

Fiction to Reality: The Evolution of Artificial Intelligence

Mr. Harish Singh

Assistant Professor

Department of Computer Applications,
Chandigarh Group of Colleges, Landran, Punjab, India

Abstract

Artificial intelligence has the potential to teach us to be better drivers, better teachers, and better writers and overall better people. It is developing faster than any one can think, and speeding up exponentially. AI would include the ability to learn just about anything, the ability to reason, the ability to use language and the ability to formulate original ideas. We all are using artificial intelligence all day, every day. We can say that in near future robots are definitely going to take our job but it is also true that a robot can ever be intelligent. About half of the AI community believes computers will be as smart as humans by 2040. A lot of smart people think developing artificial intelligence to human level is a dangerous thing to do. Once artificial intelligence gets smarter than humans, we've got very little chance of understanding it. There's no such thing as an "evil" artificial intelligence. Today's AI machines can replicate some specific elements of intellectual ability.

Index Terms- Robotics, AI, NLP, Expert System, Neural Networks.

Introduction

Artificial intelligence (AI) is the field within computer science that seeks to explain and to emulate, through mechanical or computational processes, some or all aspects of human intelligence. The primary aim of AI is to produce intelligent machines. The intelligence should be exhibited by thinking, making decisions, solving problems, more importantly by learning. [10]. The aspects of intelligence are the ability to interact with the environment through sensory means and the ability to make decisions in unforeseen circumstances without human intervention. [AI](#) is an interdisciplinary field that requires [knowledge](#) in computer science, linguistics, psychology, biology, philosophy, game playing, natural language understanding and synthesis, computer vision, problem solving, learning, robotics, and so on for serious research.

The modern definition of artificial intelligence (or AI) is "the study and design of intelligent agents" where an intelligent agent is a system that perceives its environment and takes actions which maximizes its chances of success [1]. Artificial Intelligence can be categorized in two ways:

STRONG ARTIFICIAL INTELLIGENCE

It deals with creation of real intelligence artificially. Strong AI believes that machines can be made sentient or self-aware. There are two types of strong AI.

- i. Human-Like AI- In which the computer program thinks and reasons to the level of human-being.
- ii. Non Human-Like AI- In which the computer program develops a non-human way of thinking and reasoning.

Weak Artificial Intelligence

Weak AI does not believe that creating human-level intelligence in machines is possible but AI techniques can be developed to solve many real life problems. That is, the study of mental models implemented on a computer.

History

The field of AI is considered to have its origin in the publication of British mathematician Alan Turing's (1912–1954) paper "Computing Machinery and Intelligence" (1950). The term itself was coined six years later by mathematician and computer scientist John McCarthy (b. 1927) at a summer conference at Dartmouth College in [New Hampshire](#). The earliest approach to AI is called *symbolic* or *classical* AI and is predicated on the hypothesis that every process in which either a human being or a machine engages can be expressed by a string of symbols that is modifiable according to a limited set of rules that can be logically defined [6].

McCulloch and Walter Pitts proposed a model of artificial neurons in 1943. Significance of this work is that each neuron is characterized as being “on” or “off”. Switching to an “on” occurred when significant number of neighboring neurons stimulated. McCulloch and Pitts showed that any computable function could be computed by network of connected neurons. In 1949, Donald Hebb modified the connection strength between neurons using a simple updating rule what is known as Hebbian learning even today. Marvin Minsky and Dean Edmonds built the first neural network computer called SNARC in 1951. This computer used 3000 vacuum tubes and a network of 40 neurons. Alan Turing introduced the infamous Turing test, machine learning, genetic algorithms, and reinforcement learning.

Artificial Intelligence was formally born in a workshop conducted by IBM at Dartmouth College in 1956. Mc Carthy coined the term Artificial Intelligence. It turns out to be the greatest milestone in the history of artificial intelligence. Newell, Shaw and Simon developed a reasoning program called Logic Theorist. It was meant for automatic theorem proving which led the development of Information Processing Language, the first list-processing language. Chomsky's theory of generative grammar influenced Natural Language Processing. Rosenblatt invented perceptrons in 1958. John McCarthy developed LISP, an AI programming language.

Newell and Simson wrote General Problem Sover (GPS) in IPL. It imitated the way humans solve the problems. In 1976, they formulated physical symbol system and claimed that it is sufficient for general intelligent action. Herbert Gelernter developed Geometry Theorem Prover. A.L.Samuel developed checkers program between 1961 and 1965. J.A.Robinson introduced a inference method, resolution in 1965. In the same period DENDRAL, the first knowledge-based expert

system was developed at Stanford University by J.Laderberg, Edward Feigenbaum and Carl Djerassi. DEDNDRAL was to infer molecular structure from the information provided by a mass spectrometer. Feigenbaum, Buchanan and Edward Shortlife developed an expert system called MYCIN to diagnose blood infections. MYCIN used 450 rules acquired from the information given by experts. MYCIN incorporated certainty factors, a calculus of uncertainty [9].

The beginnings of modern AI can be traced to classical philosophers' attempts to describe human thinking as a symbolic system. But the field of AI wasn't formally founded until 1956, at a conference at Dartmouth College, in Hanover, New Hampshire, where the term "artificial intelligence" was coined.

But achieving an artificially intelligent being wasn't so simple. After several reports criticizing progress in AI, government funding and interest in the field dropped off – a period from 1974–80 that became known as the "AI winter." The field later revived in the 1980s when the British government started funding it again in part to compete with efforts by the Japanese.

The field experienced another major winter from 1987 to 1993, coinciding with the collapse of the market for some of the early general-purpose computers, and reduced government funding.

But research began to pick up again after that, and in 1997, IBM's Deep Blue became the first computer to beat a chess champion when it defeated Russian grandmaster Garry Kasparov. And in 2011, the computer giant's question-answering system Watson won the quiz show "Jeopardy!" by beating reigning champions Brad Rutter and Ken Jennings [3].

Artificial Intelligence- Research Areas

The domain of artificial intelligence is huge in breadth and width. While proceeding, we consider the broadly common and prospering research areas in the domain of AI [4, 5]-

Gaming

You can buy machines that can play master level chess for a few hundred dollars. There is some AI in them, but they play well against people mainly through brute force computation--looking at hundreds of thousands of positions. To beat a world champion by brute force and known reliable heuristics requires being able to look at 200 million positions per second.

Speech Recognition

The process of enabling a computer to identify and respond to the sounds produced in human speech. It is possible to instruct some computers using speech; most users have gone back to the keyboard and the mouse as still more convenient.

Natural Language Processing

It is a field of computer science, artificial intelligence, and computational linguistics concerned with the interactions between computers and human (natural) languages. As such, NLP is related

to the area of human–computer interaction.

Examples: Google Now feature, speech recognition, Automatic voice output.

Neural Networks

A computer system modeled on the human brain and nervous system.

Examples– Pattern recognition systems, such as face recognition, character recognition, handwriting recognition.

Robotics

The field of computer science and engineering concerned with creating robots, devices that can move and react to sensory input. Robotics is one branch of artificial intelligence. Robots are now widely used in factories to perform high-precision jobs such as welding and riveting.

Examples – Industrial robots for moving, spraying, painting, precision checking, drilling, cleaning, coating, and carving, etc.

Expert Systems

An expert system is a computer system that emulates the decision-making ability of a human expert. Expert systems are designed to solve complex problems by reasoning about knowledge, represented primarily as if–then rules rather than through conventional procedural code.

Examples – Flight-tracking systems and Clinical systems.

Fuzzy Logic

Fuzzy Logic (FL) is a method of reasoning that resembles human reasoning. The approach of FL imitates the way of decision making in humans that involves all intermediate possibilities between digital values YES and NO.

The conventional logic block that a computer can understand takes precise input and produces a definite output as TRUE or FALSE, which is equivalent to human's YES or NO.

PROS AND CONS OF ARTIFICIAL INTELLIGENCE

How will AI affect our lives? Artificial intelligence (AI) is the intelligence of machines. It is about designing machines that can think. Researchers also aim at introducing an emotional aspect into them [8].

A. Pros

- i.** With artificial intelligence, the chances of error are almost nil and greater precision and accuracy is achieved.
- ii.** Artificial intelligence finds applications in space exploration. Intelligent robots can be used to explore space.

- iii.** Intelligent robots can be programmed to reach the Earth's nadirs. They can be used to dig for fuels. They can be used for mining purposes.
 - iv.** Intelligent machines can replace human beings in many areas of work. Robots can do certain laborious tasks. Painstaking activities, which have long been carried out by humans can be taken over by the robots.
 - v.** Smartphones are a great example of the application of artificial intelligence. In utilities like predicting what a user is going to type and correcting human errors in spelling, machine intelligence is at work. Applications like Siri that act as personal assistants, GPS and Maps applications that give users the best or the shortest routes to take as well as the traffic and time estimates to reach there, use artificial intelligence.
 - vi.** Fraud detection in smart card-based systems is possible with the use of AI.
 - vii.** Artificial intelligence can be utilized in carrying out repetitive and time-consuming tasks efficiently.
 - viii.** Intelligent machines can be employed to do certain dangerous tasks. They can adjust their parameters such as their speed and time, and be made to act quickly, unaffected by factors that affect humans.
 - ix.** AI is at work in the medical field too. Algorithms can help the doctors assess patients and their health risks. It can help them know the side effects that various medicines can have.
 - x.** The greatest advantage of artificial intelligence is that machines do not require sleep or breaks, and are able to function without stopping. They can continuously perform the same task without getting bored or tired. When employed to carry out dangerous tasks, the risk to human health and safety is reduced.
- B. Cons**
- i.** One of the main disadvantages of artificial intelligence is the cost incurred in the maintenance and repair. Programs need to be updated to suit the changing requirements, and machines need to be made smarter. In case of a breakdown, the cost of repair may be very high. Procedures to restore lost code or data may be time-consuming and costly.
 - ii.** An important concern regarding the application of artificial intelligence is about ethics and moral values. Is it ethically correct to create replicas of human beings? Do our moral values allow us to recreate intelligence? Intelligence is a gift of nature. It may not be right to install it into a machine to make it work for our benefit.
 - iii.** Machines may be able to store enormous amounts of data, but the storage, access, and retrieval is not as effective as in case of the human brain. They may be able to perform repetitive tasks for long, but they do not get better with experience, like humans do.
 - iv.** They are not able to act any different from what they are programmed to do. Though this is mostly seen as an advantage, it may work the other way, when a situation demands one to act in way different from the usual. Machines may not be as efficient as humans in altering their responses depending on the changing situations.

v. The idea of machines replacing human beings sounds wonderful. It appears to save us from all the pain. But is it really so exciting? Ideas like working wholeheartedly, with a sense of belonging, and with dedication have no existence in the world of artificial intelligence. Imagine robots working in hospitals. Do you picture them showing the care and concern that humans would? Do you think online assistants (avatars) can give the kind of service that a human being would? Concepts such as care, understanding, and togetherness cannot be understood by machines, which is why, how much ever intelligent they become, they will always lack the human touch.

vi. If robots begin to replace humans in every field, it will eventually lead to unemployment. People will be left with nothing to do. So much empty time may result in its destructive use. Thinking machines will govern all the fields and populate the positions that humans occupy, leaving thousands of people jobless.

vii. If the control of machines goes in the wrong hands, it may cause destruction. Machines won't think before acting. Thus, they may be programmed to do the wrong things, or for mass destruction.

viii. Apart from all these cons of AI, there is a fear of robots superseding humans. Ideally, human beings should continue to be the masters of machines. However, if things turn the other way round, the world will turn into chaos. Intelligent machines may prove to be smarter than us, they might enslave us and start ruling the world.

It should be understood that artificial intelligence has several pros but it has its disadvantages as well. Its benefits and risks should be carefully weighed before employing it for human convenience. Or, in the greed to play God, man may destroy himself[8].

Challenges

The real challenge of AI is to understand how natural intelligence works. Developing AI isn't like building an artificial heart- scientists don't have a simple, concrete model to work from. It is true that AI does not yet achieve its ultimate goal [7]. Still AI systems could not defeat even a three year old child on many counts: ability to recognize and remember different objects, adapt to new situations, understand and generate human languages, and so on. The main problem is that we, still could not understand how human mind works, how we learn new things, especially how we learn languages and reproduce them properly.

Future of Ai

AI is the best field for dreamers to play around. It must be evolved from the thought that making a human-machine is possible. Though many conclude that this is not possible, there is still a lot of research going on in this field to attain the final objective. There are inherent advantages of using computers as they do not get tired or losing temper and are becoming faster and faster. Only time will say what will be the future of AI: will it attain human-level or above human-level intelligence or not.

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