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Overview on Artificial Intelligence Technique

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ABSTRACT:

An area of study called artificial intelligence (A.I.) aims to systematise tasks that require human intelligence. Although it is not widely known, artificial intelligence (AI) is a technology that is revolutionising all facets of existence. This essay intends to inform the general public about artificial intelligence (AI) and to inspire them to use it as a tool in many fields to rethink how we mix data, analyse it, and make decisions. In this essay, we discuss about what artificial intelligence (AI) is, how it functions, its design, and its methods.

Keywords: Artificial Intelligence, Machine Learning, Deep Learning, Cognitive Computing, Computer Vision.

1. Introduction:

Artificial intelligence is the replication of human intelligence processes through technology, particularly computer systems. Typical applications of AI include expert systems, natural language processing, speech recognition, and machine vision.

Artificial intelligence is the imitation of the tricks of human intelligence using technology, especially computer systems. Unique applications of AI include expert systems, natural language processing, speech recognition, and gadget vision.

AI can appear in many different ways. Some examples are:

- Chatbots use AI to understand consumer problems faster and provide more effective solutions.
- To improve scheduling, intelligent assistants use AI to extract critical information from large free text datasets.
- A recommendation engine can automatically suggest TV shows based on customers' viewing preferences.

The powers of the human mind can be modeled and even improved by machines thanks to artificial intelligence. From the emergence of self-driving cars to the proliferation of smart assistants like Siri and Alexa, AI is becoming increasingly prevalent in everyday life. As a result, numerous IT companies from various sectors are investing in artificial intelligence technology.

2. Overview of AI:

Artificial intelligence (AI) refers to machine or software intelligence. Intelligence is the result of emotion, analysis and reaction. The field of artificial intelligence in computer science has rapidly gained popularity as it has improved human life in many areas. Over the past two decades, artificial intelligence has dramatically improved the efficiency of manufacturing and service systems. Expert systems are a rapidly growing field of technology rooted in artificial intelligence research. In many fields, intelligent machines will eventually replace or supplement human capabilities.

2.1 IS ARTIFICIAL INTELLIGENCE (AI) A THREAT TO HUMANS:

Here are some potential disadvantages of artificial intelligence that you should consider and prepare to focus on what AI can achieve today: Automate skills currently performed by humans: AI will change human jobs and activities. AI technology will eliminate certain professions, so people will have to adapt and find new hobbies that will bring social and intellectual benefits to the workplace.

Legal, political, and social implications: Instead of holding back the development of AI, Bostrom says, "Our focus should be on the best way, once all the pieces are in place, we will do our homework."

We put a lot of thought into ethics, governance and other issues before moving forward with the hope of achieving a positive outcome. As AI evolves, there could be serious shortcomings if our governments and business organizations do not take the time to establish current laws, regulations and obligations.

AI-Generated Terrorism: War will change with the advent of long-range attacks and nanorobots, autonomous drones, robot swarms, and other forms of artificial intelligence. In addition to worrying about the nuclear arms race, we need to control the global autonomous arms race.

3. Types of AI:

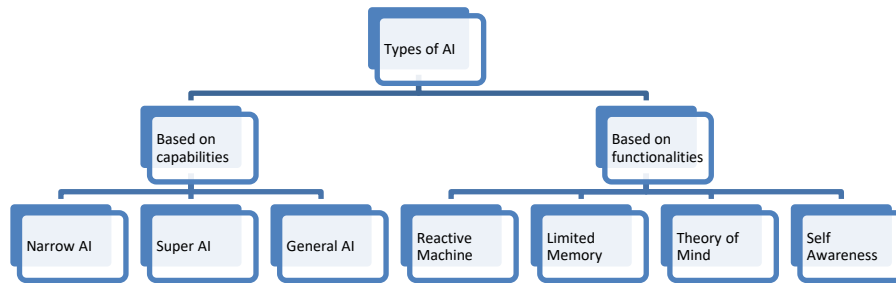


Fig 3.1 Types of AI

3.1 AI Type 1- Based on Capabilities:

Narrow AI- A type of AI known as narrow AI is capable of doing a certain task in an intelligent manner. The most common and generally available type of artificial intelligence is narrow AI. Narrow AI cannot function outside of its field or limitations because it is only trained for a single activity. It is therefore also referred to as "weak AI." When limited AI exceeds its limits, it may experience unexpected failure. Although it only does a small number of tasks, Apple Siri is a great illustration of narrow artificial intelligence. Examples of narrow AI include playing chess, making recommendations for purchases on an e-commerce site, self-driving cars, speech recognition, and image recognition.

Super AI- Super AI is a level of system intelligence where machines can outsmart people and perform any task more effectively than people who possess cognitive abilities. In general, AI is to blame. The ability to comprehend, reason, solve puzzles, make decisions, plan, learn, and communicate autonomously are some key traits of strong AI. Super AI remains a sci-fi notion of artificial intelligence. Such systems are still being developed in the real world, which is an endeavour to change the world.

General AI- A type of intelligence known as general AI is capable of doing any intellectual task just as well as a person. The creation of a system that can independently learn and reason is the aim of general AI. There is currently no system that can perform any task as well as a person and be categorised as general AI. Now, scientists from all across the world are focusing their efforts on developing robots that can do general AI tasks. It will take a long time and a lot of effort to construct generic AI systems because this field is currently under investigation.

3.2 AI Type 2- Based On Functionalities:

Reactive Machines- Reactive robots are the purest form of artificial intelligence. Such artificial intelligence systems do not remember past events or experiences in order to make decisions in the future. These machines just take into account the situation at hand and react as effectively as they can. Reactive machines include systems like IBM's Deep Blue. Google's AlphaGo is yet another example of a reactive machine.

Limited Memory- As the name implies, Limited Memory AI is able to make better judgements by reviewing historical data stored in its memory. Such an AI has a transitory memory that it can use to retain past events and, in turn, judge what to do in the future.

Self-driving automobiles are examples of Limited Memory AI, which leverages information gathered recently to make quick choices. Self-driving cars, for instance, employ sensors to detect pedestrians crossing the road, steep roads, traffic lights, and other hazards to help them make better driving decisions. This aids in averting any upcoming mishaps.

Theory of Mind- Concept of Mind A more sophisticated kind of artificial intelligence is AI. It is believed that this class of machines has a significant impact on psychology. This kind of AI will put a lot of emphasis on emotional intelligence to better understand human beliefs and thoughts. Although the Theory of Mind AI is still being thoroughly researched, it has not yet been fully developed.

The first two types of AI are widespread and have been for some time however, the other two are currently just concepts or works in progress. Theory of mind AI is the next level of AI systems that scientists are currently developing. When interacting with other beings, a theory of mind level AI will be able to recognise their wants, emotions, beliefs, and mental processes. While well-known AI researchers are concentrating on artificial emotional intelligence, which is currently a booming industry, to achieve Theory of Mind AI levels, other AI fields would also need to progress.

Self Awareness- The development of AI, which is still only theoretical, has reached this point. AI that has reached the stage of development where it resembles the human brain so closely that it has developed self-awareness is referred to as self-aware AI. The creation of this type of AI, which is decades or even centuries away from becoming a reality, is and will always be the ultimate objective of all AI research. This kind of AI will be able to recognise

and create emotions in the people with whom it interacts, but it will also have feelings, desires, beliefs, and perhaps goals of its own. This is the type of AI that worries those who are sceptical of the technology.

Although the development of self-awareness has the potential to advance our society, it also carries the risk of catastrophe. This is due to the possibility that, once self-aware, AI may have principles like self-preservation, which might either directly or indirectly herald the end of humankind. An AI with these traits could easily outwit a human brain and devise intricate plans to rule over all of life. An alternate way of classification that is more frequently used in tech jargon is the division of technology into Artificial Narrow Intelligence (ANI), Artificial General Intelligence (AGI), and Artificial Superintelligence (ASI).

4 Architecture of AI-

The artificial intelligence system has a primary thread that loops across the many components. The main system thread first links with the visual system to establish the position and orientation of robots. Besides, where's the ball? The technology then verifies the referee's command over the condition of the game. The AI module function is then invoked by the system, which supplies the necessary robot movement location as well as additional activities to do. To avoid colliding with other robots, the system calculates collision avoidance trajectories when the motions are specified. The system then calculates the velocity of every wheel on the robot. Finally, the system uses the transceiver to broadcast communication packets corresponding to commands to act.

The following is a full explanation of each of the components showed in the above figure:

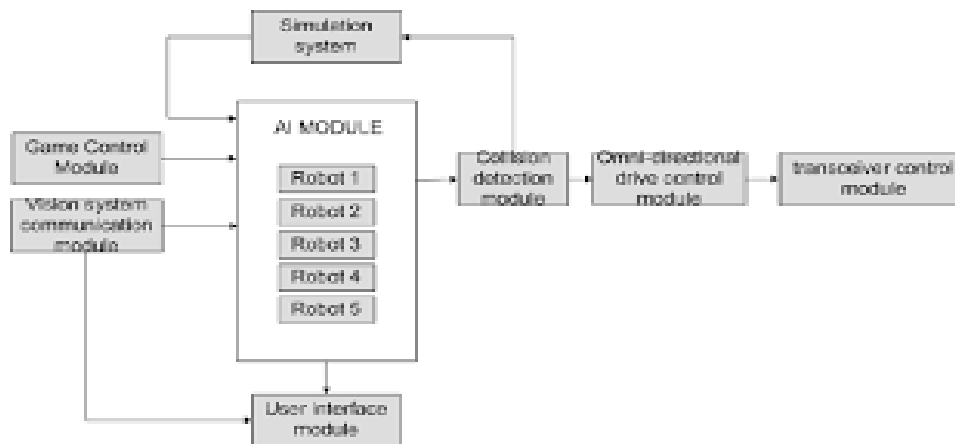


Fig 4.1 Architecture of AI

- A. **Vision system communication module:** This module provides packet-based vision system commands for the game scenario that relate to the robot, ball, and robot angle coordinates.
- B. **Game Control Module:** This module receives referee commands through a serial interface and returns the game's current condition.
- C. **AI Module:** This module receives the robots' and the ball's positions as well as their orientations, the game's state, their functions, their shooting direction, and the field's layout. All of this information is used by the system to determine the position and future movements of each robot. The layout of a tree containing all possible actions determines the selected strategy. Based on their importance, the activities are divided into categories. For each node in the tree, one or more assessments are used. Each evaluation includes a range of potential results associated with a particular score. On the loop of the programme, the tree is evaluated. The Best First Search technique is used to find the route from root to leaf (final action) based on the assessment result with the greatest score at each step. After the system has completed a final action like passing, shooting, or blocking, the kicker and dribbler devices are used, together with the robot movement vector, its linear and rotational velocity, and the placement of the kicker and dribbler devices. In order to better coordinate their joint tasks, the robots also include a roll motion. Goalkeeper, defence, first, second, and third forward are some of the roles that are employed to coordinate the robots. The goalie's duty is to stop the ball from going into the goal. When the ball is far away, it kicks it; when it is close, it takes a block path. You are only allowed to manoeuvre in the area surrounding the goal. Together with the three strikers, the defence and custodian must create a cooperative game plan to defend the goal from long-range attempts. Defenders clear the ball out when they are close to their own area and follow the opposing robots to stop a pass and goal. Despite having the same objective, the three forwards have different priorities. They move across the entire field, coordinating different passing and shooting techniques. They may travel in groups if necessary.
- D. **User Interface Module:** For each robot in this module, locations, orientations, motor speeds, desired positions, ids, actions, game status, and referee orders are all displayed in real time. An OpenGL-based GUI is used to visually display the positions, orientations, desired locations, and actions of the robot.

- E. Simulation System:** Without the use of actual robotics or vision systems, this module replicates the operation of an artificial intelligence system. A module for artificial intelligence can be used to test and debug processes. Intelligent object-based simulation is the process of creating artificial intelligence utilising decision logic. For instance, Simio uses intelligent objects that are loaded with decision logic to choose tasks or resources. 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.
- F. Collision Detection Module:** Without the use of actual robotics or vision systems, this module replicates the operation of an artificial intelligence system. A module for artificial intelligence can be used to test and debug processes. For the purpose of avoiding obstacles with wheeled robots, an infrared obstacle avoidance sensor with adjustable detection distance has been developed. The module consists of a single infrared transmitter and a single detector. The infrared light from the emitter is reflected back to the receiver when an obstruction occurs in front of the sensor. To create a digital signal, a comparator squares the signal. When there are no obstacles, output is high. When an impediment is within range, the output is low. The sensitivity may be adjusted with a potentiometer knob.
- G. Transceiver Communication Module:** This module receives the tasks that must be completed as well as the speed of each robot motor. The packets that our transceiver sends out are created by this module. Additionally, it makes sure that communication is ongoing.
- H. Omni Directional Drive Control Module:** This module determines the speed of each of the four robot motors using the movement vector, which contains both linear and angular velocities. For the robot's four omnidirectional wheels to move in the right direction, this module determines the speed of each motor.

5. Application of AI:

The average technology user interacts with artificial intelligence technologies on a regular basis in a variety of ways, although most people are unaware of the devices that use AI. Here are a few instances of artificial intelligence technologies that are used widely nowadays.

- A. Chatbots:** An AI-driven chat bot is one you may have come across on a website or social media messenger. One of the more basic applications of AI are chat bots, which are merely programmes that are programmed to transmit messages in accordance with guidelines for how they should communicate with users. Almost like "if this, then that" programming.



Fig 5.1 Chatbots

- B. Smart Assistants:** Artificial intelligence is used in smart assistants like Siri, Alexa, and the rest. They can follow instructions and react appropriately because they can understand what users are saying to them. Since they employ speech recognition and are linked to bigger databases of information like search engines, these are sort of the chat bots' next evolution.



Fig5.2 Smart Assistants

- C. **Spam Filter's:** Spam filters are common knowledge among email users. Filters in email inboxes redirect spam emails to a different folder so they don't clog users' inboxes with pointless messages. To eliminate scammers and other types of spam phone calls, spam filters are also available for calls. These spam filters are powered by AI, which screens out the correspondences based on prior knowledge of what spam emails or phone calls appear to be from a data standpoint.

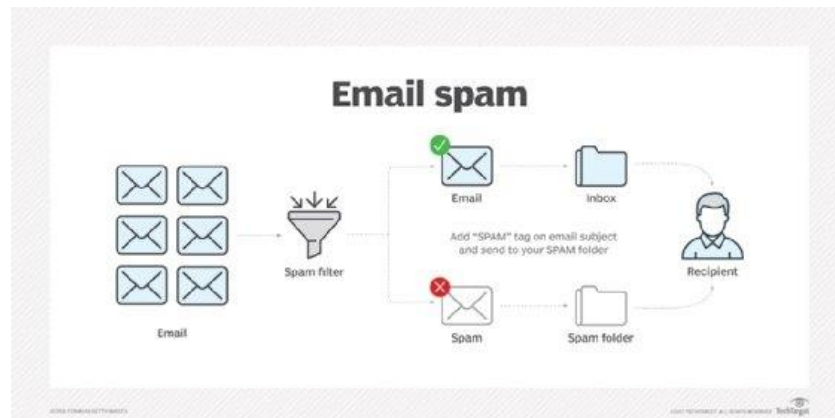


Fig 5.2 Spam Filter's

6. Advantages of AI:

- A. **Reduction in Human Error:** The phrase "human error" was created since mistakes are made by people from time to time. On the other hand, if computers are correctly programmed, they do not commit these mistakes. Artificial intelligence makes decisions using a set of algorithms and data that has already been collected. As a result, errors are reduced and there is a greater chance of reaching more precision and accuracy.

As an illustration: AI has substantially reduced human error in weather forecasting.

- B. **Available 24*7:** An average person will work for 4-6 hours a day without breaks. Humans are designed to be able to take time off to recharge and get ready for a new day at work. They even have weekly off days to keep their personal and professional lives apart. However, unlike humans, we are able to employ AI to make robots operate nonstop for 24 hours a day, 7 days a week, without getting bored.

As an illustration: Educational institutions and helplines receive a lot of requests and issues that AI can successfully resolve.

- C. **Digital Assistance:** Some of the most cutting-edge businesses interact with customers via digital assistants, which eliminates the need for human staff. Nowadays, a lot of websites use digital assistants to provide what customers want. We can talk to them about what we're looking for. Some chatbots are designed in a way that makes it difficult to distinguish between talking to a machine and a human.

As an illustration: Everyone is aware that companies employ a customer service team to address inquiries and complaints from clients. Businesses may utilise AI to develop a chatbot or speech bot that can answer all of the inquiries that customers have.

They are already being utilised by many businesses on their websites and mobile applications.

7. Disadvantages of AI:

- A. **High cost of Implementation:** Given the intricacy of engineering involved in creating one, setting up AI-based equipment, computers, etc. involves enormous costs. Furthermore, the outrageous cost doesn't end there because repairs and maintenance can cost thousands of dollars.

B. **Doesn't improve with experience:** The capacity of human cognitive strength to improve with age and experience is one of its most astounding features. The same cannot be said, however, of artificial intelligence (AI), which is a computer that does not become better with use but rather degrades over time.

C. **Lack of Creativity:** As was already said above, AIs are not designed for artistic endeavours. Therefore, it should be obvious by this point that creativity or imagination are not the strong suits of the AIs. Even while they can assist you in inventing and producing something unique, they still fall short of the human brain in terms of complexity. Their capacity for innovation is constrained by the programming and commanding person.

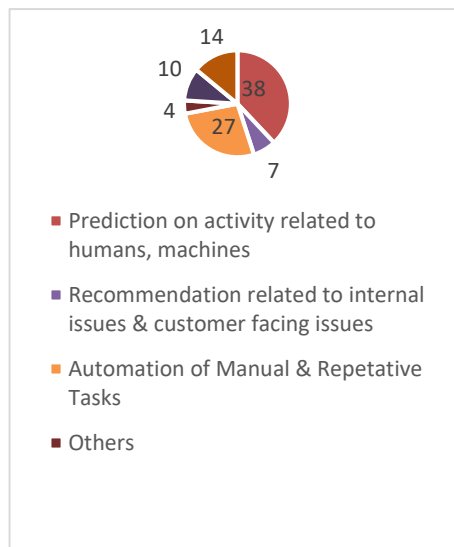


Fig 7.1 Disadvantages of A.I

8. Technologies of AI:

According to common thinking, AI is frequently misplaced on an island with robots and self-driving cars. However, this approach ignores one of the most crucial real-world uses for artificial intelligence: the analysis of the enormous amounts of data generated every day. By carefully using AI to specific tasks, insight gathering and job automation may be done at a velocity and scale that was previously unimaginable. AI systems conduct sophisticated searches through the enormous amounts of data that humans generate, interpreting both text and images to uncover patterns in complex data and taking appropriate action in response to their findings. Modern technology have enabled computer systems that can understand human language, gain knowledge from experience, and forecast the future. The following list of AI subfields.

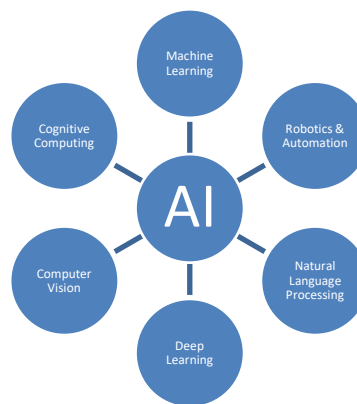


Fig 8.1: Technologies of AI

- A. **Machine Learning:** A developing technology called machine learning makes it possible for computers to learn autonomously from historical data. Machine learning uses a variety of techniques to create mathematical models and make predictions based on previous information or data. Currently, it is utilised for many different things, including recommender systems, email filtering, Facebook auto-tagging, image identification, and speech recognition.
- B. **Cognitive Computing:** Using computerised models to imitate human mental processes in complex circumstances where the solutions may be unclear and uncertain is known as cognitive computing. The expression is intimately linked to Watson, IBM's cognitive computer system.

Although computers are quicker than people in processing and performing calculations, they are still not yet adept at certain activities, such as comprehending spoken language and identifying items in an image. The goal of cognitive computing is to have computers function similarly to the human brain.

- C. **Deep Learning-** Deep learning, a branch of machine learning, employs artificial neural networks that learn by analysing data. The organic neural networks in the brain are imitated by artificial neural networks. In order to detect a facial image from a mosaic of tiles, for example, several layers of artificial neural networks work together to generate a single output from a huge number of inputs. The machines acquire

knowledge by receiving both positive and negative feedback for the work they complete, therefore they require constant processing and feedback in order to grow.

- D. Computer Vision-** Computer idea is a method of understanding picture factual, 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 identify, analyse, and understand visual input. This technology's applications have already begun to convert parts 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.
- E. NLP(Natural Language Processing)-** Computers have been taught to understand natural languages through linkages to human language. Natural Language Processing, a technique for gleaning meaning from human languages, is a reliable technological advancement. NLP technology uses a machine to record speech from speakers.

The writing is transformed to audio after the audio-to-text conversion of the dialogue. Then the system provides audio responses to users. IVR (Interactive Voice Response) systems used in call centres, language translators like Google Translate, and word processors that check text for proper syntax, like Microsoft Word, are all examples of applications for NLP.

- F. Automation & Robotics-** Computers have been taught to understand natural languages through linkages to human language.

The objective of automation is to make monotonous, repetitive tasks automatable, boosting productivity and producing more effective, efficient, and affordable results. Many organisations use machine learning, artificial neural networks, and graphs to automate processes.

This automation can help to prevent issues with fraud while making online payments by utilising the CAPTCHA approach.

Robotic process automation is made to complete repetitive, high-volume tasks and can adjust to changing circumstances.

9. Future of AI:

In just a few years, artificial intelligence has transitioned from science fiction to reality. Both in science fiction movies and real life, there are intelligent machines that help people. We currently live in an artificial intelligence (AI) world, which was previously merely a story.

Artificial intelligence technology is now ingrained in our culture and used in our daily activities, whether we are aware of it or not. Everyone now uses AI in their daily life, whether it be through chatbots, Alexa, or Siri.

This technologically based sector is developing and shifting. However, it wasn't as simple and easy as it seemed to us. To get AI to this point, a lot of effort and the involvement of many individuals were required.

10. Conclusion:

This paper has addressed every aspect of the new initiative to develop computer models of intelligence that is based on artificial intelligence technology. Any type of intelligence, whether human or nonhuman, can be expressed in terms of symbol structures and symbolic operations that can be encoded in a digital computer, according to the basic premise.

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