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Artificial Intelligence in Education

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Abstract:

Computers, machines, and other objects now demonstrate human-like intelligence that can be defined by cognitive capacities, learning, adaptability, and decision-making capabilities thanks to the field of research known as artificial intelligence and the inventions and developments that have followed. According to the study, AI has been widely adopted and employed in education, especially by educational institutions, in a variety of ways.

It provides advantages for education, covers the gaps between artificial intelligence (AI) technological advancements and their educational applications, and provides real-world examples and motivation for both the tech professionals who develop Artificial Intelligence in Education (AIEd) technologies and the educators who lead AI advancements in education.

Keywords —**Artificial Intelligence, Education, Intelligent Tutoring, Personalized Learning, Data Analysis, Accessible Education, Continuous Learning, Adaptive Systems, Learning**

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I. INTRODUCTION

The fourth industrial revolution is presently seen by many as being driven by AI, and it might even start the fourth educational revolution. Additionally, the inclusion of AI education in school curricula has started. [7] However, just as the invention of television and computers was initially regarded as revolutionizing education, it has since been established that these technologies improved access to information without significantly affecting the fundamental principles of teaching. [8]

Identify potential learning paths using AI capabilities. Given the growing interest, it is appropriate to evaluate recent AI research in education to give educators an up-to-date recognition of the area and help them get ready for any changes. [8]

The "first generation" of AI could support human intellectual work by using rule-based expert knowledge. The "second generation" may use a statistical or search model to find the best solution, and the "third generation" will significantly improve recognition performance using a brain model. [8] [12]

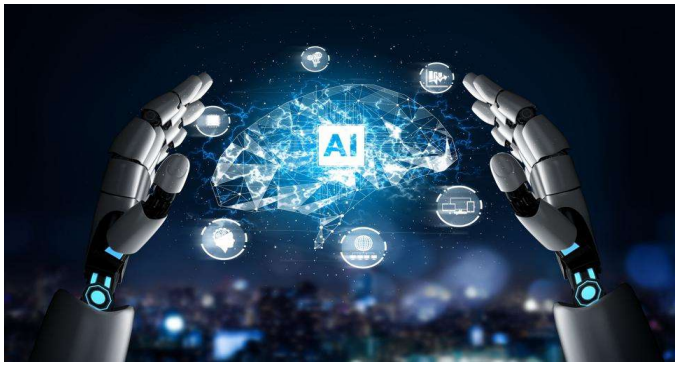

Fig. 1 Artificial Intelligence

II. What is Artificial Intelligence?

Artificial intelligence (AI) is the use of machines for carrying out objectives that normally require intelligence from humans. AI can process huge quantities of data in ways that humans cannot. AI is capable of analyzing enormous amounts of data in ways that are beyond human capabilities. Emulating human abilities, including recognizing trends, awareness, and decision-making processes, is AI's primary goal. [11]

"All notable players at this time are actively working to enhance artificial intelligence technologies. While the ramifications may appear unimportant right now, I believe that the day when AI is used as a weapon in cyberwarfare and has an impact on everyone is very near". [10]

-Ted Bell, bestselling author, and Cambridge University Writer-in-Residence

"The fear of artificial intelligence is not that people will begin to think more and more like computers, but rather that machines will begin to think more and more like people." [9]

Joseph Weizenbaum, computer scientist, cyberneticist, and social critic

"The cumulative effects of all revolutions are transcended by evolution." [9]

Gerald Dunkl, psychologist and aphorist

While there are many ways to define AI, one simple definition is "intelligence revealed by machines" (Wikipedia, 2020). [3] A robot that resembles a human being is the long-term objective of artificial intelligence, which broadly aims to increase the study and use of intelligence in science and engineering. [1][2]

A. Defining AI

The method by which robots can be possessed with intelligence, where intelligence relates to an object's ability to exhibit appropriate and astute behaviour's within its surroundings." [2]

According to this perspective, the concept of AI depends on the extent that we recognize artificially created software and hardware for their capacity to behave "appropriately" and "foresightedly." A basic electronic calculator outperforms the human brain when it comes to calculating calculations quickly and accurately. Is it appropriate to think about calculators as having intelligence? [4]

The Study Panel shares Nilsson's wide perspective that there are many different dimensions to intelligence. This point of view contends that the differences between a human brain and an arithmetic calculator are not ones of kind, but rather ones of scale, speed, degree of autonomy, and generality. [4]

B. Trending in Artificial Intelligence

A new wave of technologies, including big data analytics, 5G networks, the Internet of Things (IoT), artificial intelligence (AI), and cybersecurity, has enabled the sectors to expand and become intelligent with the capacity to consume, analyze, and exchange massive amounts of data during the past few decades. [5]

Future industrial applications benefit from the convergence of AI and other disruptive technologies. [9] Other emerging trends include AI-powered cybersecurity systems, real-time customer interactions, intelligent automation at work, making crucial decisions based on skewed data, AI assistants, biometric authentication (facial recognition), and improved privacy protections in a variety of industrial applications. [5] [10]

With the development of Industry 4.0, it is anticipated that business improvement opportunities as a result of AI trends would continue to grow. Further study in this area will greatly contribute to industrial development that is sustainable. [5]

III. Artificial Intelligence in Education Field

Computers, machines, and other objects now possess human-like intelligence that is characterized by cognitive skills, learning, adaptability, and decision-making abilities thanks to the field of research known as artificial intelligence.[7]In the beginning, artificial intelligence (AI) was represented by computers and computer-related technologies.[13] It then evolved into web-based and online intelligent education systems, and finally, with the use of embedded computer systems and other technologies, humanoid robots and web-based chat-bots were used to perform the duties and functions of instructors either alone or in collaboration with instructors.[7]

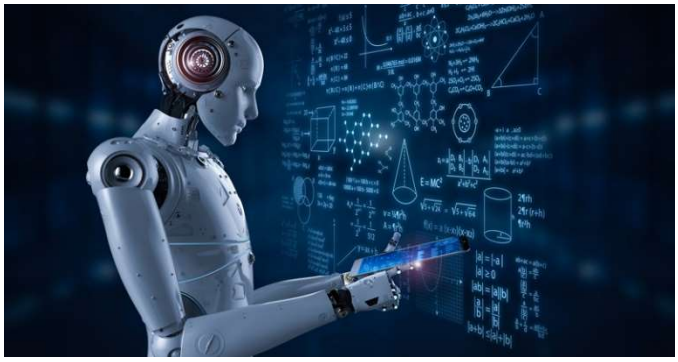

Fig. 1 AI in Education Field

III.I AI can change how schools find, teach, and support students [12]

Smart data collecting made possible by intelligent computer systems is changing how colleges interact with prospective and present students. Intelligent computer systems are assisting in more closely tailoring every aspect of the college experience to the requirements and aspirations of students, from recruiting to assisting students in selecting the finest courses. [12] [13] [7]

The current higher education environment currently heavily relies on data mining technologies, but artificial intelligence has the potential to change it even more. Some schools have already started taking steps to provide students with AI-guided training that can make the transition from high school to college easier. [12] [14]

*1) **Personalised Learning:** Large volumes of data can be analyzed by AI to identify each student's strengths, limitations, and preferred learning methods. AI-powered systems can create personalized learning plans and adaptive content that are catered to the needs of each learner using this information. With this strategy, you can be sure that students will receive specialized training and support, which will maximize their learning outcomes. [8]*

*2) **Intelligent Tutoring:** Artificial intelligence-powered tutoring systems may replicate one-on-one tutoring interactions by using machine learning and natural language processing techniques. These systems can comprehend students' inquiries, offer clarifications, give feedback, and modify their instructional approaches in response to specific student replies, promoting a more active and personalized learning environment. [15]*

III.II AI can make trial-and-error learning less intimidating

Learning via trial and error is essential, but for many students, the possibility of failing or even not knowing the answer paralyzes them. It can be intimidating for some people to have to defend their choices or behaviours in front of peers or other authority figures, such as teachers. An intelligent computer system is created to assist learners with the process of learning, offering a substantially less scary approach than trial and error.

As AI systems frequently learn through trial and error, AI is the ideal structure for facilitating this kind of learning. [12] [13]

III.III AI could change the Role of Teachers

There will always be a need for education instructors, but new technology in the form of intelligent computing systems may modify what that function is and what it involves. [12]

As we have already established, AI has the potential to replace traditional tutoring and can take over tasks like grading while also assisting students in learning. However, there are many more aspects of teaching that AI might be used to. [15] [13]

*1) **Data Analysis and Conclusion:** AI can assist teachers in evaluating a large amount of data relevant to student performance, actions, and engagement. [7] Artificial intelligence (AI) systems can produce useful insights that guide*

instructional decisions through processing and creating this data. Once learning gaps have been identified, teachers can use these insights to modify their methods of instruction and implement prompt interventions. [14] [15]

III.IV Invention in the field of AI

In recent years, there have been a great number of important discoveries and developments in the field of artificial intelligence (AI).

*1) **Deep Learning:** By allowing machines to learn from huge amounts of data and make complicated decisions, deep learning has altered AI. [20] Convolution neural networks (CNNs) and Recurrent neural networks (RNNs), two types of deep neural networks, have made significant advancements in audio, image, and natural language processing. [6] [11]*

*2) **AI in HealthCare:** From medical image analysis and diagnosis to drug discovery and specific therapy, AI has significantly impacted the healthcare sector. [18]AI models can help healthcare workers make decisions, predict patient outcomes, and aid in the early diagnosis of diseases. [12] [15]*

IV. BENEFITS OF USING AI IN EDUCATION

IV.I Accessible Education:

AI can close the accessibility gap within education by providing resources and tools that are responsive to different learning requirements and learning styles [20]. AI can provide support for students with challenges, allowing them to fully participate in educational activities. These technologies include text-to-speech, voice recognition, and sight enhancement tools. [17] [18]

IV.II Continuous Learning and Adaptive Systems:

By creating learning environments that develop and get better over time, AI may help lifelong learning. These systems can continuously collect information on students' progress, modify the learning path as necessary, and offer ongoing assistance and resources. [19]

IV.III Enhanced Accessibility:

Students with problems or a variety of learning difficulties may find education to be more accessible with the aid of AI.[22] To help students relate to educational resources in ways that are appropriate for their abilities, it can offer assistive technologies like text-to-speech, speech recognition, and flexible displays.[18][20] Real-time language translation is another service that AI can offer, improving access to education for those who do not speak the language.[20]

IV.IV Data-Driven Insights:

Large volumes of educational data, such as student performance, attendance, and engagement, can be processed by AI. [6] Teachers, administrators, and policymakers can benefit significantly from this investigation's insightful conclusions. They can identify trends, patterns, and learning gaps, as well as provide specific strategies to assist student achievement. [18]

IV.V Efficient Administrative Tasks:

Administrative activities like evaluating assignments and exams, maintaining student data, and creating reports can be handled with AI. [21] By automating some tasks, educators may spend more time teaching and connecting with students. Additionally, technology reduces the possibility of human error in administrative procedures. [20] [22]

Figure

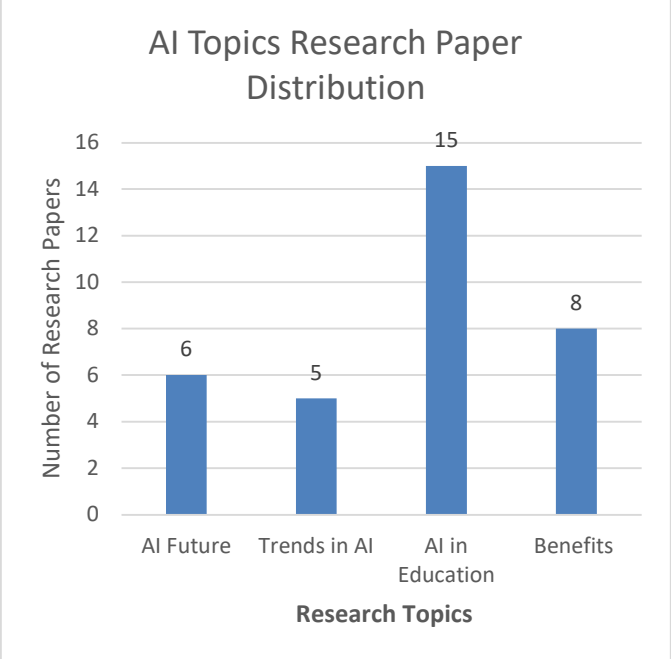

Fig.3 The graph demonstrates the various levels of research interest in various AI topics, with "AI in Education" attracting the most interest from researchers.

V. CONCLUSIONS

In conclusion, the study of artificial intelligence (AI) has significantly advanced in the field of education. Intelligent tutoring and personalized learning systems, both involving AI, have the potential to completely change how schools recruit, teach, and assist their students. These tools improve students' learning results by analyzing vast amounts of data to develop customized learning programs and offer customized feedback. AI can also ease the anxiety associated with trial-and-error learning by fostering a helpful and nonjudgmental atmosphere. Additionally, AI has the ability to change the role of instructors by automating administrative activities and generating valuable information through data analysis, allowing teachers to concentrate more on teaching and implementing beneficial teaching methods into practice.

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