

ARTIFICIAL INTELLIGENCE AND ITS EVOLUTION & APPLICATIONS

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ABSTRACT

In many fields in years to come, intelligent machines will either supplement or replace human talents. The intelligence displayed by software or robots is known as artificial intelligence. It belongs to the “computer science discipline”. There is a developing curiosity in computer science due to the increasing benefits artificial intelligence has brought to human life. Industrial, service, and educational efficiency have all seen notable gains in the last 20 years due to artificial intelligence. Research in “artificial intelligence” has led to the “development of the quickly” expanding field of expert systems innovation. Artificial intelligence is finding great applications in a wide range of industries, including education, engineering, business, medical, and weather forecasting. Expert systems are being employed extensively in many domains to tackle complicated issues. The quality and efficiency of the fields using artificial intelligence technologies have increased. This essay provides an overview of artificial intelligence technology and its applications across several fields, with a focus on how it is used in education. It also discusses the meaning, applications, innovations, and prospects of artificial intelligence.

1. INTRODUCTION

The quick “development of artificial intelligence” has important implications for both industry and society as a whole. The characteristics and manufacturing of a wide range of goods and services might be directly impacted by these technologies, which could have significant consequences on productivity, employment, and competitiveness. While these are predicted to be important advantages, artificial intelligence also has the power to change the way that innovations are made, which might have equally important repercussions that ultimately outweigh the immediate benefits. It is said that study in the fields of operational research, management sciences, and educational technology is beginning to incorporate more and more artificial intelligence. The capacity to gather information and apply it to solve challenging issues is a typical definition of intelligence. In several fields, intelligent machines will soon surpass human skills. The study of software and computers with reasoning, learning, knowledge-gathering, manipulating, and object-perception capabilities is known as artificial intelligence. The phrase “human-computer interface” was first used in 1956 by computer scientist John McCarthy. The ability to discern reason and take action is made possible by the study of computing.

The focus on computing that distinguishes artificial intelligence from psychology and the emphasis on observation, thinking, and action that distinguishes it from computer science. It improves the intelligence and usefulness of machines. It functions by using scientific theorems and artificial neurons. Nowadays, a lot of applications of AI technologies offer genuine, useful advantages due to their maturity. Key fields of artificial intelligence include “computer vision” and scene recognition, robotics and sensory systems, “natural language processing”, speech recognition, expert systems, intelligent computer-aided instructions, and neural computing. A quickly developing technology that is having a significant influence on many facets of life is derived from these expert systems. Artificial intelligence encompasses a range of methodologies, including neural networks, fuzzy logic, evolutionary computing, computer-aided guidelines, and hybrid AI.

Artificial intelligence is a term that has no universally accepted meaning, although it is generally understood to mean the study of algorithms that enable perception, reasoning, and response. Both humans and technology produce significantly more data these days than can be assimilated, interpreted, and used to make sophisticated judgments. All computer learning is predicated on “artificial intelligence”, which is also where complicated decision-making is headed. The features, introduction, definitions, history, applications, development, and accomplishments of artificial intelligence are all covered in this essay.

2. ARTIFICIAL INTELLIGENCE METHODS

1-Machine learning- This is an example of an artificial intelligence application in which robots are autonomously trained to learn from experience rather than having specific tasks explicitly coded into them. An area of machine learning known as “Deep Learning” does predictive analysis with artificial neural networks. Supervised learning, unsupervised learning, and reinforcement learning are just a few of the many machine learning algorithms that are available. The algorithm in unsupervised learning does not work on classified data by itself. By gathering both the expected output and

an input item, supervised learning infers a function from the training data. Reinforcement learning is used by machines to identify the optimal options to take into account and to adjust the reward accordingly.

2-Neural Networks- Neural networks are “biologically inspired systems” composed of a massively connected network of computational “neurons” organized in layers. By adjusting the network’s weights, artificial neural networks (NNs) may be “trained” to approximate nearly any “nonlinear function” to a desired “degree of accuracy”. NNs are often given a set of input and output exemplars. The weights in the network would then be adjusted using a learning technique (such as back propagation) to ensure that the network produced the intended output. This sort of learning is known as supervised learning.

3-Machine Vision- Machines are capable of gathering and analyzing visual data. Cameras are used to find the “visual information” in this instance. Analogue to digital conversion is used to turn the image into digital data, and “digital signal processing” is used to handle the data. That results in data that is received by a computer. Resolution—the distance at which an item can be distinguished by a machine—and sensitivity—the computer’s ability to recognize faint signals—are two crucial aspects of machine vision. Among the many uses for machine vision are signature identification, pattern recognition, and medical picture analysis.

4-Automation & Robotics- Automation aims to increase productivity by having machines complete repetitive and boring work, resulting in more economical and efficient outcomes. Neural networks, graphs, and machine learning are used in automation by many companies. Using “CAPTCHA technology”, this kind of automation helps avoid fraud problems during online “financial transactions”. Robotic process automation can adjust to changing conditions and is designed to carry out repetitive, high-volume activities.

5- Natural Language Processing- Where the computers' natural language processing is designed lies in the interactions between them and human language. For natural language processing—which extracts meaning from human languages—machine learning is a dependable technique. NLP involves the machine recording human speech. The text is next processed, where the data is turned into audio, after the audio to text interaction has taken place. Subsequently, the system responds to people via audio. The usage of natural language processing is present in word processors like Microsoft Word, interactive voice response (IVR) systems used in contact centers, and language translation programs like Google Translate. However, natural language processing is complicated because human languages include norms that are necessary for information transfer via natural language but are hard for computers to understand. Therefore, unstructured data from human languages may be transformed into a “machine-readable format” through the use of “natural language processing”, which uses algorithms to recognize and abstract natural language norms.

6-Knowledge-Based Systems- A Knowledge-Based Subject Supervisor is a computer program that uses expert knowledge from humans to make recommendations in a certain field. The knowledge, which may be represented in a variety of forms, including rules, frames, or instances, and the inference engine or algorithm that uses the knowledge base to reach a conclusion are two key characteristics of KBS.

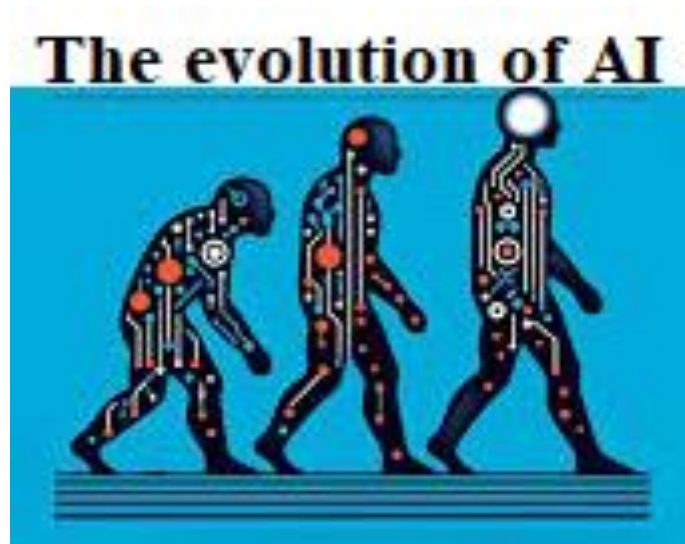
Artificial Intelligence's Evolution

Nilsson (2010), in his comprehensive historical overview of AI research, characterizes AI as “the endeavour focused on imbuing machines with intelligence, where intelligence is the attribute that permits an organism to operate suitably and anticipatorily within its surroundings.” AI covers the contributions of many other domains to advancements in AI. Undoubtedly, despite their distinct methodologies, artificial intelligence research has been linked since its inception by its association with Turing (1950) and his discourse on the potential for automating intelligence.

Despite being frequently combined, “robotics, neural networks”, and “symbolic systems” are three linked but distinct fields that may be distinguished to better understand the “conceptual history of artificial intelligence” as a scientific and technological discipline. Under the general title of symbolic systems, perhaps the most fruitful line of study in the early years of artificial intelligence dates back to the 1960s. The “symbol processing hypothesis” (Newell, Shaw, and Simon, 1958; Newell and Simon, 1976) was based on the idea that decisions made by humans can be replicated by processing symbols, even though early pioneers like Turing had stressed the value of teaching a machine as one might a child (i.e., emphasizing AI as a learning process). The ability of a computer to navigate chess pieces (or other board games) or have relatively simple conversations with humans by adhering to certain heuristics and rules embedded in a program is one example of the impressive success of early attempts to instantiate this approach. But despite the fact that studies centered around the idea of a “general problem solver” have remained highly regarded by academics and that interest in applying such approaches to support human decision-making (for example, in the context of early-stage expert systems to guide medical diagnosis) has periodically surged, the symbolic systems approach has come under fire for its incapacity to have a significant, scalable impact on real-world processes. Though there’s always a chance that this discipline could make strides in the future, it’s safe to conclude that, despite ongoing academic study, symbolic systems

have not played a major role in the commercial application of artificial intelligence. Furthermore, it is not the driving force behind the “recently publicized advancements” in AI related to “machine learning and prediction”.

In general, robotics has been a major focus of a second significant AI trajectory. Although there have been ideas of “robots” as machines that can carry out “human tasks since at least the 1940s”, the field of robotics really started to take off in the 1980s. This was due to a combination of developments in “numerically controlled machine tools” and more adaptive, yet still rules-based robotics that relies on active sensing of a known environment. This field has seen the widespread use of “industrial robots” in manufacturing applications—possibly the most economically significant use of AI to date.



These devices operate in a highly regulated setting and are specifically designed to do a certain purpose. These specially designed tools are frequently found in “cages” within extremely “specialised industrial processes” (most notably the production of automobiles). It would be more accurate to characterise them as extremely complex “numerically controlled machines” rather than as robots with a sizable AI component. “Manufacturing and automation” have benefited greatly from advances in robotics over the past 20 years, chiefly from the advent of more sensitive robots that rely on response algorithms that have been taught to react to a range of inputs. This strategy, which was notably introduced by Rod Brooks in 1990, directed AI’s commercial and innovative attention away from simulating intelligence akin to humans and instead towards supplying feedback mechanisms that would enable useful and efficient robots for certain applications. Among other things, this realization led to the development of the “Roomba and other flexible industrial” robots that could communicate with people (like Rethink Robotics’ Baxter). Robotics technologies may find broader use and acceptance outside of industrial automation as long as they continue to innovate, especially in the area of their capacity to detect and interact with their surroundings.

These developments are significant, yet when the word artificial intelligence is spoken, people’s attention is still drawn to the most sophisticated robots. However, robotics advances are often not IMIs. Research productivity is undoubtedly increased by the growing automation of lab equipment, but developments in robotics are not (yet) closely linked to the underlying processes by which researchers themselves could devise strategies for pursuing innovation across a variety of areas. There are, of course, arguments to this assertion. For example, automated remote sensing equipment’s capacity to gather data in difficult or vastly different conditions has the potential to revolutionize some study disciplines. Additionally, robotic space missions have shown to be an invaluable research tool in planetary science. However, robots are still mostly “employed in specialised” end-use or “production” applications.

Lastly, a third stream of research that has been essential to AI since its inception may be roughly classified as a “learning” approach. The “learning approach” aims to develop dependable and accurate techniques for the prediction of specific occurrences (either physical or logical) in the presence of specific inputs, as opposed to concentrating on symbolic logic or exact sense-and-react systems. In this field, the idea of a neural network has proven particularly significant. A neural network is software that translates a collection of inputs into a set of outputs by combining weights and thresholds. It then evaluates how “close” these outputs are to reality and modifies the weights used to reduce the gap between the outputs and reality. Neural networks may learn in this manner as they get more inputs (Rosenblatt, 1958; 1963). Through the invention of “back-propagating multi-layer” approaches that further boost their capacity for supervised learning, Hinton and his co-authors significantly expanded the conceptual foundation upon which neural networks are founded throughout the course of the 1980s. Neural network research has been in and out of style, especially in the US, despite

being first hailed as having great potential. During the 1980s to the mid-2000s, the problem appeared to be that the technology had substantial limits that were difficult to overcome by adding more layers of "neurons" or by utilising bigger training datasets. But in the middle of the 2000s, a few "novel algorithmic techniques" showed promise for improving prediction by using back propagation over many layers. When applied to ever-larger datasets, these "neural networks" became more predictive and could scale to any size (Hinton and Salakhutdinov (2006) is a crucial source of information). Particularly in the context of the Stanford-led Image Net visual recognition project competition, these developments demonstrated a "surprising" degree of performance gain (Krizhevsky, Sutskever, and Hinton, 2012).

Applications of Artificial intelligence -

1. Education Sector

Although humans have the most influence on the education industry, artificial intelligence is also beginning to advance in this field. Faculty members have benefited from this gradual acceptance of AI by becoming more effective and concentrating their attention on students instead of office or administrative work.

2. Medical Service

Healthcare is one sector where artificial intelligence is used extensively. Constructing cutting-edge equipment with AI applications to recognize cancer cells and diagnose disorders. AI can help with the analysis of lab and other medical data related to chronic diseases to ensure early identification. Artificial intelligence (AI) uses historical data and medical understanding to discover new drugs.

3. Video Game

Artificial intelligence (AI) has also become more popular in the game business. Intelligent, humanoid NPCs that converse with players may be created using AI. It may also be utilised for human behaviour prediction, which can help with testing and game design.

4. Administration

AI integration into all facets of government and the public sector work would be extremely advantageous. Government use of AI must consider changing workloads, security and privacy issues, and interoperability with legacy systems.

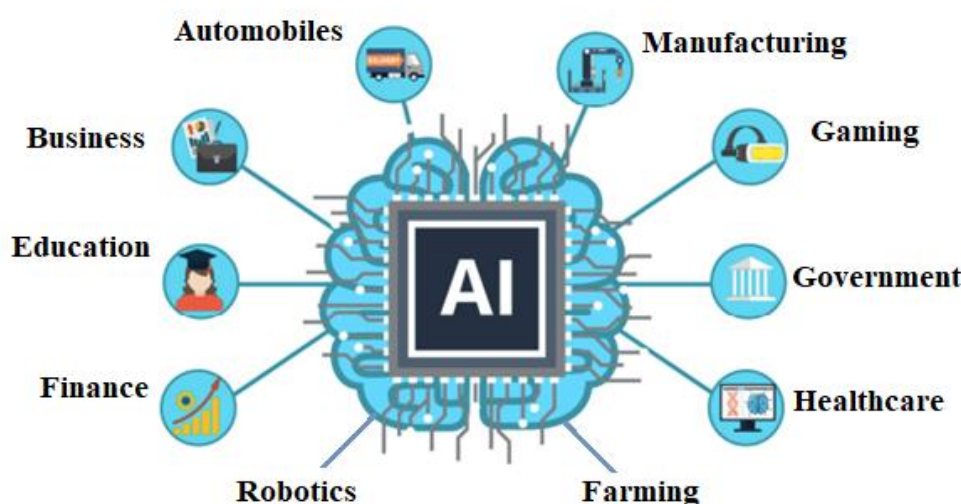
5. Finance

AI has a significant positive impact on corporate finance since it improves the identification and assessment of credit risks. For companies looking to increase their value, machine learning and other AI technologies may improve loan underwriting and lower financial risk. Fintech companies may benefit greatly from the application of AI in terms of work automation, fraud detection, and personalized recommendations. Here are some instances of how front- and middle-office AI use cases might contribute to the modernization of the financial industry: allowing for seamless, round-the-clock client interactions.

Reducing the necessity of repetitious work.

Cutting down on human error and false positives.

Putting money aside.



Applications of AI

6. Automobiles

In the automotive industry, testing automobiles is the most common usage of artificial intelligence. AI and ML systems will test and assess vehicle performance continuously, and model-based testing methods will be put into place. Additionally, with the use of machine learning algorithms, manufacturers may generate hundreds of product and part prototypes. Manufacturers may be able to introduce a fashionable model to the market with the use of these facts about design. Notable is also the application of artificial intelligence in automobile testing to guarantee automation in product design and testing.

7. Production

In the manufacturing industry, artificial intelligence (AI) refers to the application of technology to automate labour-intensive tasks and spot patterns in production processes or workflows that were previously unknown. Every firm looks for new and creative ways to raise overall production effectiveness, reduce risks, and increase profits. For them to survive and have a profitable, sustainable future, this is imperative.

8. Sector of Banking Industry

Banking institutions may use artificial intelligence to handle record-level, high-speed data and obtain valuable insights. Features like digital payments, AI bots, and biometric fraud detection systems also help to expand the pool of customers receiving high-quality services.

9. Farming

Artificial intelligence is used to identify soil flaws and nutrient imbalances. AI can use robots, computer vision, and machine learning to map out weed growth locations. Artificial intelligence (AI) bots can harvest crops faster and in larger numbers than human workers.

10. Robotics

Robotics is another field that often uses AI technologies. Robots using artificial intelligence (AI) use real-time updates to identify obstacles and instantaneously plan their paths. It's applicable for moving goods in industries, hospitals, and warehouses keeping up massive machinery and office structures Management of inventory actually, one field of research is AI in robotics.

3. CONCLUSION

Because of recent advancements in large data, processing power, and algorithmic strength, artificial intelligence has advanced significantly. In certain areas, such as language processing, picture recognition, and gaming, AI is currently on par with or better than humans. AI is still not intelligent enough or sensible enough, though. Further study is required to enable AI to perform social skills, sophisticated thinking, and creativity. In order to guarantee that these potent technologies serve mankind as whole, authorities must address ethical concerns about dangers and benefits as AI evolves. All things considered, the development of artificial intelligence has revolutionized both our personal and professional lives. Its uses range from driverless cars to virtual personal assistants. It's impossible to dispute AI's advantages, which include increased productivity and decision-making. It also poses significant queries regarding security, privacy, and employment displacement. It is crucial that we find a balance between using AI's promise and solving its problems as we continue to make progress in this sector. The development of transparent, understandable, and morally decent AI systems should be the main goal of future research. By doing this, we can make sure that artificial intelligence (AI) advances human potential and builds a brighter future for everybody.

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