

Artificial intelligence (A.I.) is a multidisciplinary field aimed at automating tasks that currently need human intelligence. Despite its lack of general familiarity, artificial intelligence (AI) is a technology that is revolutionizing every aspect of life. This article aims to educate laypeople about AI and encourage them to utilize it as a tool in many disciplines to rethink how we combine data, analyze it, and make choices. We quickly covered what artificial intelligence (AI) is, how it works, and how it may be applied in our daily lives in this article.

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 one's capacity to attain goals in the real world. Intelligence is defined as the capacity to think, envision, memorize, and comprehend, see patterns, make decisions, adapt to change, and learn from experience. Artificial intelligence is focused with making computers behave more human-like and in a fraction of the time it takes a person to do it. As a result, it is known as Artificial Intelligence. Artificial intelligence is also concerned with pushing the boundaries of practical computer science in the direction of systems that are adaptable, flexible, and capable of forming their own analyses 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 since it has improved human existence in a variety of ways. Artificial intelligence has substantially enhanced the performance of manufacturing and service systems during the previous two decades. Expert systems are a fast emerging technology that originated from artificial intelligence research. Intelligent machines will replace or augment human capabilities in many sectors in the future.

III. WORKING OF AI

AI is frequently misplaced on an island with robots and self-driving cars, according to popular belief. This method, however, overlooks one of artificial intelligence's most important practical applications: analyzing the massive volumes of data created every day. Insight gathering and job automation may be done at a previously inconceivable velocity and scale by carefully applying AI to particular activities. AI systems execute sophisticated searches through the mountains of data generated by people, deciphering both text and pictures to detect patterns in complicated data and then acting on their findings. Computer systems that can grasp the meaning of human language, learn from experience, and make predictions, thanks to cutting-edge technologies. Following are a few subfields of AI.

A. Machine Learning | Learning from experience

Machine learning, or ML, is an AI application 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 being utilized in the healthcare, pharma, and life sciences sectors to improve illness detection, medical picture interpretation, and medication acceleration, in addition to predicting what Netflix movies you would like.

B. Deep Learning | Self-educating machines

Artificial neural networks that learn by analyzing data are used in deep learning, which is 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 collaborate to produce a single output from a large number of inputs, such as detecting a facial picture from a mosaic of tiles. The machines learn by receiving positive and negative reinforcement for the tasks they perform, which necessitates ongoing processing and reinforcement in order for them to advance.

C. Cognitive Computing | Making inferences from context

Cognitive computing is another essential component of AI. Its purpose is to imitate and improve interaction between humans and machines. Cognitive computing seeks to recreate the human thought process in a computer model, in this case, by understanding human language and the meaning of images. Together, cognitive computing and artificial intelligence strive to endow machines with human-like behaviors and information processing abilities. Another form of deep learning is speech recognition, which enables the voice assistant in phones to understand questions like, “Hey Siri, how does artificial intelligence work?”

D. Computer Vision | Understanding images

Computer vision is a method of interpreting image material, such as graphs, tables, and photographs within PDF documents, as well as other text and video, using deep learning and pattern recognition. Computer vision is a branch of artificial intelligence that allows computers to recognize, analyze, and interpret visual input. This technology's applications have already begun to transform areas such as research and development and healthcare. Computer Vision and machine learning are being used to analyze patients' x-ray images in order to diagnose patients faster.

IV. TYPES OF AI

A. AI type-1: Based on Capabilities

B. AI type-2 Based on Functionality

V. AI SYSTEM ARCHITECTURE

A main thread runs through the artificial intelligence system, looping and calling each of the several modules. To determine the position and orientation of robots, the main system thread first connects with the visual system. Aside from the ball's location. The system then checks the referee's control of the game state. After that, the system invokes the AI module function, which provides the required robot movement position as well as extra actions to take. Following the specification of motions, the system calculates collision avoidance trajectories to prevent colliding with other robots. The algorithm then estimates the speed of each of the robots' four wheels. Finally, the system broadcasts communication packets corresponding to orders to take action via the transceiver.

The following is a full description of each of the modules depicted in the above diagram:

A. Vision System Communication Module

This module offers vision system commands for the game scenario, which correlate to robot and ball coordinates, as well as robot angles, through packets.

B. Game Control Module

Through a serial interface, this module takes referee orders and returns the game's current status.

C. AI Module

This module gets the locations of the robots and the ball, as well as the orientations of the robots, the game state, the roles of the robots, the firing direction, and the field setup. The system uses all of this data to calculate each robot's future position and actions. The chosen approach is determined by the configuration of a tree containing all feasible actions. The activities are categorized based on their significance. One or more evaluations are utilized for each node in the tree. Each evaluation has a set of possible outcomes linked to a certain score. The tree is assessed during the program's loop. The path to travel from root to leaf (final action) is determined by the highest score of each level's assessment result using the Best First Search technique. The robot movement vector, its linear and rotational velocity, and the employment of the kicker and dribbler devices are determined after the system has achieved a final action such as passing, shooting, or blocking. The robots also include a roll motion to help them coordinate joint operations. Different roles are used

D. User Interface Module

Positions, orientations, motor speeds, intended positions, ids, actions, game status, and referee instructions are all shown in real time for each robot in this module. Robot positions, orientations, desired locations, and actions are visually shown in an OpenGL-based GUI.

E. Simulation System

This module simulates the functioning of an artificial intelligence system without requiring the use of a real vision system or robotics. The artificial intelligence module may be used to debug and test activities. The construction of things that think using decision logic is referred to as intelligent object-based simulation. Simio, for example, selects jobs or resources using intelligent objects packed with decision logic. As a result, the item has intelligent behaviour that can predict future performances. The usage of intelligent objects in the context of AI in simulation emphasizes the integration of rule-based AI into simulation models. Manually developing complicated rule-based reasoning is a time-consuming operation, and the rule's performance is also determined by the creator's expertise level. AI, with a focus on the use of neural networks, eliminates the need for manual construction. Manually developing complicated rule-based reasoning is a time-consuming operation, and the rule's performance is also determined by the creator's expertise level.

F. Collision Detection Module

This module simulates the functioning of an artificial intelligence system without requiring the use of a real vision system or robotics. The artificial intelligence module may be used to debug and test activities. An infrared obstacle avoidance sensor with customizable detection distance is created for wheeled robot obstacle avoidance. One infrared transmitter and one detector make up the module. When an obstacle is in front of the sensor, the emitter's infrared light is reflected back to the receiver. A comparator squares the signal to generate a digital signal. The production is high when there are no obstacles. The output is low when an obstruction is within range. A potentiometer knob can be used to change the sensitivity.

G. Transceiver Communication Module

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

H. Omni-Directional Drive Control Module

This module takes the movement vector, which includes linear and angular velocities, and calculates the speed of each of the four robot motors. This module calculates the speed of each motor for the robot's four omnidirectional wheels in order to travel in the correct direction.

VI. APPLICATIONS OF AI

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

A. Chat bots

If you've ever come across a chat bot on a website or social media messenger, it is powered by AI. Chat bots are one of the more simple examples of AI, since they are simply coded to send messages based on rules about how they should interact with users. Sort of an "if this, then that" type of programming.

B. Smart Assistants

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

???????C. Disease Mapping and Prediction

Epidemiologists have always worked to try to understand how diseases spread in order to be able to predict and hopefully avoid them. Artificial intelligence is making this easier. This is an example where it's easy to see how artificial intelligence simply allows for quicker progress on data analysis and prediction modelling than humans could do alone.

???????D. Healthcare

Because of its crucial role in a productive, healthy society, healthcare is one of the most important areas in the larger landscape of big data. The use of AI 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 job. AI in healthcare may improve patient outcomes through improving preventative care and quality of life, as well as producing more accurate diagnosis and treatment regimens. By analyzing data from the government, healthcare, and other sources, AI can help anticipate and track the spread of contagious illnesses. As a result, AI has the potential to be a critical instrument in the fight against diseases and pandemics in global public health.

???????E. Spam Filters

Everyone who uses email knows about spam filters. Email inboxes are equipped with filters that send spam emails to a separate folder so they don't clutter users' inbox with useless messages. Spam filters also exist for phone calls, to filter out scammers and other spam phone calls. AI powers these spam filters by using previous knowledge of what spam emails or phone calls look like from a data perspective, and filtering out the ones that match.

???????F. Recommendation Engines

The recommendation engines on Netflix and Spotify are some of the most well-known. They use data about which shows you've previously watched or songs you've previously listened to in order to recommend other shows you should watch or songs you should listen to. These are only a couple examples. Recommendation engines also exist in social media platforms to recommend people you should connect to or to show you content you might like.

???????G. Search Engines

Search engines have such huge databases that the only way they are able to sort through all of their potential results to show you the best results for your search is with AI. Search engine algorithms are some of the best examples of robust algorithms out there. For example, Google is said to use something like 200 data points to determine where each result ranks on each results page. With billions of pages in their database, that is a lot of data running through their algorithm with every query.

???????H. Self-driving cars

Although fully self-driving cars aren't widely available yet, they are well in the works with multiple companies, and some self-driving features are already available in cars today. Companies like Google and Uber are vying to be the first to develop a consumer-ready self-driving car, but you can already buy cars with sensors that alert you to close objects, break automatically, and can parallel park themselves. Just like how AI can detect cancer better than the human eye, self-driving cars can probably drive better than a lot of humans too.

VII. ADVANTAGES OF AI

A. Reduction in Human Error

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

B. Takes risks instead of Humans

One of the most significant advantages of artificial intelligence is this. By constructing an AI Robot that can do the dangerous tasks for us, we can transcend many of humanity's risky limits. It can be utilized efficiently in every type of natural or man-made disaster, whether it is travelling to Mars, defusing a bomb, exploring the deepest regions of the oceans, mining for coal and oil.

C. Available 24x7

Without breaks, an average human will labor for 4–6 hours every day. Humans are created in such a manner that they can take time off to replenish themselves and prepare for a new day at work, and they even have weekly off days to keep their professional and home lives separate. But, unlike humans, we can use AI to make robots work 24 hours a day, seven days a week with no breaks, and they don't grow bored.

D. Digital Assistance

Digital assistants are used by some of the most modern enterprises to engage with people, reducing the requirement for human personnel. Many websites now utilize digital assistants to supply items that consumers seek. We can discuss what we're searching for with them. Some chatbots are created in such a manner that it's difficult to tell whether we're conversing with a machine or a person.

VIII. DISADVANTAGES OF AI

A. High Cost of Implementation

Setting up AI-based machines, computers, etc. entails huge costs given the complexity of engineering that goes into building one. Further, the astronomical expense doesn't stop there as repair and maintenance also run into thousands of dollars.

D. Risk Of Unemployment

With rapid development being made in the field of AI, the question that plagues our intuitive brain is that – will AI replace humans? Honestly, I am not sure whether AIs will lead to higher unemployment or not. But AIs are likely to take over the majority of the repetitive tasks, which are largely binary in nature and involve minimum subjectivity

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While concluding, it can be analyzed that AI has benefited computer science because it is the artificial psychology that made the machines to focus on the philosophical arguments. AI performs tasks faster than human beings and the major goal of artificial intelligence is to create the technology in an intelligent manner. It is proved that artificial intelligence is the computer knowledge that has human traits, however, these computers and robots help the environment to grow, and they respond rationally to help human beings. AI has already impacted lives of people in various fields and will surely continue to do more in the future.

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