

A Study on Artificial Intelligence in Education

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ABSTRACT

Artificial Intelligence is a booming technological domain capable of altering every aspect of our social interactions. The ways that teaching and learning are conducted are impacted by the advent of new technologies. The use of artificial intelligence (AI) in education is becoming more and more obvious as a result of the technology's recent rapid progress. The first section of this paper discusses the use of AI in education, including virtual classrooms, adaptive learning, and educational assessment. And then examines its effect on education, which is beneficial for raising the standard of instruction provided by teachers and the quality of education received by students. Lastly, it outlines the potential difficulties that AI applications in education may encounter going forward and offers resources for AI to support educational change.

Keywords: artificial intelligence, education, teaching

Introduction

At present, AI technology has advanced significantly along with advances in global science and technology. AI technology is widely applied in many different sectors and is updated often (Pannu, 2015). Undoubtedly, AI is becoming more and more integrated into the classroom and teaching methods used in educational institutions. As the technology advances, more and more individuals become aware of its significance in the field of education. AI has been applied extensively in the field of education and has demonstrated significant application benefits, which have a significant impact on classroom management and the teaching process (Chassignol, Khoroshavin, Klimova, & Bilyatdinova, 2018; Roll & Wylie, 2016). At the same time, it can significantly improve the classroom management level of teachers and ensure that classroom management is more reasonable and efficient (Tuomi, 2018; Wang, 2020). With the rapid development of modern science and technology, AI technology is also advancing. The application of AI in the field of education has realized the full integration of teaching and learning, and also provided an opportunity for the reform of teaching and learning. Artificial intelligence (AI) refers to the ability of a digital machine to perform tasks commonly associated with intelligent beings, and its associated technologies are divided into various branches, such as computer vision, speech, machine learning, big data, and natural language processing (Chiu, 2021; Chiu et al., 2022; Xia et al., 2022).

What Is Artificial Intelligence?

Artificial intelligence, as used in this text, refers to the use of software algorithms and techniques that duplicate human perception and decision-making in computers and machines in order to successfully execute tasks. Artificial intelligence (AI) has been used for both more complex and simpler tasks. For example, AI has been used to make automated phone calls and texts from banks when an unusual transaction shows up on a customer's account. AI has also been used to make advanced driver assistance systems in cars stay in their lanes and maintain a safe distance from the car in front of them. AI-based applications are currently being used to classify and recognize images on the internet; compose original media content, including music and news articles; and predict the likelihood of outcomes, such as next week's weather, a customer's emotional state, the likelihood that a particular student will graduate from college on time, and the next movie a person might want to rent from Netflix.

Artificial Intelligence in Education

Currently, there are two broad groups of narrow AI applications in education. Adaptive software systems for education fall within the first group, which includes rule-based applications.

Applications that use machine learning, such those that score student essays automatically, fall under the second category. Furthermore, deep data mining and artificial intelligence (AI) technologies can be utilized to thoroughly examine and evaluate instructional data, which can lead to improved teaching practices and reform (Williamson, 2018). We will next go over the research on how AI is affecting intelligent tutoring robots, virtual classrooms, smart campuses, adaptive learning, and teaching assessment.

1. Adaptive learning

AI promotes the development of adaptive learning, in which data mining, intelligent teaching systems, learning analytics, and real-time analysis are applied in adaptive learning. Adaptive learning attempts to incorporate all aspects of testing, teaching, learning, and practice into the adaptive learning system to facilitate students' learning (Van Der Vorst & Jelicic, 2019). The adaptive learning system can collect student learning behavior data, plan the optimal learning path for students based on the analysis of student abilities, and complete the closed-loop learning process by pushing learning content as online teaching videos. There are some problems that encountered and cannot be solved after class study, the human-computer interaction technology provided by AI can assist teachers in answering questions for students online (Goel & Polepeddi, 2016). Nowadays, many companies provide adaptive learning systems, such as Dream Box Learning (Grams, 2018), BYJU'S (Tripathy & Devarapalli, 2020), and IBM Watson Education (Russo-Spena, Mele, & Marzullo, 2019), which are relatively mature companies with adaptive learning systems, and teachers apply the systems in class to improve classroom teaching effects.

2. Teaching Evaluation

AI technologies such as image recognition, prediction system and computer vision provide convenience for teaching assessment. In the teaching process, the assessment of students is an essential part. In traditional teaching, it takes a long time for teachers to complete the assessment tasks, such as question preparation, scoring, performance evaluation, and test paper analysis. AI makes teaching evaluation methods more diverse, the evaluation process more scientific, and the evaluation results more accurate. AI technology not only can generate exam questions (Rahim, Aziz, Rauf, & Shamsudin, 2018), but also can automatically correct the assignments and test papers (Li et al., 2018).

3. Enhancing teachers' ability to teach:

The combination of computer assisted instruction and AI technologies has been applied to helping teachers manage their classroom teaching (D. Yang, Oh, & Wang, 2020; Jaiswal & Arun, 2021; Nabiyeve et al., 2013; Wang & Zheng, 2020; Zhang, 2021a, Zhang, 2021b). AI technologies have been used to support teaching in different subject classrooms (e.g., physical and language education) by efficiently uploading, assigning, and distributing learning materials and assignments and by speaking out text-based problems. These applications have greatly improved the efficiency of classroom management for teachers (Gupta & Bhaskar, 2020; Huang et al., 2021; Jarke & Macgilchrist, 2021; Rapanta & Walton, 2016). However, most teachers lack an understanding of how the technologies operate. Without a grasp of the mechanism of task assignment and teaching strategy recommendations, teachers have reported feeling that their control was diminished and that they were working with a black box. The resulting decline in self-efficacy may discourage teachers from using AI to support their classroom teaching.

4. Virtual Classrooms

The development of virtual reality (VR), augmented reality (AR), hearing and sensing technologies is conducive to the reform of teaching environment. Utilize ubiquitous computing technology to realize the integration of physical space and virtual space to create virtual classrooms and virtual laboratories (Encalada & Sequera, 2017; Krumm, 2018).

Virtual classrooms use virtual technology to simulate teaching scenes that are difficult to explain, and for natural phenomena or changes in things that cannot be observed or hard to observe in real life, it can be presented in a smart classroom to create a contextual learning environment for students. Multi-dimensional presentation of learning content, mobilizing students' vision, hearing, kinesthetic and other senses to participate, allowing students to feel a strong sense of reality, it makes abstract concepts and theories more intuitive and visualized, stimulate students' interest in learning, and improve teaching effects. . The hybrid virtual classroom is very promising regarding flexibility in course attendance (Lakhal, Bateman, & Bédard, 2017) since students can choose to come to the campus or to attend the lecture at home.

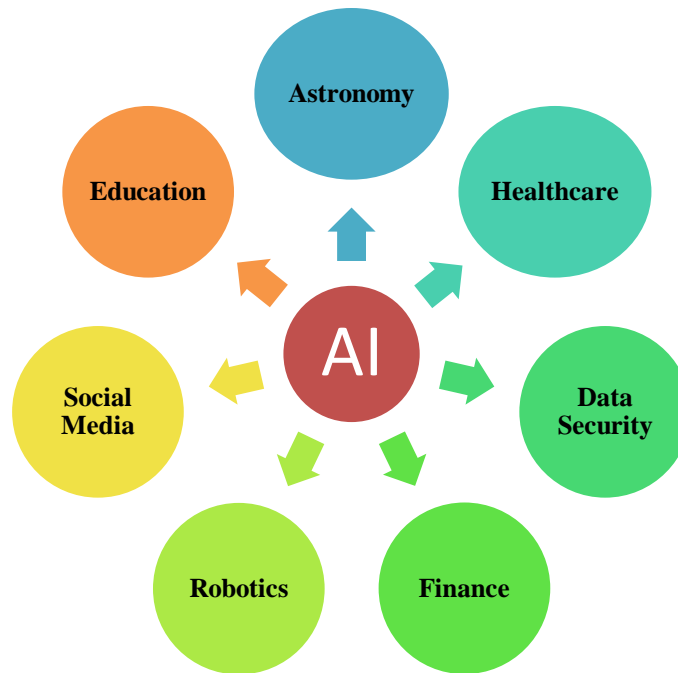
5. Intelligent Tutoring Robots

Tutoring robots are multi-disciplinary and cross-field scientific research involving education, computer science, automatic control, materials science, psychology, optics and other fields. From the perspective of the development process of robots, the research and development of early robotics technology was mainly based on industrial robots (Grau, Indri, Lo Bello, & Sauter, 2017). With the popularization of robotics technology, the educational value of robots has also attracted increasing attention. The earliest educational robot came from the AI laboratory founded by Professor Papert of the Massachusetts Institute of Technology in the 1960s (Catlin & Blamires, 2019), and gradually became intelligent. Educational robots are specially developed for the education field, aiming at cultivating students' analytical ability, creativity and practical ability. It has the characteristics of teaching applicability, interactivity, openness and scalability (Miller, Nourbakhsh, & Siegwart, 2008). Tutoring robots are equipped with a variety of AI technologies such as voice recognition technology, emotion recognition that analyzes expressions and tones, and bionic technology that can present beautiful joint technology similar to human actions, and has human-like listening, seeing, thinking and communication capabilities (Yang & Zhang, 2019). With the growth of AI technology in recent years, robots have progressively become more intelligent and human. Intelligent and humanized robot products will be more suitable for the future education and teaching environment.

Applications of AI

Artificial Intelligence has various applications in today's society. It is becoming essential for today's time because it can solve complex problems with an efficient way in multiple industries, such as Healthcare, entertainment, finance, education, etc. AI is making our daily life more comfortable and fast.

Following are some sectors which have the application of Artificial Intelligence:



1. AI in Astronomy

- Artificial Intelligence can be very useful to solve complex universe problems. AI technology can be helpful for understanding the universe such as how it works, origin, etc.

2. AI in Healthcare

- In the last, five to ten years, AI becoming more advantageous for the healthcare industry and going to have a significant impact on this industry.
- Healthcare Industries are applying AI to make a better and faster diagnosis than humans. AI can help doctors with diagnoses and can inform when patients are worsening so that medical help can reach to the patient before hospitalization.

3. AI in Data Security

- The security of data is crucial for every company and cyber-attacks are growing very rapidly in the digital world. AI can be used to make your data more safe and secure. Some examples such as AEG bot, AI2 Platform, are used to determine software bug and cyber-attacks in a better way.

4. AI in Finance

- AI and finance industries are the best matches for each other. The finance industry is implementing automation, chatbot, adaptive intelligence, algorithm trading, and machine learning into financial processes.

5. AI in Robotics:

- Artificial Intelligence has a remarkable role in Robotics. Usually, general robots are programmed such that they can perform some repetitive task, but with the help of AI, we can create intelligent robots which can perform tasks with their own experiences without pre-programmed.
- Humanoid Robots are best examples for AI in robotics, recently the intelligent Humanoid robot named as Erica and Sophia has been developed which can talk and behave like humans.

6. AI in Social Media

- Social Media sites such as Facebook, Twitter, and Snapchat contain billions of user profiles, which need to be stored and managed in a very efficient way. AI can organize and manage massive amounts of data. AI can analyze lots of data to identify the latest trends, hashtag, and requirement of different users.

7. AI in education:

- AI can automate grading so that the tutor can have more time to teach. AI chatbot can communicate with students as a teaching assistant.
- AI in the future can be work as a personal virtual tutor for students, which will be accessible easily at any time and any place.

Impact of AI in Education

The continuous improvement of AI technology has been widely used in all walks of life, and the education field is no exception. AI simulates human listening (machine translation, speech recognition) (Delić et al., 2019), speaking (speech synthesis, human-computer dialogue) (Chiba, Nose, Kase, Yamanaka, & Ito, 2019), watching (computer vision, image recognition, text recognition) (Paglen, 2019), thinking (Theorem Proving) (Sarma & Hay, 2017), learning (machine learning, intelligent adaptive learning) (Colchester et al., 2017) and action (robot) (Khandelwal et al., 2017). In particular, AI technologies such as computer vision, natural language processing, and intelligent adaptive learning have changed traditional education and teaching (Yufei, Saleh, Jiahui, & Abdullah, 2020), and have provided universities and teachers with new ideas for teaching reform. One of the importance of AI in education is it plays a role in promoting personalized teaching and learning. AI has changed the way teachers teach and the way students learn. It can form a personalized learning plan according to the needs and learning situation of students (Dishon, 2017), provide immersive learning experience (Ip et al., 2019) and intelligent learning tracking to help students improve their learning ability and efficiency. AI can deeply evaluate students' daily and test performance based on big data and machine learning, and provide personalized teaching guidance for students' difficult knowledge and difficulties (Bingham, Pane, Steiner, & Hamilton, 2018), shortening students' learning time (Quer, Muse, Nikzad, Topol, & Steinhubl, 2017) and improving learning efficiency (Kong et al., 2019). Adaptive learning technology can help implement one-to-one personalized teaching between machines and students. Intelligent adaptive learning technology is an AI education technology that simulates the process of one-to-one teaching by teachers to students and gives the learning system personalized teaching capabilities (Kakish & Pollacia, 2018).

Challenges of AI in Education

While AI brings a series of education benefits, it will also face some unprecedented challenges. Understanding the problems that may be encountered when AI is introduced into education will help people better prepare and improve the future application of AI in education. These challenges mainly lie in the following aspects:

First of all, it is necessary to ensure fairness when applying AI in education. With the development of AI, developing countries face the risk of exacerbating the divisions in education by new technologies. Just as the digital divide has separated those who can access to the Internet from those

who cannot, the ever-widening algorithmic divide now threatens to deprive many educational opportunities provided by AI. Because most AI algorithms come from developed countries, the algorithms cannot fully consider the conditions of developing countries and cannot be directly applied (Yu, 2020). The education sector must overcome significant obstacles such as lacking of basic technology and infrastructure to create basic conditions for AI to improve learning.

Secondly, we need to pay attention to the ethical and safety issues arising from collecting, using, and disseminating data. AI has raised many ethical issues in terms of providing personalized advice to students, collecting personal data, data privacy, and the ownership of responsibilities and data feed algorithms (Bodó et al., 2017; Southgate, 2020). Strengthening the supervision of AI technology and its products requires the public to discuss the ethics, responsibility and safety involved.

Thirdly, it helps teachers prepare for AI-assisted teaching. Teachers must master new digital teaching skills in order to use AI to promote teaching reform appropriately. In addition, the developers of AI teaching products must understand the way teachers work and create a teaching product usage plan that is convenient for teachers to use.

Fourth, more attention needs to be paid to student-student communication. If more and more students use AI platforms for learning, and the object of their communication are machines, the student's social communication skills will become a problem. Students should promote mutual learning. To solve this problem, AI education projects can set up a distance education model that emphasizes socialization. Students can study online and interact with classmates in different camps and social activities.

In short, with the in-depth development of economic and technological globalization, the important role of AI technology in education has become increasingly prominent. And many countries have regarded the development of AI technology as a national priority. The main feature of the innovation AI-based education ecosystem is the precision, individualization and adaptation of education services and management. In the process of building the innovation educational ecosystem, schools, teachers, and students are facing various challenges and problems brought by AI. To solve these problems and realize the perfect connection between AI technology and education, teachers, students, and other education ecosystems members need to work together.

Conclusions

With the development of AI technology, AI will be more and more used in the education field in the future. By analyzing the application of AI in education and the challenges faced by AI technology in education, people have an overall understanding of the situation of AI + education. And help teachers and student's better face and use AI technology in the teaching and learning process, improve teachers' teaching quality and students' learning methods, make students' learning styles more diversified and personalized. It is for sure that development in this field of computer science will change the complete scenario of the world Now it is the responsibility of creamy layer of engineers to develop this field.

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