

# Unlocking potential: The impact of AI on education technology



Keerthi Jain<sup>a</sup>  | J. Naga Venkata Raghuram<sup>a</sup> 

<sup>a</sup>Vellore Institute Of Technology, Tamil Nadu, India.

**Abstract** According to several international journals, artificial intelligence in education (AIET) is a more recent field in the educational sector. Even though it has been there for close to 30 years, educators are still confused about how to utilize it pedagogically on a larger scale and how it may have a substantial impact on teaching and learning as per SDG-4 Indicator 4.4.1, which tracks the proportion of educators and academia with the necessary information technology skills, putting them on the road to better employment and understanding Education 4.0. This article postulates a review of the impacts of AI in education and briefs the number of published studies in the area of AI in education, which has expanded as a result of the growing usage of artificial intelligence (AI) technology in education. However, extensive evaluations have been conducted to fully study the numerous facets of this topic. This study seeks to address this gap by utilizing PRISMA to detect trends and issues relevant to AI applications in education (AIET) based on publications from 2000 to 2022. The review's findings show that the academic community is becoming more interested in applying AI to education. The primary research questions covered in this study are those related to the origin: Rise in AI, Importance, and Impact of AI on Education Technology, as well as related areas such as intelligent tutoring systems for education AI challenges in the education sector, and future scope of AI and ChatGPT-3 in higher education.

**Keywords:** artificial intelligence, education technology, intelligent tutoring system, adaptive learning

## 1. Introduction

The tremendous growth of the economy and knowledge has made the twenty-first century an age of information. Worldwide, nations see educational information as a key strategy for fostering educational progress and change. The fourth industrial revolution is linked to the learning method known as "Education 4.0," which aims to change education in the future via automation and cutting-edge technology. This industrial revolution includes the use of robots, artificial intelligence, and smart technologies. The growth of information technology (IT) has drastically altered people's lifestyles and educational practices. The introduction of new technology in all organizational sectors, including the education sector, offers new benefits and problems. (Huang et al., 2021). The technical instrument with the largest projected reach and influence for the rest of the twenty-first century is artificial intelligence, which is now a reality in the field of education. The goal of this study was to describe how AIET is used in the educational field of higher education.

The artificial intelligence in education technology (AIET) community has spent the majority of the last 25 years working to develop systems that are as successful as one-on-one human tutoring in terms of solving the two-sigma problem. The use of artificial intelligence in education has gained popularity because it alters how rapidly we learn and puts forward the question, "What does this entail for academia? Has the use of AI in academic learning changed anything about them? For academia and mentors, does AI in education have the power to change games?"

Industries and organizations are increasingly disrupted by new and unconventional applications of technology. Technological advancement usually causes institutions to deteriorate or collapse. Formal education uses a large amount of technology, which is an important step in fostering learning. The word "education" has a Latin root that means "to bring out." Successful learning systems integrate the learner, learning environment, and corpus of knowledge. Learners are the true producers of learning, as they must acquire the requisite information and abilities.

The future of education is inextricably related to advancements in new technologies and the processing power of emerging intelligent machines. Advances in artificial intelligence in this area present new opportunities and challenges for teaching and learning in higher education and have the potential to radically alter governance and the internal structure of these institutions. Since 1956, chemistry, biology, linguistics, mathematics, and the development of AI solutions have had an impact on many theoretical understandings of artificial intelligence. (Guan et al., 2020). However, the range of meanings and understanding remains hotly contested. Most approaches either concentrate on constrained viewpoints on cognition or neglect the philosophical, psychological, and political dimensions of the idea of intelligence. We offer a fundamental definition for our analysis of the effects of artificial intelligence on teaching and learning in higher education, which is supported by a survey of relevant literature. Thus, artificial intelligence (AI) can be defined as a computational system



capable of human-like activities such as learning, adapting, synthesizing, self-correction, and data utilization for complex processing tasks.

## 2. Objective of the Study

The main objective of this study is to understand how the evolution and revolution of AI in the context of the use of education technology has played an important role in the education industry and to understand the various technological developments that will be beneficial for incorporating technology in education. As a result, a systematic review was conducted following the predefined reporting components for systematic reviews using PRISMA in the context of AIET and its impact, which answers the following questions:

- Q1. How has AI originated, evolved, and increased?
- Q2. What are the important advances and definitions of AI in the educational sector?
- Q3. What is the publishing trend in AIET-related publications?
- Q4. What is the Importance of AI in Education?
- Q5. What is the impact on AIET, and what are the challenges?

## 3. Methodology

### 3.1. Origin and Evolution of AI

The concept of artificial intelligence encompasses the various techniques and theories employed in the development of computers that can mimic human intelligence during AI research. The evolution of computers in the 1940s and 1950s, the emergence of connectionism and cognitivism, and debates surrounding the feasibility of constructing an artificial brain all occurred concurrently with the development of AI. The letter written by Warren Weaver on the potential of machines for language translation further highlighted the possibility of computers possessing intellect comparable to that of humans. Similarly, Alan Turing's research paper addressed questions related to the detection of a machine's sentience.

### 3.2. Important Advances in AIET

- John MacCarthy coined the word "AI" in a conference held at Dartmouth in 1956. The basic notion that has continued to advance in the area was to study how machines may be made to replicate various features of human intelligence.
- General Motors in 1961 introduced the first industrial Robot Unimate to replace humans on the assembly line
- ELIZA, a cutting-edge chatbot, was developed by Joseph Weizenbaum in 1965 at the MIT Artificial Intelligence Laboratory.
- In the 1980s, AI research initiatives were revived as a result of Edward Feigenbaum's development of expert systems that can imitate a human expert's decision-making abilities.
- In the early 2000s, deep learning by Igor Aizenberg first described a family of machine learning algorithms that employ many layers to gradually extract higher-level characteristics from the input's raw data.
- In 2005, Stanford University and the Volkswagen Electronics Research Laboratory collaborated to produce the autonomous vehicle Stanley (ERL), which won the DARPA Grand Challenge.
- In 2014, personal assistants such as Siri, Alexa, Google Now, Cortana, and other voice assistants used speech recognition to respond to queries and carry out activities.
- In 2017, Google developed a computer program that outplayed Go champions Lee Sedol and Ke Jie, a game with more potential outcomes than there are atoms in the universe.
- In 2020, GPT-3 was created by open AI, a San Francisco AI research lab that has 175 billion machine learning parameters.
- In 2021, Baidu made their linear fold AI algorithm available to scientific and medical teams treating the virus.

### 3.3. Important Definitions of AI in Education

- According to Ross (1987), AI approaches can enable intelligent tutoring systems to solve the problems they assign to users in a suitable and human-like manner and to subsequently reason about and remark on the solution process.
- Hwang (2003) defined AI in education as an intelligent tutoring system that organizes system knowledge and operational information to improve operator performance and automatically selects exercise progression and remediation throughout a training session based on previous student performance.
- Peterson and Kerr (2017) Computing systems that can perform human-like functions including learning, adapting, synthesizing, self-correcting, and using data for intricate processing tasks are referred to as artificial intelligence (AI) systems.

- AI is a term used to describe computational systems that are capable of performing human-like functions, including adapting, and learning and data must be synthesized, corrected, and used in many ways to complete complicated tasks (Bhattacharjee, 2020).

### 3.4. The Rise of AI

Artificial intelligence (AI) was first coined in 1956, although it took a considerable amount of time for it to gain widespread recognition and acceptance. Between 1990 and 2000, the exponential growth in processing power, as predicted by Moore's Law, enabled the utilization of AI in previously unexplored fields, such as mineral exploration and medical diagnostics. The mainstream media coverage of AI began in 1997 when IBM's Deep Blue, an artificial intelligence system, defeated the world chess champion Garry Kasparov (Haenlein & Kaplan, 2019). The advancement of connectivity, mobility, and the availability of personal computers, the Internet, and smartphones facilitated the steady growth of AI between 2000 and 2010. Since 2010, Moore's Law has guided the progress of AI, supported by data processing. The key to performing a task by a system lies in the rules, but to think or give the right answer, it needs to learn through data processing. As a result, researchers have created new deep-learning methods that have produced remarkable results and enabled the launch of numerous projects (Meng et al., 2020).

The advancement of AI has led to a significant increase in the demand for data management, enabling it to be utilized in various fields, such as education, healthcare, transportation, and entertainment. The continuous expansion of AI capabilities has raised concerns regarding the future employment of individuals. In the education sector, the use of AI has significantly transformed the learning landscape, with intelligent tutoring programs offering individualized instruction. However, designing learning settings that cater to the diverse needs of students presents a challenge, particularly in terms of replicating the unique personality traits of each student.

### 3.5. Research Mechanics

An official review was conducted by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to examine the most popular and diverse artificial intelligence (AI) systems developed for the education industry, as well as the most significant factors that influence the various technological theories and models in AIET (Artificial Intelligence in Education Technology). Data were collected between January 2000 and December 2022 using the Scopus and Web of Science databases. The search terms used were "Artificial Intelligence" and "Education technology." The primary objective was to gather as many relevant papers as possible on the subject while ensuring that the articles selected addressed practical issues. The articles were sequentially filtered based on their outputs until they were peer-reviewed. The current study focuses on AI in Education Technology, and the keywords used were "Artificial Intelligence" and "Education." This resulted in 100 data points from Scopus and 100 from Web of Science. The two databases' results were then cross-referenced, and 16 duplicates were removed, yielding 184 articles. To be more specific, inclusion and exclusion criteria were implemented, as shown in Table 1. After applying the inclusion and exclusion criteria and reviewing abstracts, 15 legitimate publications on the application of artificial intelligence and education technology were selected for the study, and the remaining 164 articles that were not in the context of social sciences, psychology, and Arts and Humanities were excluded. The results are shown in Figure 1.

**Table 1** Inclusion and Exclusion Criteria.

Criteria	Inclusion	Exclusion
Subject Area	Business Management and Accounting	Social sciences, psychology, and Arts and humanities
Document Type	Article, Review	Conference paper
Source Type	Journal	Conference proceedings books and journal
Language	English	Other
Access	Open	Paid

## 4. Results and discussion

This review article aims to examine the significance and relevance of AIET, as presented in the final review, which encompasses both empirical and review papers. The theme of the impact and significance of AI in education has been considered to address the questions posed to gain a comprehensive understanding of AIET and its challenges and prospects. This will contribute to the advancement of other researchers' work in the field.

### 4.1. Publication history

As seen in Figure 2 from the Scopus database, where research in AI has grown drastically, the unanticipated increase in internet usage has significantly influenced publishing patterns and frequency. The substantial role that educational technology has played in recent years has led to the establishment of a variety of outcomes employing AI to accelerate the present expansion of the e-learning age. Artificial intelligence in Education Technology (AIET) is a term used to describe the



use of AI in E-Learning platforms as well as the numerous technologies, settings, applications, services, tools, platforms, devices, and interactive systems that were employed in the chosen research. There are many ways that these services are put to use in educational environments to enhance the quality of education.

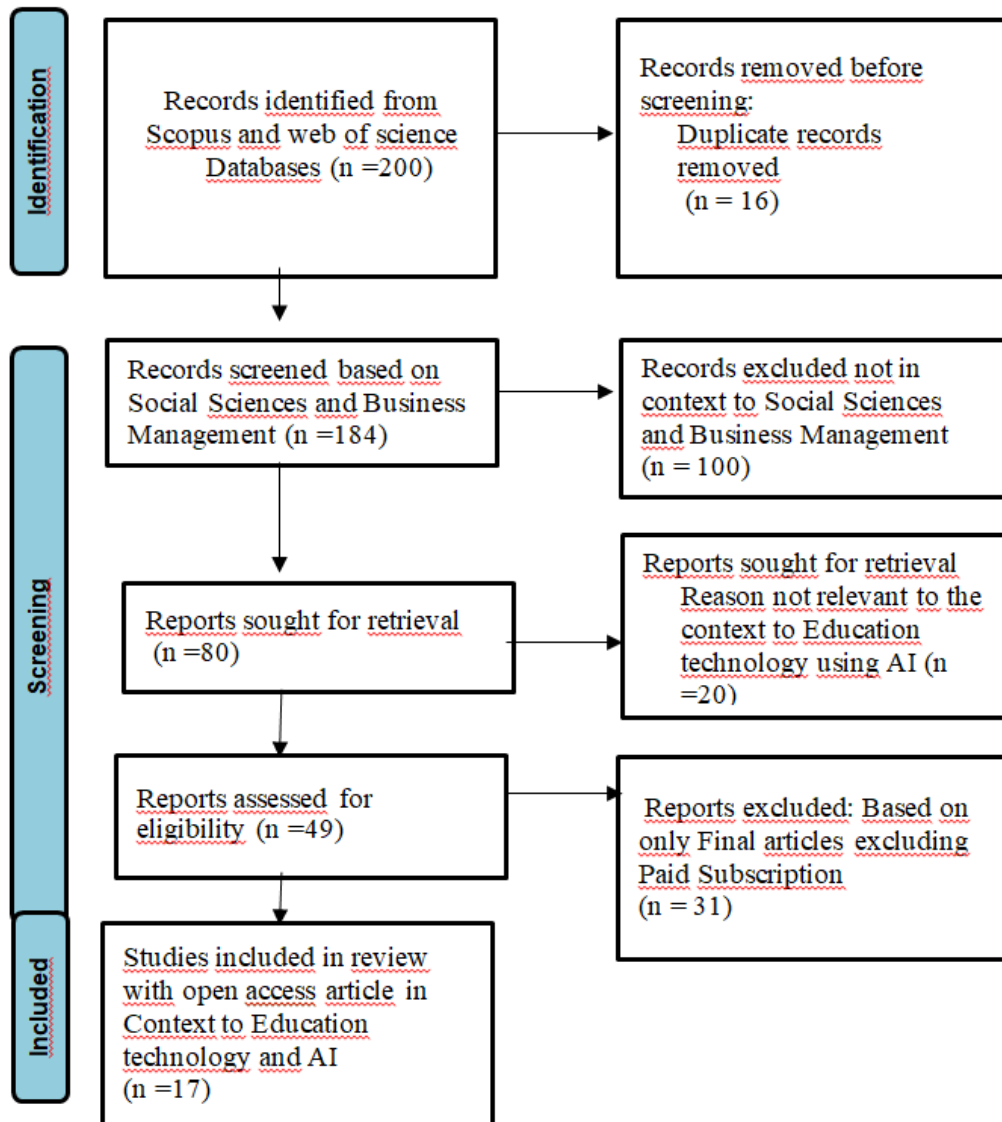


Figure 1 PRISMA flow chart.

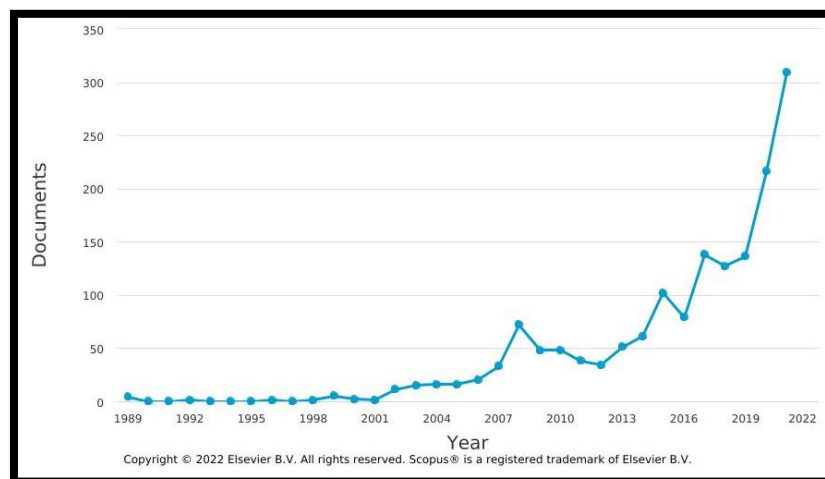


Figure 2 Publication history yearwise in AIET.



The use of digital education technology has made it possible to track a student's progress in learning new skills and knowledge as well as to quickly alter the learning process, making education more flexible. Time and location-based restrictions are no longer an issue thanks to technology (Spies & Brothers, 2020). Artificial intelligence is a rapidly developing field that holds great potential for advancing and improving teaching and learning in higher education.

#### 4.2. AI in Education

In the field of education, there is no exception. In reality, people have said over and over again for the past 30 years that using AI to make intelligent tutoring systems will help make learning better. With the use of ITS, a computerized system may offer content in a flexible, learner-centric manner that meets each student's requirements while also being able to make intelligent pedagogical decisions about how to "teach" the student (Beck et al., 1996; Luckin, et al., 2016). Despite being promoted for more than three decades, there is not yet a commercially available AI-powered ITS system. I, or artificial intelligence in education, is a branch of AI that specializes in enhancing educational institutions' teaching and learning processes. A powerful collection of tools called AIEd is described as being used to better understand how learning happens at the individual level, extending beyond cognitive comprehension and accounting for all socioeconomic, cultural, and physical aspects (Luckin et al., 2016). In their 2016 paper, Luckin et al. explain the pedagogical, knowledge, and learner models, which are the three conceptual frameworks that makeup AIEt. The Future Today, Institute (2018) discusses how AI is still developing and makes predictions about what this means for educational technology, including the emergence of cognitive computing and systems that use natural language processing to understand our (human) intentions and facilitate interactions more naturally. These predictions are included in their annual Tech Trends Report. It is expected that more advanced cognitive systems will be developed to help knowledge workers in healthcare, education, and other fields where information and knowledge are important. Bostrom (2015) reports that 50% of the top AI researchers think universal (or robust) intelligence will be realized by AI by the year 2050, and 90% think it will be realized by the year 2070. These timeframes are still some decades away, but the field of AI research and development is growing swiftly. Before people become, in a sense, the fuel for paperclips, we need to know what AI can do now, what it will be able to do in the future, and how to build the future of this technology in a socially acceptable way.

#### 4.3. Impact of AI on Education

The impact of AI in education has played a dominant role in influencing the use of digital technology in education to have a greater outcome and to analyze and build data that will enhance the ability to perform more research for the betterment of education. Additionally, big data and AI technologies are integrated to thoroughly mine and analyze teaching data, which may also support teaching reform and enhance the quality of instruction (Williamson, 2018). The next step will be to look at the research on how AI affects intelligent tutoring robots, smart campuses, virtual classrooms, teacher evaluation, and adaptive learning.

#### 4.4. Adaptive learning

Adaptive learning using AI is a process that can be completed by pushing learning content as online instructional videos. The adaptive system can gather data on student learning behavior (Cui et al., 2019), plan the best learning path for educators based on the analysis of learning levels, and identify the most effective learning path for students. Certain issues persist despite in-class learning, and artificial intelligence (AI) technology may help professors aid students by providing online answers to their inquiries (Goel & Polepeddi, 2016). Many businesses now offer adaptive learning systems, including IBM Watson Education (Russo-Spena, et al., 2019), BYJUs (Tripathy & Devarapalli, 2020), DreamBox Learning (Grams, 2018), and other more established providers. Teachers use these systems in the classroom to enhance the effectiveness of their instruction. The artificially intelligent assessment and learning system known as Assessment and Learning in Knowledge Spaces (ALEKS) is popular in the USA. Yilmaz (2018) looked at how ALEKS affected middle school pupils' arithmetic proficiency. The analysis's findings demonstrated that ALEKS education improved students' end-of-year math results statistically. To evaluate ALEKS's impact on learning, Fang et al. (2019) performed a meta-analysis. Their findings showed that ALEKS was only as successful as conventional classroom instruction when used for shorter periods as opposed to longer ones. Teachers who use the ALEKS learning system to support student learning may benefit more from this study.

#### 4.5. Teaching Evaluation

AI tools such as image recognition, prediction systems, and computer vision make teaching assessments simple. Students' evaluation is a crucial step in the teaching process. The tasks associated with assessment, such as question creation, grading, performance assessment, and test paper analysis, take considerable time for teachers to accomplish in traditional teaching. AI increases the variety of teaching evaluation techniques, the scientific rigor of the evaluation procedure, and the accuracy of the evaluation outcomes. In addition to creating exam questions, AI technology can also

automatically correct assignments and test papers (Rahim et al., 2018; Li et al., 2018). It is common practice for teachers to correct homework assignments and test papers. Teachers get tired quickly when they spend a lot of time inspecting homework and test papers. As a result, when test papers are corrected after a while there may be some mistakes. Li et al. (2017) say that image recognition technology frees teachers from having to mark and correct student work, which is hard work and has a low error rate. AI technology is used to correct exam papers. This technology can also find blank papers and papers that might be the same, which saves teachers time.

#### 4.6. Smart Classroom and Smart Campus

The evolution of hearing, sensing, virtual reality (VR), augmented reality (AR), and other technologies helps change the classroom experience. Utilize ubiquitous computing to construct virtual classrooms and virtual labs by fusing physical space with virtual space (Encalada & Sequera, 2017; Krumm, 2018). A smart classroom may exhibit natural phenomena or changes in objects that are impossible to notice or difficult to observe in real life to create a situational learning environment for the students. Virtual classrooms employ virtual technologies to replicate instructional settings that are difficult to describe.

Presenting learning material in multiple dimensions engages students' vision, hearing, kinesthetics, and other senses, giving them a strong sense of reality. This increases the intuitiveness and visual clarity of abstract concepts and theories, piques students' interest in learning and enhances the effectiveness of teaching. In terms of flexibility in course attendance, the hybrid virtual classroom is particularly promising (Lakhal, et al., 2017) since students may choose to attend the lecture at home or on campus.

Services and campus management are heavily dependent on AI. Technologies for face recognition, hearing, and sensing are used to create a smart campus. Intelligent management techniques are developed through the gathering and analysis of big data (Villegas-Ch, et al., 2019). AI forms a human-machine collaboration for a decision-making model that can discover problems in the operation of the education system in time, realize more efficient resource allocation, and effectively improve campus safety (Liu et al., 2018).

#### 4.7. AI Tutoring Robots

Involving education, computer science, automatic control, materials science, psychology, optics, and other fields, scientific research on tutoring robots is multidisciplinary and cross-field. From the perspective of the development process of robots, the research and development of early robotics technology were centered mostly on industrial robots. Various intelligent tutoring robots have different functions, which can be mainly divided into 5 functions: robot-subject instruction, automaton instruction, robot-managed instruction, robot represented routine and robot-directed instruction (Hsieh et al., 2020). Spolaôr and Benitti (2017) conducted a literature review on the applications of educational robotics in tertiary education that is based on learning theory. They looked at research showing how using robots may improve learning and skill development, which will support the education industry for quality content and quality education.

#### 4.8. E-Learning in ALET

According to the e-learning industry, "An AI-based e-learning platform is a machine/system that can conduct different operations needing human cognition." It can offer solutions for a variety of human-related problems, such as voice recognition, translation, decision-making, and many others. Industries such as IBM say that AI leverages computers and machines to mimic the problem-solving and decision-making capabilities of the human mind.

AI is a data-driven strategy that continually monitors each student's performance while utilizing machine learning algorithms to forecast outcomes and modify the material to take into account each student's interests and areas of competence. As a result, until a student has completely learned the subject, the platform will continue to adjust the content and difficulty levels depending on their progress. Making tailored learning paths for each student with relevant material promotes motivation in addition to time efficiency.

#### 4.9. Challenges of AI in Education

Despite the challenges of AI in education, equality must be maintained. Developing nations run the danger of allowing new technologies to exacerbate the gaps in educational attainment as a result of the development of AI. Many of the educational possibilities made available by AI are now in danger, just as the digital divide has divided those who can use the Internet from those who cannot. As most AI algorithms come from wealthy countries, they cannot properly account for the situations of underdeveloped countries and hence cannot be deployed there (Yu, 2020). The education industry must overcome enormous obstacles, including a lack of infrastructure and fundamental technologies if AI is to enhance learning. Data collection, usage, and distribution raise ethical and security issues that need to be taken into account. AI has brought up several ethical questions about providing students with individualized advice, collecting personal data, protecting data privacy, and ownership of duties and data feed algorithms (Bodó et al., 2017; Southgate, 2020). To improve the monitoring of AI technology and its products, the public must discuss relevant ethical, responsible, and safety problems. It helps prepare

instructors for teaching using AI. Teachers must learn new digital teaching methods if AI is to successfully support educational transformation. Additionally, AI developers must have a solid grasp of how instructors work to produce educational solutions that are simple for teachers to use. Changes in learning approaches place higher requirements on kids' ability to learn independently. Learning will be student-centered in the era of AI, and most learning activities will be managed by students. Students may design personalized learning plans, autonomously choose learning resources, set up learning progressions, and participate in group cooperative learning based on the intelligent teaching system (Fang et al., 2019; Walkington & Bernacki, 2020; Yilmaz, 2018). Individualized learning approaches create more demands on students' ability to self-regulate and self-manage, claim (Bergamin & Hirt., 2018; Tseng et al., 2019). As a consequence, throughout the teaching process, instructors must concentrate on promoting autonomous learning in their students. Students' interactions with one another need more attention. As more students use AI platforms for learning and converse with computers as the focus of their dialogs, social communication skills among students will become a concern. Collaborative learning should be encouraged among students. To solve this problem, AI education projects can develop a remote learning strategy that prioritizes social interaction. Students may study online and interact with classmates in a variety of social situations.

In conclusion, with the comprehensive spread of economic and technological globalization, the importance of AI technology in education has become increasingly apparent. Furthermore, several countries have given the development of AI technology significant importance.

#### 4.10. Reinvigorate AI in Education Technology

There is an ongoing discussion about what AI is. The capacity of a computer or system to learn, apply that information, and engage in intelligent behavior is what is often referred to as AI (OECD, 2018). Numerous cognitive functions, including detecting, comprehending, and making judgments, may be accomplished by AI technologies. Based on the outcomes of the cognitive exercises, AI technologies may then conduct additional activities such as moving and manipulating objects. Combinations of processes, such as big data analytics, cloud computing, machine-to-machine communication, and the Internet of Things (IoT), regulate the operation and learning processes of intelligent systems (ESCAP, 2017). A bibliometric analysis of AI applications in education was provided by Holmes et al. (2019) and Ahmad et al. (2020). The topic of AI applications in education was segmented by the authors into Intillitute Tutoring System (ITS), assessment, customized learning, recommender systems, student performance, sentiment analysis, retention and dropout, and classroom observation. The authors divided AIEL applications into four categories: automated writing assessment (AWA), dialog-based tutoring systems (DBTS), instructional technology (ITS), and automatic writing assessment (AWE). Intelligent tutoring programs are appealing because they may provide some degree of individualized instruction.

Web-based and game content may be used more easily using adaptive tutoring systems, which makes learning more engaging. To raise the standard of education, AI can also identify the variables that affect student performance and provide descriptive data. Artificial intelligence has advanced in higher education, but not nearly enough. Although they will still be needed for a few more years as instructors and pupils, the role of human educators is expected to change drastically when robots with artificial intelligence enter the classroom. Following COVID-19, the period for students and educational institutions was disastrous (Sayed Al Mnhrawi & Alreshidi, 2022).

Universities will soon experience the consequences of AI given the developments and investments in it (Popenici & Kerr, 2017). According to a project by Adams Becker et al. (2018), AI may be applied in higher education by 2021. According to Technavio, cited by Adams Becker et al. (2018), by 2022, the market for AI technologies in the educational sector will be expected to be approximately 50%. Because of trends such as increased student enrollment brought on by the democratization and globalization of higher education, institutions of higher learning are looking at AI solutions (Popenici & Kerr, 2017). The improvement of online learning, the improvement of adaptive learning software, and the preservation of research processes may be supported by AI. According to Popenici and Kerr (2017), teacher bots are already replacing certain teaching assistants by being given administrative teaching tasks, including delivering curriculum and providing administrative feedback. Adams Becker et al. (2018) propose that AI be used to perform mundane tasks, freeing up educational staff members' time to focus on more important tasks such as research. By predicting student learning rates, degrees of comprehension and progress, and the challenges associated with certain topics and learning techniques, AI and machine learning may assist instructors in the future and have a blended learning approach with the use of AI. Higher education might be significantly impacted by AI and the GPT-3 model, particularly by increasing the effectiveness and efficiency of various instructional procedures (Chan, 2022). AI algorithms can develop personalized lesson plans and learning materials that are suited to the needs of each student by assessing student performance and behavior data. Increased student engagement and better learning results may result from this.

Natural language processing (NLP) and automatic summarization are two further ways AI and GPT-3 can be applied in higher education. This can help teachers grade, summarize, and give comments on student work, which can lessen their workload and enhance the caliber of feedback they give to students. Zhang et al. (2021) Students can also use AI and GPT-3 to help them with their research and writing projects. Students can save time and effort by using GPT-3, which can produce summaries and outlines.

## 5. Final Considerations

The future of and assistance in human fulfillment and AI technology in education technology is primarily concerned with the development of computers that perform cognitive tasks generally associated with individual minds, particularly learning and problem-solving (Sucu, 2019). Education in the era of artificial intelligence is challenging but also presents a chance (Ocaa-Fernández et al., 2019). New learning channels are being developed, including chatbots powered by natural language processing (NLP), interactive voice recognition and speech synthesis technologies, education management systems based on digital curricula, tailored learning through big data analysis, and interactive technologies such as voice-based recognition and speech synthesis (Ekin, 2022). The bulk of AI technologies are used in education and training. Education is essential for a person's whole development (Sulak, 2021). Theoretically, modern education uses technology, in particular artificial intelligence (AI), to improve course content, alter students' perceptions, and challenge traditional paradigms. (Icen, 2022). The emergence of AI has sparked a significant discussion regarding the future role of teaching and learning in the educational sector and the decisions that will be made in this respect. Furthermore, AI software built on sophisticated algorithms created by programmers who may embed their own biases or agendas in operating systems will replace many sets of activities that are now at the center of instructional practice in education. To remain institutions that can uphold civilization, advance knowledge, and cultivate wisdom, the education sector must continually examine and question the answers that have been suggested. The future scope takes into account the necessity for study on the moral ramifications of the existing restrictions on AI growth as well as the potential for the monopolization of a small number of entities to dwindle the depth of human knowledge and viewpoints.

### Ethical considerations

Not applicable.

### Conflict of Interest

The authors declare no conflicts of interest.

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