

РОЗДІЛ 7. ІНФОРМАЦІЙНО-КОМУНІКАЦІЙНІ ТЕХНОЛОГІЇ
В ОСВІТІTHE ROLE OF ARTIFICIAL INTELLIGENCE IN ENHANCING ONLINE LEARNING
РОЛЬ ШТУЧНОГО ІНТЕЛЕКТУ У ВДОСКОНАЛЕННІ ОНЛАЙН НАВЧАННЯ

The article delves into contemporary artificial intelligence technologies being integrated into online education. Emphasis is placed on analyzing the impact of these technologies on the quality of education and accessibility of educational resources. An important aspect is discerning the advantages and limitations of using artificial intelligence for various categories of students and educators. In this era of rapid technological advancement, particular attention is directed towards artificial intelligence (AI) and its influence on various aspects of life, notably in education. Online education, as a pivotal segment of the educational landscape, demonstrates the potential of AI in transforming traditional pedagogical methods and providing the opportunity for knowledge acquisition to all interested parties, regardless of their location or material resources. The utilization of AI in online education emerges as a pertinent and promising avenue for further research and development in this field.

The article offers a projection of potential future directions for the development of AI-based online learning systems. The research underscores the significant potential of employing AI in the educational process, its capacity to reshape conventional pedagogical methods, and ensure access to knowledge for a wide array of users, irrespective of their location or resources.

The integration of artificial intelligence tools in online education represents a significant stride in modern education. These technologies unlock boundless opportunities for optimizing the learning process and grant access to quality education for a diverse spectrum of students. Artificial intelligence enables the development of individualized learning programs, automates routine tasks for both instructors and students, thereby enhancing efficiency and engagement in learning.

In this context, it is crucial to consider and address issues related to data confidentiality, the necessity for professional system maintenance, and aspects of ethics and user rights protection. A thorough analysis of these aspects in the process of developing and implementing AI-based online learning systems stands as a vital task for the successful integration of this innovative technology into the educational realm.

The authors affirm the significance and prospects of employing artificial intelligence in online education, contributing to the continued advancement of this promising direction in education.

Key words: Artificial intelligence, online learning, higher education, information technologies.

Стаття досліджує сучасні технології штучного інтелекту, які впроваджуються в сфері онлайн навчання. Акцент робиться

на аналізі впливу цих технологій на якість освіти та доступність освітніх ресурсів, де важливим аспектом є розпізнавання переваг та обмежень використання штучного інтелекту для різних категорій студентів та викладачів.

У цій ері стрімкого технологічного розвитку, особлива увага приділяється штучному інтелекту (ШІ) та його впливу на різні сфери життя, особливо в освіті. Онлайн навчання, як один з ключових сегментів освіти, виявляє потенціал ШІ у перетворенні традиційних педагогічних методів та наданні можливості отримання знань всім бажаним, незалежно від їхнього місцезнаходження чи матеріальних ресурсів. Використання ШІ в онлайн навчанні виходить на передній план як актуальний напрямок для подальших досліджень та розвитку цієї галузі.

У статті надається прогноз можливих майбутніх напрямків розвитку систем онлайн навчання, що базуються на штучному інтелекті. Дослідження підкреслює значущий потенціал використання ШІ в освітньому процесі, його здатність трансформувати традиційні педагогічні методи та гарантувати доступ до знань для широкого кола користувачів незалежно від їхнього місцезнаходження чи ресурсів.

Доведено, що інтеграція засобів штучного інтелекту в онлайн навчання є важливим кроком у сучасній освіті. Ці технології розкривають безмежні можливості для оптимізації навчального процесу та надають доступ до якісної освіти для різноманітного спектру студентів. Штучний інтелект дозволяє розробляти індивідуальні навчальні програми, автоматизувати рутинні завдання як викладачів, так і студентів, що підвищує ефективність та мотивацію до навчання. У цьому контексті важливо враховувати та вирішувати питання, пов'язані з конфіденційністю даних, необхідністю професійного обслуговування систем та аспектами етики та захисту прав користувачів. Ретельний аналіз цих аспектів у процесі розробки та впровадження систем онлайн навчання на базі штучного інтелекту є важливим завданням для успішної інтеграції цієї інноваційної технології в освітній простір.

Автори підкреслюють важливість та перспективи впровадження штучного інтелекту в онлайн навчанні, що сприятиме подальшому розвитку цієї перспективної галузі освіти.

Ключові слова: штучний інтелект, онлайн навчання, вища освіта, інформаційні технології.

УДК 004.7:37.018.3

DOI <https://doi.org/10.32782/2663-6085/2023/63.2.36>

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Raising of the problem and its copulas with important practical tasks. Education is a significant factor in shaping human potential, considering

its capacity to facilitate knowledge acquisition, skill development, and socio-cultural experience [7]. It influences the development of intellectual, social, and

professional competencies, thereby contributing to self-realization and enhancing individual quality of life [4]. In the current era of active technological advancement, particular importance is given to Artificial Intelligence (AI), which impacts various spheres of life, including education. One of the key areas where AI demonstrates its potential is in the realm of online education [1; 9]. Online education plays a crucial role as a strategic tool for ensuring access to education and ensuring the sustainability of the learning process. It provides the opportunity for a wide range of students and professionals to receive education and skills regardless of geographical location and helps mitigate the impact of external turbulent factors on the learning process, such as pandemics [8], military actions, natural disasters, and so forth. Online education creates opportunities for innovation in teaching methods and tools, fosters self-development, and ensures flexibility and alignment of educational programs with the needs of modern society. Productive technologies based on AI open up new perspectives for learning for both students and educators, transforming traditional pedagogical methods and providing access to knowledge for all interested parties, regardless of their location or resources [16]. In this context, the use of AI in online education becomes relevant and promising for further research.

Analysis of basic research and publications.

The research is founded on the contributions of distinguished scholars from various fields of education. They explore the systematic approach to organizing education (V. Zahvyazinsky, V. Kuzmin, Ye. Yudin, et al.), peculiarities of postgraduate education (V. Oliynyk, M. Kyrychenko, T. Sorochan), as well as the utilization of IT in the educational process (N. Bakhmat, V. Bykov, I. Voytovych, A. Hurzhiy, L. Kartashova [5; 6], V. Lapinsky, Yu. Ramsky, O. Spirin, et al.).

The aim of the article is to investigate and analyze the impact of artificial intelligence utilization on contemporary online learning systems.

The main objectives include: a survey of contemporary artificial intelligence technologies utilized in online learning; an analysis of the impact of artificial intelligence deployment on the quality of education and accessibility of educational resources; identification of the advantages and limitations of using AI in online education for various categories of students and educators; examination of potential future directions for the development and enhancement of AI-based online learning systems.

Presenting main material. Artificial Intelligence (AI) is rapidly advancing and increasingly being utilized in various fields, including online education. Modern AI technologies have the potential to enhance the accessibility, effectiveness, and personalization of online education [2; 14].

Here is a review of some contemporary AI technologies employed in online learning [10]:

- **Personalized Learning:** AI can analyze student data, such as test results, task completion, and time spent on learning, to create personalized learning plans [11]. This can help students achieve their educational goals more quickly and efficiently. Services like Thinkster and Duolingo, used for learning mathematics and foreign languages, initially administer tests to form individualized learning programs for students.

- **Learning Assistants:** AI-powered learning assistants can provide support and aid to students in their learning endeavors. They can answer questions, provide explanations, and even assist students with homework assignments. Examples of such assistants include:

1. Jill Watson Assistant, an AI assistant developed by the Georgia Institute of Technology, used as a teaching assistant in a computer ethics course. Jill Watson Assistant can answer students' questions, provide explanations, and even help with homework assignments.

2. Brainly Tutor, an online learning assistant that helps students with homework and other educational tasks. Brainly Tutor is available in 18 languages and has a database containing over 100 million questions and answers. Brainly Tutor can also provide students with individualized study recommendations.

3. Cognii AI Tutor, a digital learning assistant that uses artificial intelligence to provide students with personalized learning materials and support. Cognii AI Tutor is available in 10 languages and has a database containing over 10 million questions and answers. Cognii AI Tutor can also provide students with individualized study recommendations.

- **Task Automation:** AI can be used to automate tasks such as grading, tracking student progress, and providing feedback. This can free up teachers' time to focus on what they do best: teaching students.

- **Interactive Learning Materials:** AI can be used to create interactive learning materials that can help students better grasp educational material [6].

As of today, some of these technologies are already being utilized on online course platforms, such as Coursera. Coursera employs AI algorithms to create personalized learning plans for its students. These algorithms analyze data on test results, task completion, and time spent on learning to determine which materials and tasks are best suited for each student. Coursera also employs AI assistants that can respond to students' questions, provide explanations, and even assist students with homework assignments. Additionally, it uses AI for task automation, such as grading, tracking student progress, and providing feedback. Moreover, on this platform, AI is employed for translating courses into other languages and creating new ones.

Therefore, the utilization of AI brings forth the following advantages [12]:

Advantages of using AI in online education include:

1. Personalization of learning: AI can create personalized learning programs tailored to the individual needs and knowledge level of each student.
2. Automation and efficiency: AI can handle routine tasks such as test grading and assessment, freeing up the instructor's time for more productive sessions and personal interaction with students.
3. Increased engagement: Interactive and engaging widgets developed based on AI can enhance interest in the material and promote active student participation.
4. Quick access to information: AI can provide instant responses to students' questions and grant access to vast amounts of information in real-time.
5. Geographic flexibility: The use of AI in education enables both students and instructors to access educational material regardless of their geographical location [17].

However, there are also some limitations:

1. The need for qualified support: The development and maintenance of AI systems require specialists with specific skills and knowledge, which can be a limiting factor for some educational institutions.
2. Development and implementation costs: Implementing AI in online learning systems can be a costly process, especially for small educational institutions or projects with limited budgets.
3. Confidentiality and security concerns: Processing and storing a large amount of students' personal data can raise confidentiality and security issues.
4. Risk of technological dependency: Heavy reliance on AI may pose a risk that students and educators could lose important skills that may be needed in the event of technological failure.
5. Lack of interaction and personal contact: The use of AI may reduce personal contact and interaction between instructors and students, which can have a negative impact on the quality of learning and the development of interpersonal skills [18].

Future directions for the development of online learning using artificial intelligence include automatic content generation, integration of teacher expertise with AI analytics, improvement of assessment and retroactive learning, issue resolution support systems, expansion of accessibility and inclusive education, use of virtual and augmented reality, and analytics for enhancing students' skill development.

Our further research will encompass various aspects of applying artificial intelligence in education, including: impact of artificial intelligence in a broader educational context, such as workforce training, corporate learning, and self-directed education; development of precise and effective algorithms for adapting learning to each student's needs to maximize their educational potential; addressing privacy and ethical concerns in the use of artificial intelligence in the

educational process; creating robust and sophisticated artificial intelligence systems tailored for education; understanding how artificial intelligence influences the learning of students with diverse needs to develop inclusive educational programs; evaluating the effectiveness and performance of systems utilizing artificial intelligence, comparing them to traditional teaching methods; developing new teaching and evaluation methods that leverage the capabilities of this technology; investigating the impact of artificial intelligence on student motivation and engagement to devise better motivation strategies; assessing the economic feasibility and accessibility of employing artificial intelligence for various educational institutions and students; providing practical advice and recommendations for universities and educational institutions regarding the implementation and optimization of artificial intelligence systems in the educational process [13; 16].

Conclusions from this study and prospects for further exploration in this direction.

The implementation of artificial intelligence in online education is a key direction in the development of modern education. This cutting-edge technology opens up unlimited possibilities for improving the learning process and providing quality education to various categories of students. Artificial intelligence enables the creation of personalized learning programs, automates routine tasks for both teachers and students, and enhances the efficiency and engagement in learning. However, it is important to consider that the use of artificial intelligence presents its own challenges, such as data confidentiality, the need for qualified system maintenance, and ethical considerations and user rights protection. It is crucial to thoroughly study and address these aspects in the development and implementation of AI-based online learning systems.

Further research in this field may encompass ethical considerations, adaptation to different categories of students and educators, as well as the development of even more powerful AI technologies in education.

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