IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 7, April 2023

# Artificial Intelligence

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**Abstract:** *Artificial Intelligence (A.I.) is a multidisciplinary field focused on automating tasks that currently require human intelligence. Despite its lack of general awareness, artificial intelligence (AI) is a technology that is revolutionizing all aspects of life. This article aims to educate lay people about AI and encourage them to use it as a tool in many fields to rethink how we combine data, analyze it and make decisions. In this article, we quickly discussed what artificial intelligence (AI) is, how it works, and how it can be used in our daily lives.*

**Keywords:** Artificial Intelligence

## I. INTRODUCTION

Artificial intelligence (AI) is defined as the ability of an artificial entity to solve complicated problems using its own intelligence. Computer science and physiology are combined in artificial intelligence. In layman's terms, intelligence is the computational component of a person's ability to achieve goals in the real world. Intelligence is defined as the ability to think, imagine, remember and understand, see patterns, make decisions, adapt to change and learn from experience. Artificial intelligence aims to make computers behave
like humans in a fraction of the time it takes a human. As a result, it is known as artificial intelligence. Artificial intelligence is also concerned with pushing the boundaries of practical informatics towards systems that are adaptable, flexible and capable of creating their own analysis and solution techniques by applying general knowledge to specific situations.

## II. OVERVIEW OF AI

Machine or software intelligence is referred to as artificial intelligence. Perceive + analyze + react = intelligence. Artificial intelligence is a subject of computer science that is rapidly gaining popularity as it has improved human existence in many ways. Artificial intelligence has substantially increased the performance of manufacturing and service systems over the past two decades. Expert systems are a rapidly developing technology that emerged from artificial intelligence research. In the future, intelligent machines will replace or augment human capabilities in many industries.

## III. WORKING OF AI

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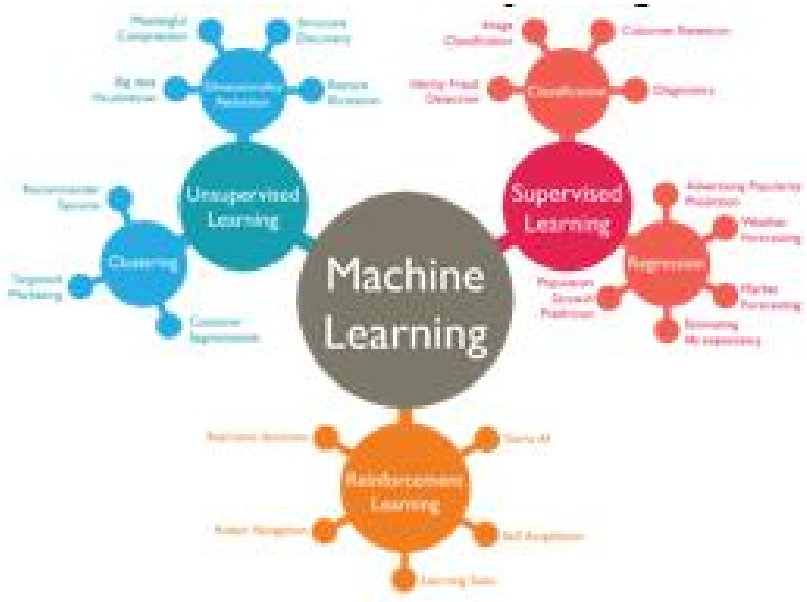
Artificial intelligence is often believed to be lost on an island of robots and self-driving cars. However, this method overlooks one of the most important practical applications of artificial intelligence: the analysis of the huge volumes of data generated every day. Insights gathering and work automation can be done at previously unimaginable speed and scale by carefully applying artificial intelligence to specific activities. AI systems perform sophisticated searches through mountains of human-generated data, decipher both text and images to detect patterns in complicated data, and then act on their findings. Computer systems that, thanks to cutting-edge technology, can understand the meaning of human language, learn from experience and make predictions. The following are several subfields of AI.

## IV. MACHINE LEARNING

Machine learning, or ML, is an application of artificial intelligence that allows computers to automatically learn and grow from their experiences without having to be explicitly programmed. The goal of machine learning is to create algorithms that can analyze data and generate predictions. Machine learning is used in healthcare, pharmaceuticals and life sciences to improve disease detection, interpret medical images and speed up medication, in addition to predicting what movies you'd like on Netflix.




### Deep Learning

Artificial neural networks that learn by analyzing data are used in deep learning, a subset of machine learning. Artificial neural networks are designed to look like organic neural networks in the brain. Several layers of artificial neural networks work together to produce a single output from a large number of inputs, such as detecting a face image from a mosaic of tiles. The machines learn by receiving positive and negative reinforcement for tasks they perform, which requires ongoing processing and reinforcements to advance

### Cognitive Computing

Another essential part of artificial intelligence is cognitive computing. Its purpose is to imitate and improve human interaction and machinery. Cognitive computing tries to recreate the human thought process in a computer model, in this case understanding human language and the meaning of images. Together, cognitive computing and artificial intelligence are trying to provide machines human behaviour and information processing abilities. Another form of deep learning is speech recognition, which enables voice assistant in phones to understand questions like: “Hey Siri, how does artificial intelligence work?

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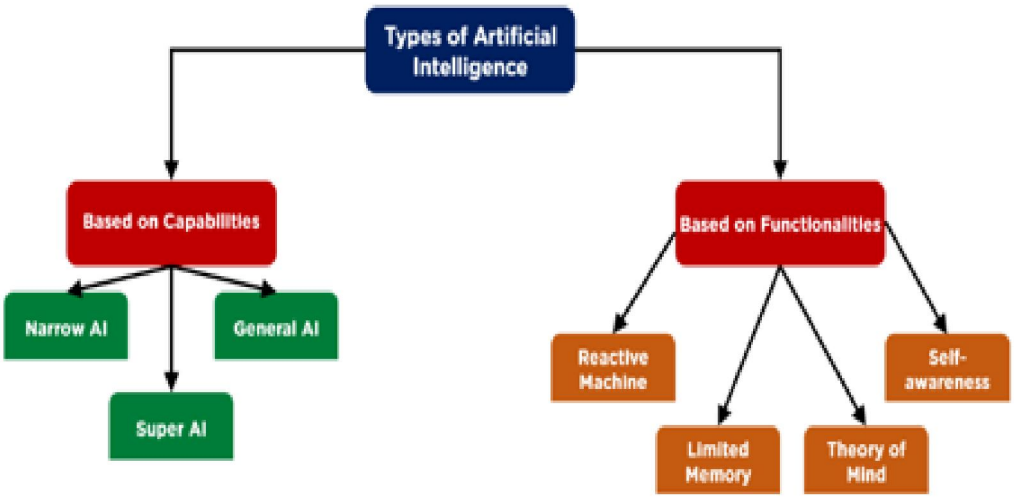
**Computer Vision**

Computer vision is a method of interpreting visual material such as graphs, tables, and photos in PDF documents, as well as other text and video, using deep learning and pattern recognition. Computer vision is a branch of artificial intelligence that enables computers to recognize, analyze and interpret visual input. Applications of this technology have already begun to transform areas such as research and development and healthcare. Computer vision and machine learning are used to analyze patient X-rays to diagnose patients faster.

## V. TYPES OF AI



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**A. Type 1 AI: Ability based**

- **Narrow AI:** Narrow AI is a kind of AI that is capable of intelligently performing a specific task. In the field of artificial intelligence, narrow AI is the most common and currently available AI. Because a narrow AI is trained exclusively for a single activity, it cannot step outside of its field or boundaries. As a result, it is also known as "weak AI". When narrow AI reaches its limits, it can fail in unexpected ways. Apple's Siri is an excellent example of narrow AI, but it only performs a limited set of duties. Playing chess, shopping suggestions on an e-commerce site, self-driving cars, speech recognition, and image identification are examples of narrow AI.
- **General Artificial Intelligence:** General artificial intelligence is a type of intelligence that is capable of performing any intellectual work as well as a human. The goal of general artificial intelligence is to create a system that can learn and think like a human. Currently, there is no system that can be classified as general artificial intelligence and does any job as well as a human. Researchers around the world are now focusing their efforts on creating robots that can perform general AI tasks. As generic AI systems are still being researched, developing such systems will take a lot of work and time.
- **Super AI:** Super AI is a degree of system intelligence where machines can outsmart humans and perform any task better than humans with cognitive abilities. It's a result of AI in general. Some essential characteristics of a powerful artificial intelligence are the ability to understand, reason, solve puzzles, make judgments, plan, learn, and communicate independently. Super AI is still a futuristic idea of artificial intelligence. Creating such systems in the real world is still an effort to change the world.

**B. Type 2 AI based on functionality**

- **Reactive machines:** The most basic kinds of artificial intelligence are purely reactive robots. Such AI systems do not track memories or past experiences to make future decisions. These bots only take into account the current circumstances and react in the best possible way. One example is reactive machines such as IBM's Deep Blue system. AlphaGo, developed by Google, is another example of reactive machines.
- **Limited Memory:** This kind of AI, like Reactive Machines, has memory capabilities that allow it to use previous data and experience to make better judgments in the future. This category includes most of the commonly used applications in our daily life. These AI applications can be trained using a large amount of training data stored in a reference model in their memory. Example: Many self-driving cars have limited memory technology. They store data like GPS location, speed of neighbouring cars, size/nature of obstacles and a hundred other types of data to drive like a human.
- **Limited memory:** While the first two categories of artificial intelligence have been and continue to be abundant, the other two types of artificial intelligence exist for now only as an idea or work in progress. Another level of artificial intelligence systems that researchers are actively working on is the theory of artificial intelligence. A theory of mind-level AI will be able to identify the needs, emotions, beliefs and mental processes of the creatures it interacts with. While AI is now a burgeoning business and the focus of leading AI researchers, reaching the level of Theory of Mind AI would require progress in other areas of AI as well. Because AI computers will need to view humans as individuals whose brains can be altered by a variety of elements to truly understand human needs, they will need to "understand" humans.
- **Self-awareness:** This is the last step in the development of artificial intelligence, which at this point only exists in theory. A self-aware AI is an artificial intelligence that has reached the point where it is so similar to the human brain that it has gained self-awareness. The ultimate goal of all AI research is and always will be to create this form of AI that is decades, if not centuries, away from becoming a reality. This form of artificial intelligence will not only be able to recognize and generate emotions in the individuals it interacts with, but will also have its own emotions, desires, beliefs, and possibly goals. And this is the kind of artificial intelligence that sceptics of the technology fear. Although the growth of self-awareness has the potential to accelerate our progress as a civilization, it also has the potential to lead to disaster. This is because once an AI becomes aware, it may have ideals like self-preservation that could either directly or indirectly spell the end of

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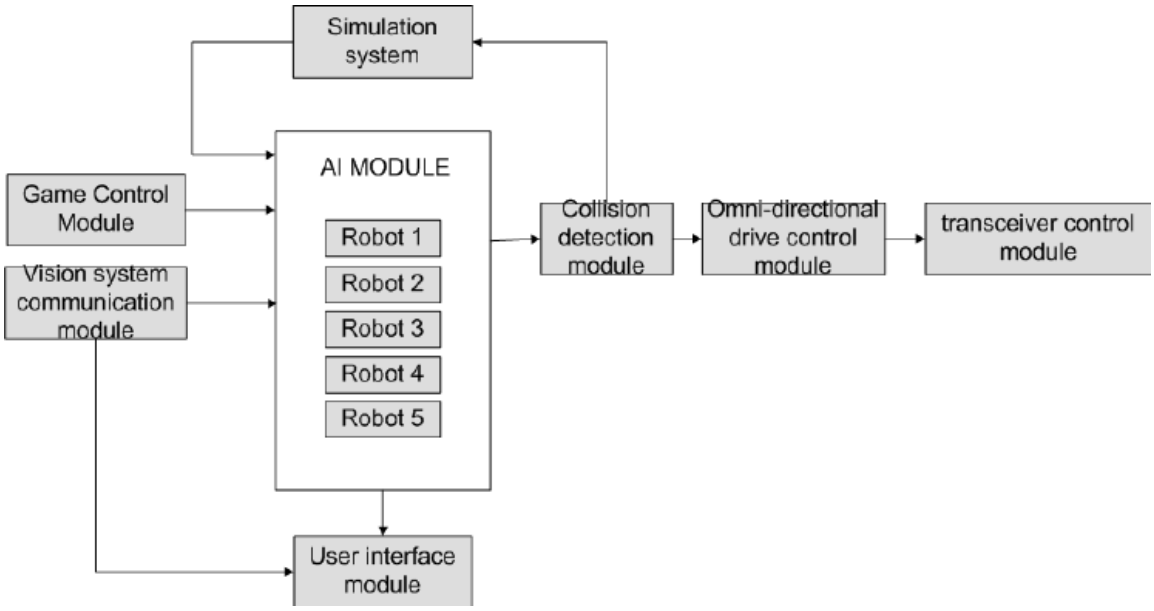
humanity, as such an entity could easily outmanoeuvre any human brain and create sophisticated schemes to dominate humanity. Categorizing technology into Artificial Narrow Intelligence (ANI), Artificial General Intelligence (AGI), and Artificial Superintelligence (ASI) is an alternative method of classification that is more commonly used in technical jargon (ASI).

## VI. AI SYSTEM ARCHITECTURE




A main thread runs through the AI system, looping and calling each of several modules. To determine the position and orientation of the robots, the main thread of the system first connects with the visual system. Apart from ball placement. The system then checks how the referee is checking the state of the game. Then the system invokes the AI module function which provides the desired robot movement position as well as other actions to be performed. After specifying movements, the system calculates collision avoidance trajectories to avoid collisions with other robots. The algorithm then estimates the speed of each of the robot's four wheels. Finally, the system sends communication packets corresponding to commands to perform an action through the transceiver.
The following is a full description of each of the modules shown in the diagram above:

### A. Communication module of the Vision system

This module offers vision system commands for a game scenario that correlates to robot and ball coordinates as well as robot angles via packets.

### B. Game control module

Through the serial interface, this module receives the commands of the referees and returns the current state of the game.

### C. AI module

This module will get the location of the robots and the ball, as well as the orientation of the robots, the state of the game, the role of the robots, the shooting direction and the field settings. The system uses all this data to calculate the future position and actions of each robot. The chosen approach is determined by configuring a tree containing all feasible actions. Activities are categorized according to their importance. One or more evaluations are used for each node in the tree. Each assessment has a set of possible outcomes associated with a certain score. The tree is evaluated during the program cycle. The path to the root-to-leaf path (final action) is determined by the highest score of the evaluation result of each level using the Best First Search technique. The robot's motion vector, its linear and rotational

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velocity, and the use of kicker and dribbler devices are determined after the system achieves a final action such as passing, shooting, or blocking. The robots also include scrolling motion to help them coordinate joint operations. Different roles are used to coordinate the robots: goalkeeper, defence, first, second and third striker. The goalkeeper's job is to keep the ball out of the net. When the ball is far away, it takes a path through the block; when the ball is close, he kicks it. The area around the target is the only place you can move. The defence is responsible for assisting the goalkeeper in defending the goal against long-range shots, as well as working out plans to work with the three forwards. When defenders approach their own area, they clear the ball and follow the opposing bots to prevent a pass and a goal. All three attackers have a common goal, but their priorities differ. They travel all over the court and coordinate different forms of passing and shooting. They can migrate in groups if necessary.

**D. User Interface Module**

Positions, orientations, motor speeds, intended positions, ids, actions, game state and referee instructions are all displayed in real-time for each robot in this module. The robot's position, orientation, desired locations, and actions are visually displayed in an OpenGL-based GUI.

**E. Simulation system**

This module simulates the operation of an artificial intelligence system without the need for a real vision system or robotics. The AI module can be used to debug and test activities. Constructing things that think using decision logic is called intelligent object simulation. For example, Simio selects tasks or resources using smart objects loaded with decision logic. As a result, the item has intelligent behaviour that can predict future performances. The use of intelligent objects in the context of artificial intelligence in simulation emphasizes the integration of rule-based artificial intelligence into simulation models. Manual development of complicated rule-based reasoning is a time-consuming operation, and the performance of the rule is also determined by the skill level of the creator. AI with a focus on the use of neural networks eliminates the need for manual construction. Manual development of complicated rule-based reasoning is a time-consuming operation, and the performance of the rule is also determined by the skill level of the creator.

**F. Collision detection module**

This module simulates the operation of an artificial intelligence system without the need for a real vision system or robotics. The AI module can be used to debug and test activities. The infrared obstacle avoidance sensor with adjustable detection distance is designed for obstacle avoidance on wheeled robots. The module consists of one infrared transmitter and one detector. When there is an obstacle in front of the sensor, the emitter's infrared light is reflected back to the receiver. The comparator squares the signal to create a digital signal. Production is high when there are no obstacles. Output is low when an obstacle is in range. A potentiometer knob can be used to change the sensitivity.

**G. Transceiver Communication Module**

This module gets the speed of each motor of the robot as well as the actions to be performed. This module creates the packets that our transceiver transmits. It also ensures that communication is always active.

**H. Omnidirectional drive control module**

This module takes a motion vector that includes linear and angular velocities and calculates the speed of each of the robot's four motors. This module calculates the speed of each motor for the robot's four omnidirectional wheels to drive in the correct direction.

## VII. APPLICATIONS OF AI

There are many ways that the average tech consumer interacts with AI technologies in their daily lives, but most people don't realize what technologies actually use AI. Here are a few examples of AI technologies that many people will encounter in their lives.

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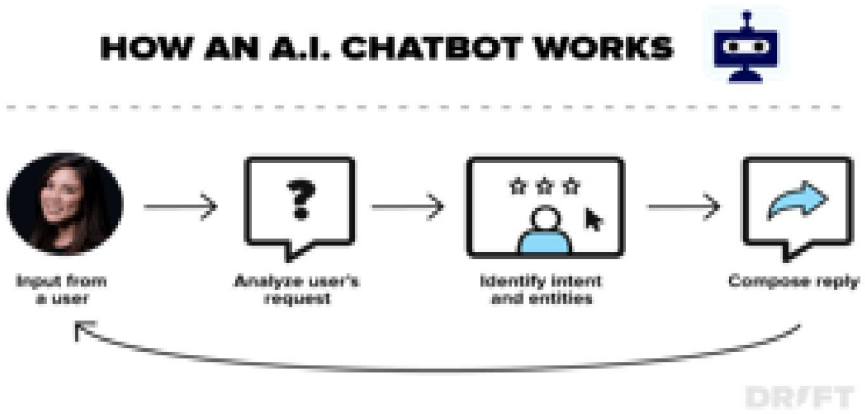
**A. Chatbots**

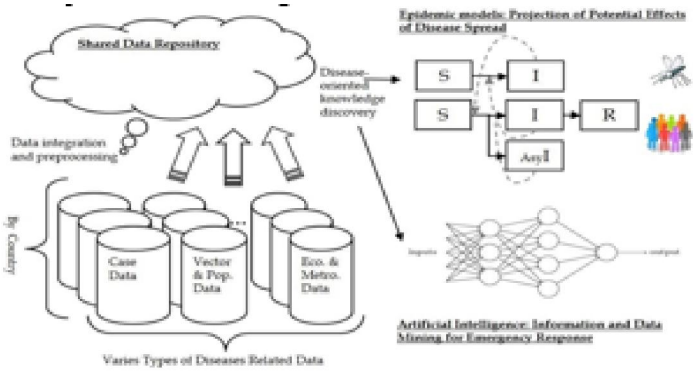
If you've ever come across a chatbot on the web or in a social media messenger, it's powered by artificial intelligence. Chatbots are one of the simpler examples of artificial intelligence because they are simply coded to send messages based on rules about how they should interact with users. A kind of "if this, then that" type of programming.




**B. Smart Assistants**

Siri, Alexa , and all other smart assistants are examples of artificial intelligence. They understand what users are telling them and can follow instructions and respond accordingly. They are like the next level of chatbots because they use speech recognition and are connected to larger databases of information such as search engines.


**C. Mapping and prediction of diseases**



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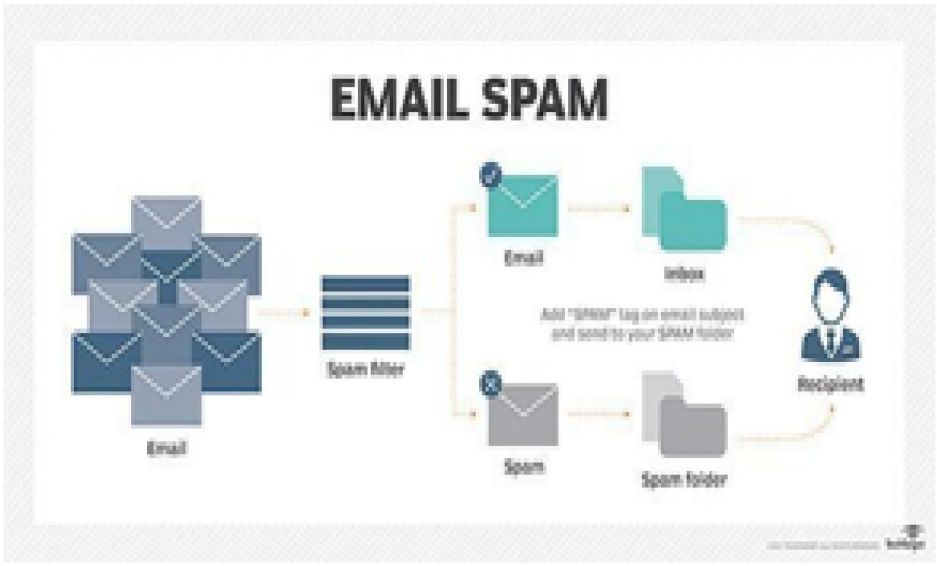
Epidemiologists have always tried to understand how diseases spread so that they can be predicted and hopefully avoided. Artificial intelligence makes it easy. This is an example where it's easy to see how AI is simply enabling faster advances in data analysis and predictive modeling than humans could do on their own.

**D. Healthcare**

Given its essential role in a productive and healthy society, healthcare is one of the most important areas in the broader big data landscape. The use of artificial intelligence in healthcare data can actually mean the difference between life and death. Doctors, nurses and other healthcare personnel can benefit from artificial intelligence in their regular jobs. Artificial intelligence in healthcare can improve patient outcomes by improving preventive care and quality of life, as well as creating more accurate diagnostic and treatment regimens. By analyzing data from government, healthcare and other sources, AI can help predict and track the spread of infectious diseases. As a result, AI has the potential to become a critical tool in the fight against disease and pandemics in global public health.


**E. Spam Filters**

Anyone who uses email is familiar with spam filters. Email boxes are equipped with filters that send spam emails to a separate folder, so they don't fill user's inboxes with unnecessary messages. Spam filters also exist for phone calls to filter out scammers and other unsolicited phone calls. Artificial intelligence powers these spam filters by using prior knowledge of what spam emails or phone calls look like from a data perspective and filtering out the ones that match.




**Self-driving cars**

Although fully self-driving cars are not yet widely available, they are well under way with many companies and some self-driving features are already available in cars today. Companies like Google and Uber are racing to be the first to

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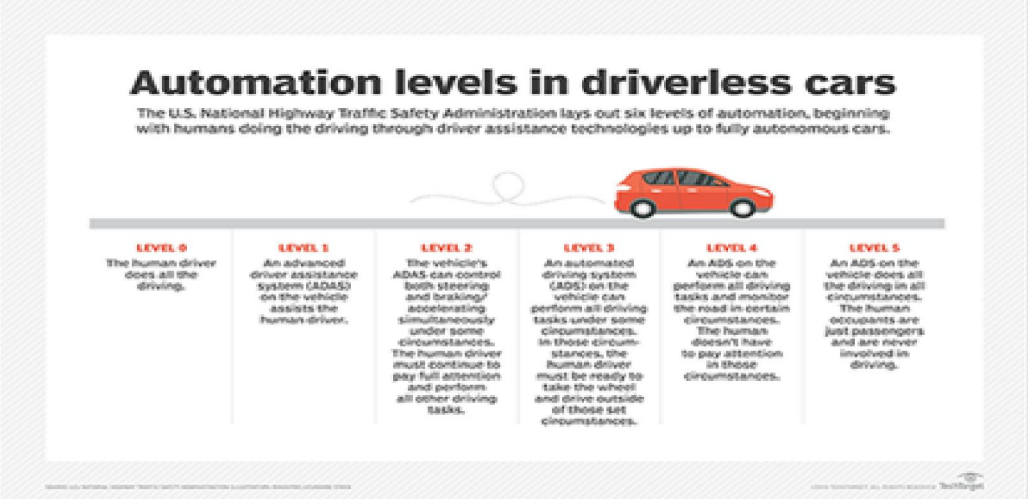
develop a consumer-ready self-driving car, but you can already buy cars with sensors that alert you to the proximity of objects, break automatically, and parallel park. Just as AI can detect cancer better than the human eye, self-driving cars can probably drive better than many humans.




**Advantages of AI**

**A. Reducing human error**

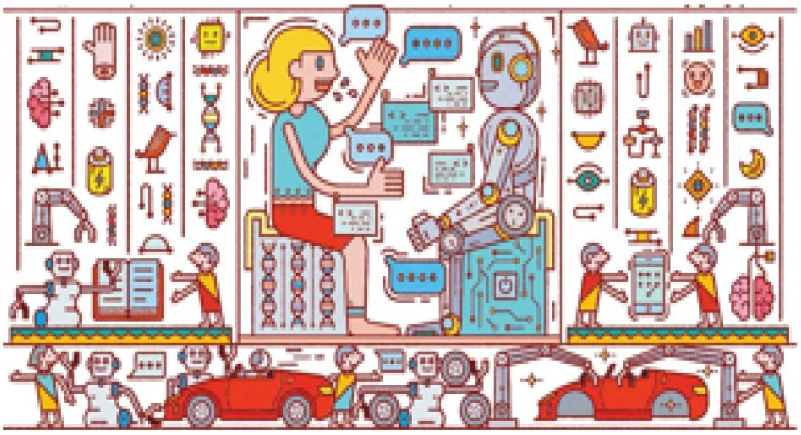
Because humans make mistakes from time to time, the term "human error" was created. Computers, on the other hand, do not make these mistakes if they are programmed correctly. Artificial intelligence makes decisions based on previously acquired data and a set of algorithms. As a result, the number of errors is reduced and the prospect of achieving better accuracy and precision is increased.

For example: AI has eliminated most human errors in weather forecasting.

**B. Takes risks instead of people**

This is one of the most significant advantages of artificial intelligence. By constructing an AI robot that can do dangerous tasks for us, we can exceed many of humanity's risk limits. It can be used effectively in all types of natural or man-made disasters, whether it is going to Mars, defusing a bomb, exploring the deepest regions of the oceans, mining coal and oil.

For example: Did you hear about the explosion at the nuclear power plant in Chernobyl, Ukraine? At the time, there were no artificial intelligence-powered robots to help us minimize the effects of radiation by bringing the fire under control early, as any human who came close to the core died within minutes. Finally, they used helicopters to drop the sand and boron from a safe distance. AI bots can be used in circumstances where human interaction is risky.



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**C. Available 24x7**

Without breaks, the average person will work 4-6 hours each day. Humans are designed to take time off to recharge and prepare for a new day at work, and even have weekly days off to separate their professional and home lives. But unlike humans, we can use AI to make robots work 24/7 without breaks and never get bored.

For example: Educational institutions and trust centres receive a large number of requests and problems that AI can successfully solve.

**D. Digital assistance**

Digital assistants are used by some of the most advanced businesses to interact with people, reducing the need for human staff. Many websites now use digital assistants to provide the items consumers are looking for. We can discuss with them what we are looking for. Some chatbots are built in such a way that it is difficult to determine whether we are talking to a machine or a human.

For example: We all know that businesses have customer service people who are responsible for answering customer questions and problems. Organizations can use AI to create a voice robot or chatbot that can help customers with all their queries. Many companies have already started using them on their websites and mobile applications.

**Disadvantages of AI**

**A. High implementation costs**

Setting up AI-based machines, computers, etc. comes at a huge cost due to the complexity of the engineering required to build them. In addition, the astronomical costs do not end there, as repairs and maintenance also run into the thousands of dollars.

**B. It does not improve with experience**

One of the most amazing features of human cognitive power is its ability to develop with age and experience. However, the same cannot be said Artificial intelligences are machines that cannot improve with experience , rather they begin to wear out over time

**C. Lack of creativity**

As mentioned above - AIs are not built for creative jobs. So it should be crystal clear that creativity orimagination is not AI's strong suit. Although they can help you design and create something special, they still can't compete with the human brain. Their creativity is limited to the creative abilities of the one who programs and controls them.

**D. Risk of Development**

With the rapid development in the field of artificial intelligence, the question that plagues our intuitive brain is this – will artificial intelligence replace humans? Honestly, I'm not sure if AI will lead to higher unemployment or not. But AIs are likely to take over most repetitive tasks that are largely binary in nature and involve minimal subjectivity.

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## VIII. CONCLUSION

In conclusion, it can be analyzed that artificial intelligence has benefited computer science because it is artificial psychology that has made machines focus on philosophical arguments. Artificial intelligence performs tasks faster than human beings and the main goal of artificial intelligence is to create technology in an intelligent way. Artificial intelligence is proven to be computer knowledge that has human characteristics, however these computers and robots help the environment grow and react rationally to help humans. Artificial intelligence has already affected people's lives in various fields and will surely do more in the future.