

# The Impact of Artificial Intelligence in the Educational Field

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## ABSTRACT:

Recently, the concept of Artificial Intelligence has caused concern not only in the scientific community but also in the media sphere, primarily due to the lack of a universally agreed-upon definition. There is a lack of consensus among people regarding a comprehensive definition of intelligence, and even more so regarding artificial intelligence. Given these circumstances, the growing prevalence of the notion of Intelligence Artificial intelligence has advanced to the extent that it is now a vital element in nearly every sector of today's contemporary economy, exerting a substantial influence on our personal, societal, and political spheres. The foundation of this idea is based on the premise that human intelligence can be precisely described, allowing for the creation of a machine capable of simulating it. This gives rise to philosophical debates concerning the nature of consciousness and the moral implications of developing synthetic entities possessing human-like cognitive abilities. Artificial intelligence presents a myriad of challenges related to comprehension, responsibility, and confidence.

*Keywords: artificial intelligence, development, technology, education*

## 1. Introduction

Artificial intelligence applications have become an essential component of our daily lives, demonstrating the increasing significance of technology (Angheluta et al., 2021). In recent years, there has been a rise in the development of educational applications that utilize artificial intelligence, thanks to advancements in this field. The significance of artificial intelligence (AI) and adaptive learning technology systems in education cannot be exaggerated (Bates, et al., 2020).

In the 1950s, Alan Turing proposed a criterion for determining whether a system can be considered "intelligent" or an example of artificial intelligence. According to Turing, if a listener is unable to distinguish between a conversation with a human and one with a machine, then we can conclude that we have an intelligent system.

In 1956, McCarthy offered an early and impartial definition of artificial intelligence: "The investigation of artificial intelligence must proceed with the belief that every aspect of learning or any other characteristic of intelligence can be accurately described to the extent that it can be replicated by a machine." AI can be defined as the capacity of computing

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systems to perform human-like processes such as learning, adaptation, synthesis, self-correction, and the utilization of data for intricate computational tasks.

Artificial intelligence refers to the intelligence demonstrated by machines, which is distinct from the innate intelligence possessed by humans and animals. Artificial intelligence, also known as machine intelligence, is a term used in computer science. Informatica defines AI research as the examination of "intelligent agents." "Intelligent agents" refers to any device that can perceive its surroundings and taking actions that enhance its likelihood of successfully accomplishing its objectives (Bostrom & Yudkowsky, 2011).

Artificial intelligence refers to machines that imitate the cognitive abilities typically associated with the human mind, such as learning and problem solving. The capabilities of modern machines that are typically classified as AI include proficient comprehension of human speech, adept competition in strategic game systems like chess, autonomous operation of machines, intelligent routing in content delivery networks, and military simulations.

Artificial intelligence can be categorized into three distinct types of systems:

1. Analytical artificial intelligence refers to AI systems that are focused on analyzing and processing data to derive insights and make informed decisions.
2. Human-inspired artificial intelligence refers to AI systems that are designed to mimic human cognitive processes and behaviors.
3. Humanized artificial intelligence refers to AI systems that are developed to interact with humans in a way that is like human-human interactions.

Analytical AI is characterized by its ability to generate a cognitive representation of the world and use experience to make informed decisions about the future.

Human-inspired artificial intelligence incorporates both cognitive and emotional intelligence. In addition to cognitive elements, it possesses the ability to comprehend human emotions and consider them when making subsequent decisions (De Lange, 2015).

Humanized artificial intelligence exhibits a range of competencies, including cognitive, emotional, and social intelligence. It possesses self-awareness and demonstrates this awareness during interactions with others (Gomede et al., 2018)..

## **2. Artificial intelligence and its functions**

Artificial intelligence marks the inception of a novel epoch in the field of computer science, known as cognitive computing. This computing paradigm is a revolutionary departure from the programming systems that came before it. Despite significant differences from programming principles of the previous century, these programming systems are still based on rules and logic aimed at achieving mathematically accurate results, often employing a strict decision tree methodology. With the abundance of big data and the increasing complexity of evidence-based decision-making, a rigid approach is inadequate for keeping pace with the available information.

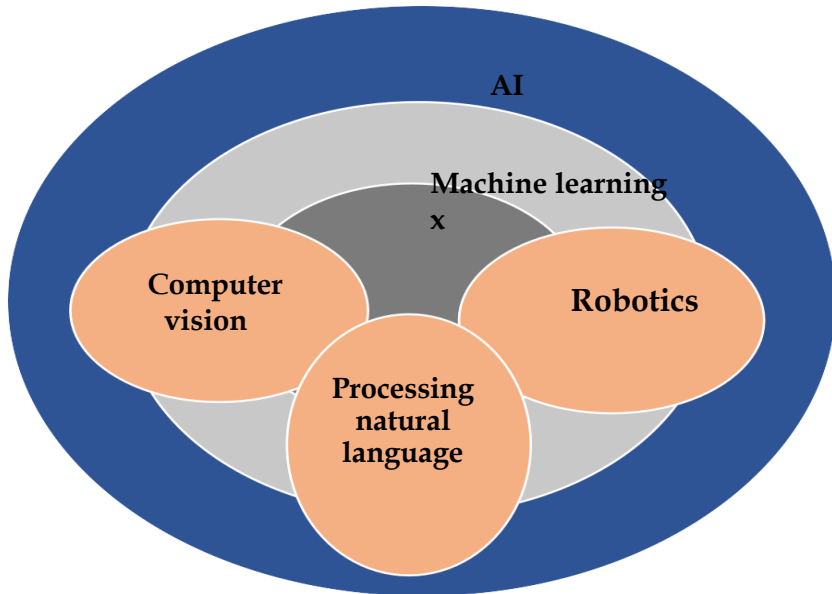


Figure 1. *Forms of Artificial Intelligence*

## 2.1 Functions of Artificial Intelligence

Industry has frequently endeavored to utilize technology to enhance productivity. To decrease production expenses, industries have implemented automation in numerous repetitive activities and processes to minimize the level of human involvement necessary (Hiran, 2021). Machine learning is a specialized area within the field of artificial intelligence that enables computers to acquire knowledge and improve their performance without the need for explicit programming. Unlike deterministic systems, this approach involves providing the system with training data in the form of examples or experiences. Machine learning algorithms then analyze these examples to identify patterns and generate predictions, even for data that has not been previously encountered (Holmes, et al, 2021). Machine learning is an innovative concept where a computer ingests a substantial amount of data and leverages the knowledge acquired from the data to enhance its own algorithm and optimize data processing in subsequent instances. Neural networks are the primary focus of machine learning. Neural networks consist of interconnected nodes known as neurons or perceptron's. These networks are designed to mimic the cognitive processes of the human brain. Neural networks possess the capability to store data, acquire knowledge from it, and enhance their capacity to categorize novel data.

There are three distinct categories of machine learning scenarios, namely:

1. Supervised learning.
2. Unsupervised learning;

### 3. Consolidation of learning.

Deep learning is a subcategory of machine learning. Deep Learning involves the organization of neural networks into complex architectures consisting of numerous layers, and these networks are trained using substantial volumes of data. Deep learning is a form of machine learning that is capable of efficiently extracting valuable patterns from data without requiring significant human involvement. This is achieved by automating the process of feature extraction, thereby reducing the need for human experts. Furthermore, it eliminates the need for certain data preprocessing steps that are commonly necessary in machine learning. Deep learning distinguishes itself from other forms of machine learning by its emphasis on training with labeled data. In the field of Deep Learning, the expanded artificial neural network is provided with unlabeled data and does not receive any explicit instructions. Deep learning algorithms exhibit exceptional efficacy in handling unstructured data, including images, video, text, and audio.

Consequently, they find extensive application in computer vision and natural language processing domains (Haseski, 2019). Computer vision typically employs Convolutional Neural Networks (CNNs) for the purpose of object recognition, while Recurrent Neural Networks (RNNs) are utilized for understanding sequences of images, such as video frames. Optical Character Recognition (OCR) is widely recognized as one of the earliest and most prominent applications of Computer Vision. Some applications include number plate recognition, physical intrusion detection, traffic violation detection using CCTV camera feeds, and facial recognition for security purposes. Additionally, it possesses vast potential in the field of medical diagnosis, specifically in the expedited detection of cancer from images, surpassing conventional techniques and ultimately resulting in life-saving outcomes. N

Natural language processing technology encompasses the capability to convert textual or spoken language into encoded, organized data using a suitable ontology. PLN focuses on the interface between computers and human languages, particularly on the programming of computers to handle and examine extensive quantities of data derived from natural language. PLN allows computers to comprehend human language in both written and spoken formats (Popenici & Kerr, 2017). Conversational AIs, also known as chatbots, are widely used and popular in the field of Natural Language Processing (NLP). Intelligent chatbots aim to create the illusion of human interaction while engaging with a chatbot. Voicebots and Emailbots are additional applications within the realm of conversational AI. Psycholinguistics is a domain where PLN can be applied to analyze a person's psychological characteristics by examining a text authored by that individual. Summarization is an additional aspect of PLN utilization. The computer processes a lengthy text and generates a concise synopsis. The Natural Language Generation (NLG) methodology is used to produce a summary, whereas summarization algorithms identify and extract the crucial sentences to form this summary.

Robotics involves the creation, construction, and utilization of machines that imitate human movements and intelligence to carry out tasks. A robot is a versatile and programmable machine that is designed to manipulate objects, such as materials, parts, tools, or specialized devices, by following pre-programmed instructions to perform a wide range of tasks (Rodríguez-Hernández et al., 2021). An intelligent robot can possess visual perception through the implementation of computer vision technologies. It can also

exhibit the ability to comprehend and respond to voice commands or engage in conversation with individuals using natural language processing (NLP) technologies. Additionally, it can take the form of an autonomous mobile robot (RMA), capable of independent movement without human guidance (Grosz & Stone, 2018).

### **3. The impact of artificial intelligence in education**

Currently, students are positioned at the forefront of a diverse array of opportunities and difficulties in the realm of learning and instruction in higher education. Advanced computing systems utilizing machine learning algorithms have the capability to assist individuals of all abilities (Hillier *et al.*, 2015). These systems can mimic human-like processes and handle intricate tasks, making them valuable in educational settings. This marks the beginning of a new era for higher education institutions.

What unique prospects can artificial intelligence in education provide to distinguish humans from robots? Soon, decision-makers and implementers in the field will likely prioritize these topics. In fact, there are ongoing discussions questioning the feasibility of AI replacing teachers.

The concerns regarding the influence of AI and related technology on educational practice should be considered in conjunction with concerns about their influence on society. The PEW Research Center conducted interviews with 979 individuals who are technology innovators, software developers, business leaders, researchers, academics, and activists. Half anticipated that emerging technologies would undermine democracy, primarily due to their capacity to enable the unrestricted dissemination of fabricated (or merely deceptive) information. Individuals place a high level of trust in modern technology, often verging on reverence. The ability to think critically, which includes evaluating sources of information, assessing arguments, and constructing one's own arguments based on reliable sources, remains as crucial as ever.

According to Manyika *et al.*, competent educators will persist in the future, instructing classes specifically tailored to enhance students' emotional intelligence, innovation, and interpersonal skills. According to these authors, advancements in artificial intelligence and automation will enhance human qualities and characteristics. Haseski asserts that the integration of artificial intelligence in education will enhance personalized learning, facilitate effective learning experiences, enable students to uncover their talents, enhance their creativity, and alleviate the workload of teachers. However, it is important to acknowledge that there are also conflicting viewpoints.

Artificial intelligence studies perceive the transfer of teachers' roles to computers as a perilous endeavor. To prepare for the future, it is necessary for states and nations to develop a teacher profile that can effectively collaborate with these support structures (Androniceanu & Burlacu, 2017a).

The education system is expected to undergo significant changes due to the growing impact of artificial intelligence in education. According to the findings of the study conducted by Sekeroglu, Dimililer, and Tuncal, it was concluded that artificial intelligence has the potential to enhance personalized education for teachers. Artificial intelligence has the capacity to offer suitable educational opportunities to individuals with disabilities, refugees, and those residing in remote communities. Studies indicate that artificial

intelligence techniques and intelligent learning environments can facilitate the implementation of personalized approaches. While human teachers are typically seen as necessary for quality education, the use of artificial intelligence can enhance the quality of education, particularly through personalized learning (Androniceanu & Burlacu, 2017b). Pedro et al. emphasizes the use of a dual-teacher model incorporating artificial intelligence to facilitate personalized education. By leveraging artificial intelligence, teachers can minimize the time spent on repetitive tasks and administrative duties, such as frequent repetition and answering questions on various subjects. This reduction in routine procedures allows teachers to dedicate more time to student guidance and direct interaction.

Various studies have demonstrated that artificial intelligence is currently being utilized in the education sector, resulting in significant progress across various domains. Data analysis and prediction are integral elements of AI-enhanced education. Smart education and innovative virtual learning both fall into this category.

Table 1 provides a comprehensive list of the primary applications of AI in education, along with the key technologies that facilitate these applications. It is important to acknowledge that as the demand for education rises, the significance of utilizing AI for learning also grows.

Intelligent education systems provide timely and personalized instruction, benefiting both teachers and students. Various computing technologies, particularly those pertaining to machine learning and cognitive learning theory, are being employed to enhance the educational worth and efficiency of these tools.

**Table 1.** Artificial intelligence and education

<b>The type of activity</b>	<b>The technology</b>
<b>Smart school</b>	<b>Facial recognition, virtual labs, recognition</b>
<b>Online and Distance Education</b>	<b>speech</b>
<b>Individualized training</b>	<b>Personalized virtual assistant, real-time analysis</b>
<b>ASSESSMENT</b>	<b>Intelligent teaching system, learning analysis, data mining</b>
<b>Grading and evaluation</b>	<b>Adaptive learning methods, learning analysis</b>

**Source:** own processing based on Bates et al., 2020

Although AI-based solutions have existed for a considerable period, their integration into various industries has been sluggish. Nevertheless, the pandemic has significantly altered the educational environment, compelling educators to depend on technology for remote instruction. Presently, most educators hold the belief that technology should be an essential component of education. Artificial Intelligence (AI) has the capacity to enhance both the process of acquiring knowledge and the act of instructing,

thereby facilitating the advancement of the education sector for the advantage of both learners and educators.

Artificial intelligence aids in identifying a student's existing knowledge and areas of deficiency, creating an individualized study plan that addresses these gaps in understanding. AI customizes educational programs to cater to individual student requirements, thereby enhancing their effectiveness.

#### 4. Conclusion

The implementation of AI in education initially began with the utilization of computers and computer-related systems, subsequently transitioning to online and web-based platforms. Embedded systems now enable teachers and instructors to work together with robots, specifically cobots or humanoid robots. Additionally, chatbots have the capability to carry out tasks that are comparable to those performed by teachers or instructors. The utilization of these platforms and tools has enhanced and expanded the proficiency of educators, leading to superior and more extensive educational material. Artificial Intelligence greatly influences educational institutions. The integration of AI in the education sector has occurred at a later stage compared to its implementation in the industrial sector. However, educational institutions that have already embraced artificial intelligence and are actively investing in AI applications will undoubtedly gain a competitive advantage. The proliferation of AI is rendering numerous jobs obsolete, necessitating the acquisition of a new skill set. Educational institutions are required to provide training and foster the growth of their students to prepare them for the AI revolution.

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