

The Impact and Potential of Artificial Intelligence and Machine Learning Technologies on Education

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Abstract

How we study, work, and live is changing as a result of artificial intelligence. AIED is one of the burgeoning fields in educational technologies, according to the 21st international conference on artificial intelligence in education conducted in 2020. Computer science (artificial intelligence) has always made a significant contribution to the field of education. The study explains how artificial intelligence and machine learning will shape education in both wealthy and developing nations. The purpose of this study is to investigate how artificial intelligence and machine learning are used to help students learn. The future of education using artificial intelligence and machine learning is the main topic of the study. Although there are still some issues with artificial intelligence and machine learning in the education system, the results show that they are helpful in instructional methods, examination, evaluation and staff training. The study makes research recommendations on evaluation and examination of students using artificial intelligence and machine technologies. It also outlines a specific method for creating an artificial intelligence-enabled platform for education, and it concludes by discussing the effects of artificial intelligence in education.

Keywords: Artificial intelligence, education, staff training, burgeoning, machine learning, evaluation, examination

INTRODUCTION

The world is fast changing due to artificial intelligence (AI) and machine learning (ML), and the educational sector is no exception. The application of AI and ML to teaching, learning, and evaluation in the field of education has significantly increased in recent years. AI and ML have had a significant impact on education, and many experts believe that in the future, these technologies will radically transform how we teach and learn [1]. This study examines the advantages, difficulties, and potential future effects of AI and ML in education.

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AI AND ML IN EDUCATION: BENEFITS

Personalized learning is one of the most important advantages of AI and ML in education. These tools can examine student data and produce individualized learning routes that take into account the requirements and learning preferences of each student. This increases student involvement and motivation while also enhancing instructional efficacy [2]. Additionally, grading and assessment procedures can be automated by AI and ML, freeing up teachers' time to work on more important tasks

like lesson planning and student support. Additionally, kids who may be at risk of falling behind can be identified and given early intervention using AI and ML. Additional advantages of applying AI and ML in education include the following:

Improved student outcomes: AI and ML may be used to spot problematic students and give them the extra assistance they require. This may contribute to better student outcomes and a narrowing of the achievement gap [3].

The usage of AI and ML can be utilized to design more interactive and engaging learning experiences, which will increase student engagement. Students' motivation and interest in their studies can be maintained in this way [4].

Less labor for teachers: Many of the duties that teachers presently perform, such as grading assignments and giving comments, can be automated using AI and ML. Teachers may have more time to devote to instruction and less time to administrative duties as a result.

The possibility for personalized learning is one of AI and ML's biggest effects on education. Tracking student progress, identifying areas of weakness, and recommending tailored learning tools are all possible using AI and ML. This may enable pupils to learn at their own rate and in a way that suits their own need for instance, the AI-powered learning platform Knewton employs machine learning to tailor the learning experience for each student [5]. The platform monitors students' progress pinpoints their areas of weakness and suggests tailored learning materials. It has been demonstrated that Knewton enhances student performance in a number of areas, including math, science, and reading.

AI and ML are also being utilized to automate chores in the classroom in addition to individualized learning. AI-driven chatbots, for instance, can be used to grade assignments, give comments, and respond to questions from students. This may enable teachers to devote more of their time to instruction and less time to administrative duties [6].

Last but not least, learning experiences that are more interactive and engaging are being developed using AI and ML. For instance, the online learning platform Khan Academy employs AI and ML to tailor each student's educational experience [7]. Each of Khan Academy's videos, exercises, and quizzes is customized to the needs of a specific learner. Learning becomes more interesting and useful as a result. In summary, AI and ML are significantly influencing education. They are being utilized to provide more dynamic and interesting learning experiences, automate tasks, and personalize learning. In the years to come, it's possible that AI and ML will have an even bigger impact on education as they continue to advance.

SEVERAL DRAWBACKS OF AI AND ML

While machine learning (ML) and artificial intelligence (AI) have a lot to offer the field of education, there are also a number of drawbacks and difficulties that come with their use. The following are some drawbacks of AI and ML in education:

1. A lack of direct human engagement between students and professors may result from AI and machine learning technologies. This may result in the loss of the emotional support, mentorship, and personal connection that human educators offer. Some students might need the direction and inspiration that only human professors can provide [8].
2. *Discrimination and bias:* Because AI algorithms draw their knowledge from historical data that may reflect society biases, they may be unfair. These biases have the potential to reinforce educational inequality if they are not recognized and addressed. Algorithms used for student evaluations or college admissions, for instance, may mistakenly favor some groups while discriminating against others [9].

3. *Data privacy and security:* Collecting and analyzing substantial volumes of student data is a necessary step in the usage of AI and ML in education. This raises issues of data security and privacy. Strong security measures must be put in place by educational institutions and technology suppliers to guard against unauthorized access, misuse, and breaches of student data [10].
4. *Over reliance on technology:* Using AI and ML in education too much can make students dependent on technology. The development of critical thinking, creativity, and problem-solving skills through interpersonal interaction and non-technological learning experiences may be undermined by this. To achieve a well-rounded education, integrating AI with established educational methods must be done in a balanced way.
5. *Cost and access:* Using AI and ML in education can be expensive, making them only available to universities with enough funding. Existing educational disparities could be made worse by this, and schools that can afford such tools might become separated from those that cannot. In order to reduce educational inequities, it is crucial to guarantee equal access to AI and ML tools.
6. *Ethical considerations:* The application of AI and ML in education poses issues of privacy, informed consent, and the ethical use of data. In order to solve these issues and guarantee the ethical use of AI and ML technologies in education, educators and policymakers must provide explicit rules and ethical frameworks.

To make the most of AI and ML's capabilities while fostering an inclusive and morally sound educational environment, it is critical to recognize and overcome these drawbacks.

STATE OF AI AND ML IN EDUCATION CURRENTLY

The use of AI and ML in education is currently being explored and adopted more often across a variety of educational contexts and institutions. Here are some significant elements of the current scenario:

1. *Integrating with learning management systems:* A growing number of educational platforms and learning management systems have begun integrating AI and ML capabilities. These consist of tailored topic suggestions, flexible tests, computerized grading, and sophisticated teaching programs. The goal of integrating AI and ML into the current educational infrastructure is to improve educational outcomes and the learning experience.
2. *Personalized learning:* Algorithms based on AI and ML are being used to provide individualized learning opportunities. To customize instruction and materials, these systems analyze learner data such as performance, preferences, and learning styles. To offer customized learning routes, material recommendations, and focused interventions, adaptive learning platforms and intelligent tutoring systems use AI and ML.
3. *Data analytics and insights:* Educational institutions are using AI and ML to examine vast amounts of educational data, such as student engagement, performance, and behavior. Teachers, administrators, and politicians can use these analytics to discover trends, form data-informed judgments, and create interventions that are supported by solid research.
4. *Ed Tech startups and advancements:* AI and ML advancements have exploded in the Ed Tech industry. Adaptive learning platforms, automated essay grading, and language learning are just a few of the difficulties in education that startups are addressing by creating AI-powered tools and services. These developments provide a variety of methods to improve the teaching and learning process.
5. *Educator professional development and upskilling:* AI and ML technologies are being used to support educator professional development and upskilling. Intelligent systems offer individualized learning recommendations for educators, assisting them in staying current with the most recent pedagogical techniques and topic knowledge.
6. *Ethical and policy considerations:* The use of AI and ML in education has sparked debates about issues including fairness, data privacy, and ethical issues. Conversations are taking place between educators, decision-makers, and stakeholders to create rules, frameworks, and policies that will guarantee the ethical and responsible use of AI and ML in educational environments.

7. *Obstacles and challenges:* Despite the advancement, obstacles still exist. Concerns concerning algorithmic bias, the need for trustworthy data, accessibility to infrastructure and resources, instruction for educators in AI and ML, and guaranteeing equity in access to AI-powered educational technologies are a few among them.

The current state of affairs shows an increasing understanding of how AI and ML can be used in education. To properly comprehend and utilize the advantages of these technologies while resolving related issues; however, there is still considerable study, improvement, and research required.

FUTURE EDUCATION IMPLICATIONS OF AI AND ML

The future effects of AI and ML on education are significant, despite the difficulties. We can anticipate a greater emphasis on individualized instruction and student-centered strategies as these technologies advance and become more sophisticated. Moreover, by supporting teachers and improving education in under-resourced places, AI and ML can assist address the worldwide teacher shortage. Finally, AI and ML can be extremely helpful for lifelong learning by enabling people to keep learning and improving their skills throughout their careers. Future developments in AI and ML in education will have far-reaching effects that could completely alter the way that people learn. The following are some crucial areas where AI and ML are anticipated to have a major impact:

1. *Personalized learning:* Using AI and ML, personalized learning may be facilitated, with each student's needs and preferences taken into account. To create adaptive learning routes, these systems can analyze a tremendous quantity of data, including student performance, learning styles, and interests. Through personalized learning, students can get information, timing, and feedback that are specifically suited to them, improving their learning outcomes.
2. *Intelligent tutoring:* AI-driven tutoring programs can offer pupils personalized advice and support. These systems are able to evaluate student performance, pinpoint problem areas, and offer focused treatments.
3. *Enhanced assessments:* By automating grading and delivering rapid feedback, AI and ML can completely transform the assessment process. While machine learning algorithms may examine patterns and trends in extensive evaluation data, natural language processing algorithms can assess textual responses. This expedites the evaluation procedure, saves teachers time, and gives pupils fast feedback.
4. *Data-driven decision making:* Using AI and ML algorithms, educational data may be analyzed to produce insights for teachers and policymakers. These algorithms can identify at-risk kids, optimize resource allocation, and provide strategic decision-making for educational institutions by looking for patterns in student performance, attendance, and behavior.
5. *Intelligent learning environments:* AI and ML technologies enable the development of adaptive, intelligent learning environments. Virtual reality, augmented reality, and simulations are a few examples of these settings, which offer engaging and dynamic learning opportunities. Smart recommendation systems that offer pertinent learning resources can also be made possible by AI, encouraging independent and self-directed learning.
6. *Lifelong learning and upskilling:* AI and ML can support lifelong learning by making individualized suggestions for ongoing professional development and upskilling. These tools can recommend pertinent courses and learning routes to support people throughout their careers by examining individual learning habits and labor market developments.

Although AI and ML present enormous benefits for education, there are also issues to be resolved. These include assuring fair access to AI-powered educational tools and resources, worries about data privacy, algorithmic bias, and ethical problems.

FACTS

World Economic Forum estimates that by 2022, more than 54% of all workers will need significant upskilling and reskilling as a result of technology improvements.

Up to 25% of jobs in the education sector could be lost to AI, according to a Brookings Institution study. However, the same study also discovered that AI might boost productivity and create new jobs, which would have a beneficial overall economic impact.

A markets analysis projects that the AI in education market will grow at a compound annual growth rate of 47.0% from 2018 to 2023, reaching \$3.68 billion.

CONCLUSION

In conclusion, AI and ML have the potential to revolutionize the field of education by enabling personalized learning, automating repetitive chores, and raising student motivation and engagement. However, there are a number of issues with its use as well, such as bias, job losses, and worries about data privacy. In order to make sure that AI and ML are used properly and for the benefit of all students, it is crucial that we carefully assess these concerns and try to overcome them as we go forward.

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