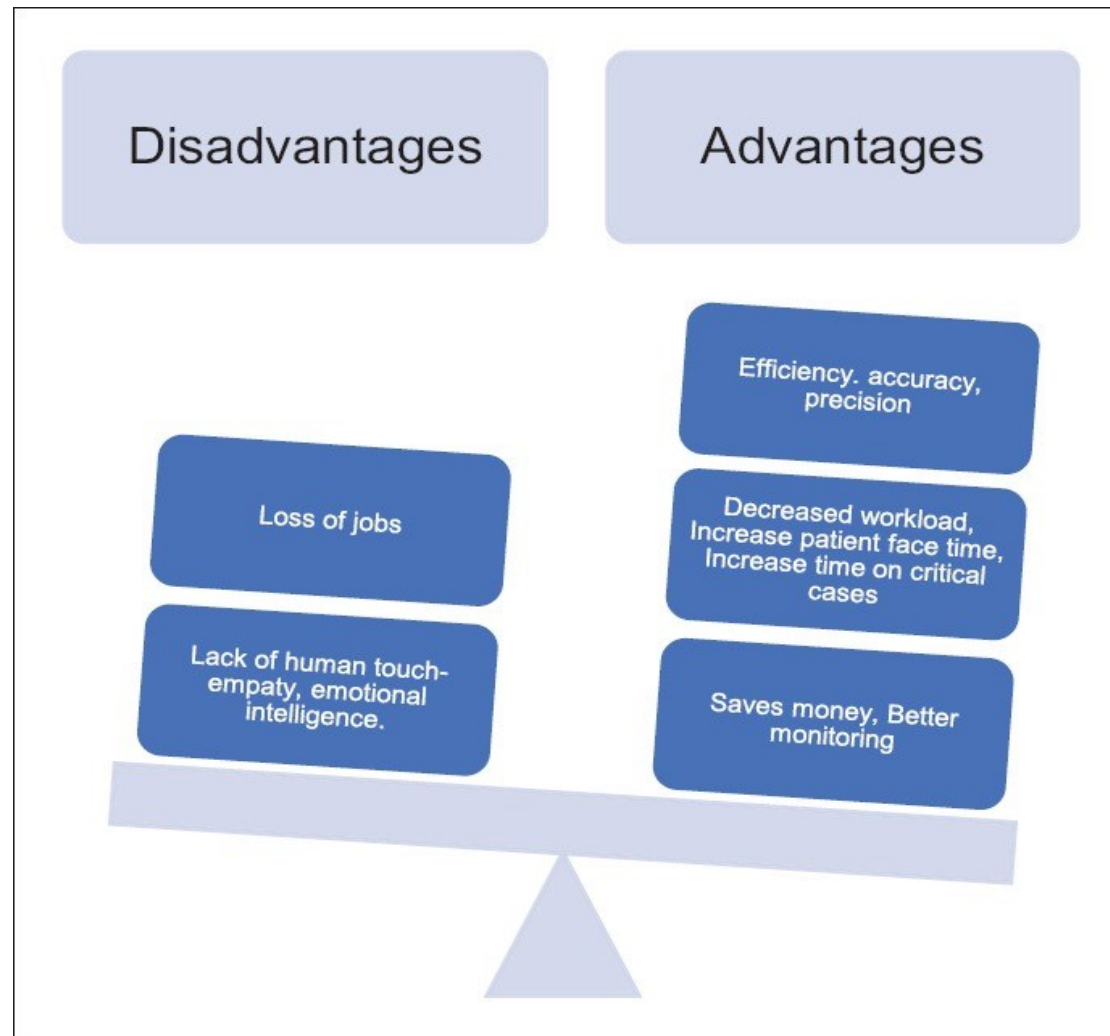
9. Medical robotics: Artificial intelligence plays a significant role in medical robotics. AI-guided surgical robots can enhance surgical precision and accuracy. These robots can follow precise instructions from physicians and perform more precise and less risky surgical procedures.

Applications of artificial intelligence in health care



- Drug development
- Health monitoring
- Managing medical data
- Disease diagnostics
- Digital consultation
- Personalized treatment
- Analysis of health plans
- Surgical treatment
- Medical treatment

Advantages and disadvantages of artificial intelligence in medicine

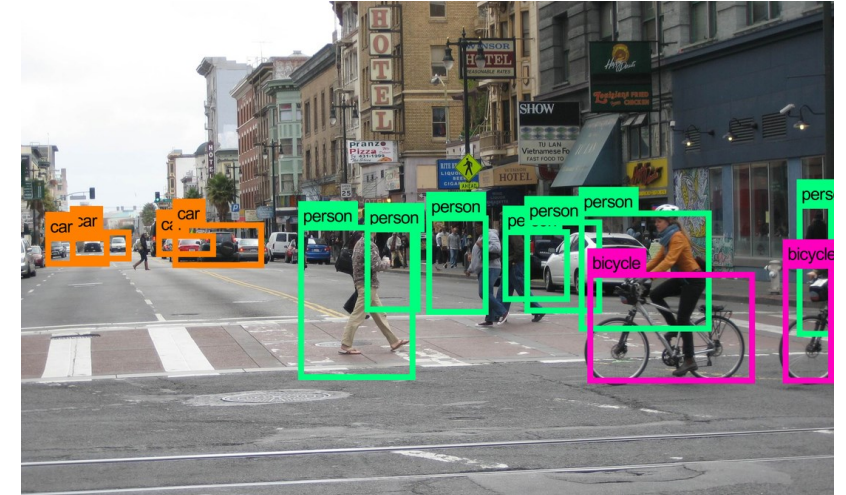
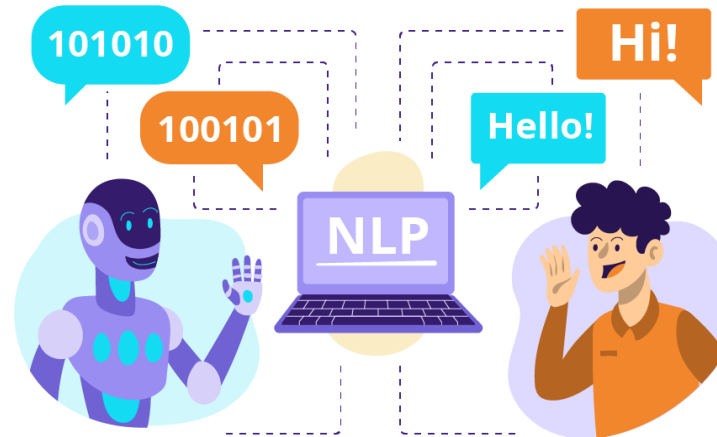
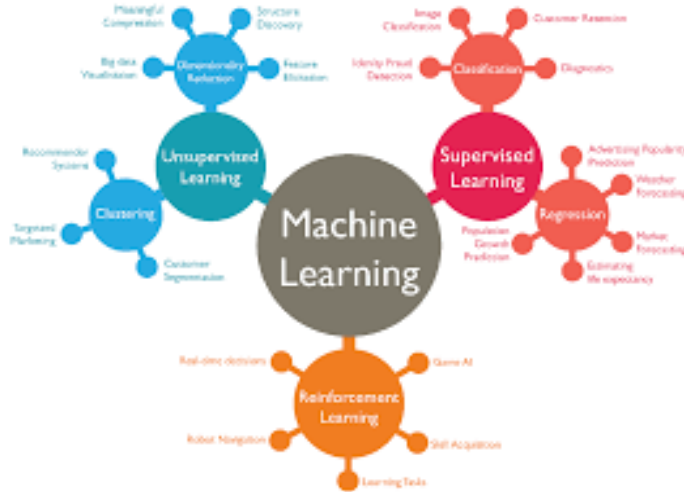




Challenges and limitations faced by AI

- ❑ **Limited data availability**
- ❑ **Data quality and reliability**
- ❑ **Lack of interpretability**
- ❑ **Ethical considerations**
- ❑ **Validation and regulation**
- ❑ **Human-AI collaboration**
- ❑ **Limited generalizability**
- ❑ **Technical limitations**

Branches of Artificial Intelligence



Machine Learning: Machine Learning is concerned with the design of algorithms and models that learn from data and have the ability to recognize patterns and make predictions and decisions. This branch includes methods such as artificial neural networks, decision trees, support vector machines, and reinforcement learning algorithms.

Natural Language Processing (NLP): NLP deals with the design and analysis of natural language by computer systems. This branch includes tasks such as text comprehension and interpretation, text generation, machine translation, information extraction, and chatbot systems.

Computer Vision focuses on the computer's ability to understand and interpret images and videos. This branch includes tasks such as pattern recognition, object detection, face recognition, motion detection, and 3D vision.

Branches of Artificial Intelligence



Speech Processing: Speech Processing involves the analysis, interpretation, and generation of speech by computer systems. This branch includes tasks such as speech recognition, speech-to-text conversion, speech synthesis, and voice translation

Robotics: Robotics is concerned with the design, construction, and control of robots for specific tasks. Artificial Intelligence is used in robotics to provide decision-making capabilities and interaction with the environment.

Knowledge Processing and Reasoning: This branch is dedicated to the design and development of systems capable of representing knowledge, logical reasoning, and performing complex inference. It includes expert systems, fuzzy logic, and rule-based reasoning.

Branches of Artificial Intelligence



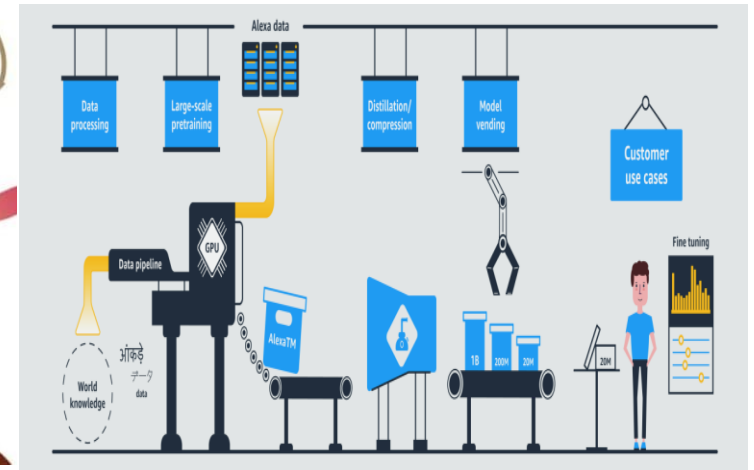
Computational Intelligence:

Computational Intelligence utilizes computational algorithms and techniques to facilitate artificial intelligence processes. This branch includes artificial neural networks, genetic algorithms, evolutionary optimization, and clustering systems.



Social Intelligence:

Social Intelligence focuses on the ability of artificial intelligence systems to understand and interact with humans. This branch includes social cognition, emotion recognition, and human-machine interaction.



Ambient Intelligence:

Ambient Intelligence deals with the ability of intelligent systems to detect and understand the surrounding environment, provide services, and create suitable environmental conditions for users. This branch includes smart homes, smart cities, and intelligent environments.