Journal of Politics and Ethics in New Technologies and AI

Vol 3, No 1 (2024)

Journal of Politics and Ethics in New Technologies and AI

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doi: 10.12681/jpentai.38477

Journal of Politics and Ethics in New Technologies and AI
Volume 3, Issue 1 (2024)
e-ISSN: 2944-9243

https://doi.org/10.12681/jpentai.38477

COMMENTARY

The Application of Artificial Intelligence in the Field of Education: Challenges and Opportunities

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Abstract
Artificial Intelligence (AI) has become an integral part of our lives, revolutionizing various aspects, including education. Its implementation in education has the potential to transform traditional teaching methods, providing personalized and adaptive learning experiences for students. In this paper, we will explore the role of AI in education and its impact on educators and learners alike. The introduction of AI in education opens up new opportunities not only for personalized and adaptive learning but also to streamline administrative processes. AI in education refers to the utilization of intelligent systems and technologies to enhance the learning process. It involves the integration of machine learning, natural language processing, and data analysis to create intelligent tutoring systems, virtual instructors, and smart classrooms. These advancements enable individualized learning pathways for students, catering to their unique learning styles, interests, and needs. However, it is crucial to proceed with caution, addressing privacy and ethical considerations to ensure the responsible use of AI in education.

Keywords: Artificial Intelligence, Education, Learning, Machine Learning, Data

Introduction

Artificial Intelligence (AI) is one of the biggest trends in information and communication technologies (ICTs) and is already found in many aspects of everyday life. Its rapid growth is now drastically affecting the education sector as well and has begun to radically change the way education is delivered globally. From personalized learning experiences to the most advanced educational systems, it is becoming clear that AI is now influencing all aspects of the learning process. The ultimate goal of this article is to examine the application of AI in educational activities, focusing on issues such as the existing opportunities and the perspectives that are opening up, but also the challenges related to the future of AI technology in education such as the ethical concerns (Vousinas et al., 2022).

Vousinas, G. L., & Meleouni, C. (2024). The Application of Artificial Intelligence in the Field of Education: Challenges and Opportunities. *Journal of Politics and Ethics in New Technologies and AI*, *3*(1), e38477. https://doi.org/10.12681/jpentai.38477

The Applications of Artificial Intelligence in Education

AI has made remarkable progress and is having a significant impact in many fields, including that of education. Its application in education is of great importance, as it will greatly facilitate teaching and learning. This section examines in detail the main applications of AI in education and provides an in-depth overview of how IT contributes to the improvement and delivery of educational services.

One of the main AI applications is personalized learning. In particular, machine learning algorithms, by analysing student data, provide personalized learning opportunities with tailored content based on the needs and abilities of each student (Luckin, 2018). In addition, AI is widely used to analyse data related to student behaviour and performance, allowing teachers to adjust their instruction as well as provide personalized support to their students (Luckin & Cukurova, 2019; Chen, 2023; Efthymiou-Egleton, 2020). AI can also be used to automatically assess student work and provide feedback on their progress and performance (Luckin, 2018).

At the same time, AI is used to create advanced educational content, such as educational games, educational videos and interactive learning environments. Robotics education allows students to leverage AI to create algorithms and programs, introducing them to the fundamentals of programming and engineering (AIContentfy team, 2024). Moreover, Advanced applications of AI in education go beyond the basic functions described above, with the striking example of robotic education where AI is combined with the physical construction of robotic devices. Through this approach, students develop practical programming and reasoning skills, as well as the ability to solve problems through interaction with mechanical devices - robots (Chu, Hwang, & Tu, 2022).

Another modern IT application is automatic text generation and processing. In particular, AI systems are capable of producing and processing high-level texts. This can be applied to the creation of teaching materials, reports or even automatic assessment of student work (González-Calatayud et al., 2021). Also important is the contribution of AI chatbots, which have the potential to revolutionize educational systems in various ways. AI chatbots are a form of software designed to mimic human conversation using text or voice interaction and providing information in a conversational format. Thus, they are able to provide immediate support by answering questions, offering explanations, and providing additional learning resources, and they can also act as virtual teaching assistants, supporting teachers through various means (Labadze, Grigolia, & Machaidze, 2023). In addition, the use of Virtual Reality (VR) and Augmented Reality (AR) in education allows students to experience different learning environments (AIContentfy team, 2024). This technology is able to assist students in learning complex concepts through alternative approaches.

Worth mentioning is the fact that technologies that make use of AI allow the development of immersive learning experiences beyond the usual. Typical examples are the integration of game mechanics in a non-game environment (gamification) and Virtual Gaming Simulation (VGS), which on the one hand involve students in complex concepts and on the other hand increase their interest and participation making learning more dynamic and at the same time attractive (Soroliou et al., 2023). In addition, AI systems can recognize faces and emotions from images and videos, allowing teachers to adapt their lessons and assess progress based on their students' reactions (AIContentfy team, 2024).

All of the above applications document the potential of AI to significantly improve all aspects of education and provide a rich and interactive learning experience that will be both reliable and enjoyable for students as well as teachers.

Challenges & Opportunities

The use of AI opens up new horizons in education and remains at the center of international interest in terms of benefits on one hand and challenges on the other. In terms of benefits, AI promotes personalized education considering the individual needs, abilities, peculiarities and learning level of each student. This can lead to a greater degree of learning effectiveness, as well as improved academic performance. In addition, a positive factor is the ability to automatically assess student work, as it saves time for teachers and provides immediate and objective feedback to students (Gligorea et al., 2023). Furthermore, machine learning algorithms can adapt lessons to learner pace and preferences, thereby improving content comprehension and integration. In this direction, the application of AI facilitates the creation of innovative educational programs and applications that encourage the active participation of students and contribute to the creation of a pleasant learning experience (Kabudi, Pappas, & Olsen, 2021).

On the other hand, the challenges surrounding the use of AI are many and significant. First, the collection and analysis of student data using AI may raise issues related to the protection of students' and teachers' privacy (Kamalov et al., 2023). Furthermore, the application of AI in education is breaking new ground, allowing students to solve problems and study at home through tests created by such systems. However, the use of this technology raises concerns about the reliability of learning and the university admissions process. Furthermore, in addition to the ethical issues that arise (Vousinas et al., 2022), there is the risk of jeopardizing the full understanding and acquisition of knowledge by students (Kamalov et al., 2023).

Another important parameter concerns the fact that AI systems depend on how they are designed and the data they are provided with and use, so their improper use can lead to biased decisions. For

example, if the data contains information about student performance by ethnic, racial, or socioeconomic group, the AI system may favour or disfavour some of them during the assessment process. In addition, equally important is the existence of prejudices, which may exist or even lurk in relation to political ideology and, in some cases, educational philosophy (Perry & Lee, 2019).

It is worth mentioning that the European Commission published guidelines in 2022 with the aim of helping teachers to deal with misconceptions around AI and to promote its ethical use. More specifically, the aim was to clear up any misconceptions about AI that may cause confusion or anxiety about its use, especially in education. This publication also examined ethical issues, offering practical advice to teachers and school leaders on how to design the most effective use of AI and related data in schools. For example, the guidelines advise how they can use technologies to adapt teaching to the abilities of each student or how to prepare and implement individualized interventions for students with special needs (European Commission, 2022).

A challenge that needs to be studied is the overuse of AI in education, as it can reduce human awareness and interaction, and lose the emotional connections between teachers and students (Perry & Lee, 2019). While at the same time it can lead to extensive inequalities in access to educational resources, as not all students have the same access to technology and the internet (Perry & Lee, 2019).

Finally, the automation of education through AI can significantly reduce human involvement in the educational process, which is crucial for creating rich and inspiring learning experiences (Perry & Lee, 2019). Removing the human factor may lead to a loss of the educational experience and a reduction in the effectiveness of learning.

AI & the Future of Education

AI is expected to play a key role in the future of education, drastically influencing the methods of learning and teaching. The ultimate goal is to provide personalized learning, considering the needs, preferences and learning styles of students (Data Science UA, n.d.). Machine learning algorithms are expected to identify potential difficulties faced by students and provide suggestions for dealing with them appropriately. In addition, AI will create a collaborative learning environment, in which students will be able to collaborate and learn in a pleasant environment (Kim, Lee, & Cho, 2022).

Moreover, AI is expected to facilitate the analysis of data on student progress and performance with the aim of providing more accurate feedback and teaching strategies tailored to each student (Data Science UA, n.d.). Also, AI-based educational games are expected to encourage active student

participation and acquisition of new knowledge with the ultimate goal of providing a more advanced overall educational experience (Li, Chen, & Deng, 2024).

All in all, AI is expected to holistically redefine the way and methodology of teaching and learning, while creating a more personalized, efficient and broadly attractive educational environment for all students without exception.

Conclusions

From the above analysis it is clearly understood that the application of AI in the field of education opens new horizons and offers a multitude of opportunities to improve the learning and teaching process. By using modern technological tools and machine learning algorithms, education can evolve into a more personalized, efficient and advanced learning and knowledge environment.

AI enables the delivery of learning experiences that are tailored to each student's unique needs and abilities, while AI algorithms can assess student work and provide immediate feedback, saving educators significant time. The use of advanced technological applications, such as virtual reality and robotics, enriches the educational process and offers more interactive learning experiences for all participants. However, despite the multiple advantages, there are also challenges that need to be considered and properly addressed, such as the protection of student data privacy, impartiality, as well as the need for equal access to technology.

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