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VECTORS OF ARTIFICIAL INTELLIGENCE USAGE IN NEW GENERATION UNIVERSITIES

The development of artificial intelligence (AI) technologies is an important area of digital transformation that affects the educational process in higher education institutions. Modern universities are actively implementing algorithmic solutions to optimize learning, automate administrative processes, and personalize the educational environment. Despite its considerable potential, the widespread use of AI in education raises debates about its ethical aspects, impact on traditional approaches to learning, and the need to ensure information security. The purpose of the paper is to identify the main vectors of AI usage in new generation universities, analyze the opportunities and challenges of its integration into the learning process, administration, and academic interaction. The results of the research showed that AI has a wide range of applications in higher education. Three main categories of AI have been identified: weak, strong, and super-strong, of which traditional, adaptive, and generative algorithms are most common in education. The growing potential of generative AI contributes to the expansion of its use in the creation of educational materials, organization of knowledge assessment, automation of administrative tasks, and increase of students' engagement in the learning process. An important aspect is the combination of algorithmic models with traditional teaching approaches to preserve academic values. Conclusions. The implementation of AI in new generation universities opens up significant opportunities for improving the learning process and administrative management. At the same time, this requires the development of effective regulatory mechanisms that take into account ethical and regulatory aspects. Further research should focus on developing strategies for integrating AI into the educational process while ensuring its responsible use and data security.

Keywords: automation of the learning process, digital university, digitalization of education, digital technologies, artificial intelligence

INTRODUCTION

The development of artificial intelligence (AI) technologies is one of the key trends of modern digital transformation, which covers various spheres of public life, including the higher education system. Since the 1950s, when the first electronic computers and expert systems appeared, AI has gradually evolved from highly specialized algorithms to complex generative models capable of analyzing large amounts of data and creating new content.

In the XXI century, the implementation of AI technologies in education has become an irreversible process due to the rapid growth of information, the need to personalize the learning process and optimize the administrative activities of higher education institutions. The use of AI makes it possible to increase the efficiency of teaching, simplify the process of assessing students' knowledge, and automate a significant part of the routine tasks of educational institutions [1; 2].

However, along with the prospects, the large-scale implementation of AI in new generation universities raises a number of challenges and discussions. In particular, the issues of ethical boundaries of AI use, its impact on traditional forms of education, and the need to ensure cybersecurity in the educational environment remain open [3, P. 102]. In this regard, there is a need to identify key vectors of AI application in modern universities that will contribute to a harmonious combination of technological progress and academic values.

MATERIALS AND METHODS

The research on the implementation of AI in higher education is carried out by such scientists as A. Kozynets, V. Shpylova, S. Yahodzynskyi, Y. Gudz, O. Skliarenko, S. Popenici, S. Kubiv, N. Bobro, H. Lopushnyak, Y. Lehner, A. Kozhyna, et al. However, the aspects of AI integration into the activities of new generation universities, its impact on the learning process, administrative procedures,

and educational interaction remain insufficiently researched and require further scientific study.

The **PURPOSE** of the paper is to identify the main vectors of AI usage in new generation universities, analyze the opportunities and challenges of its implementation in the learning process, administrative management, and academic interaction.

RESULTS

The history of AI dates back to the 1950s with the advent of the first electronic computers and the development of expert systems. For many years, AI has remained a subject of scientific interest, and its systems have been created mainly by research institutes. The prospects for mass commercial application of most AI technologies have been limited due to insufficient computing power and the lack of the required amount of data. In the 2000s and 2010s, the growth of computer speed and memory, as well as the increase in data volumes due to the development and expansion of Internet access, allowed to overcome previous barriers to the AI development [4, P. 76].

Currently, there is a large number of AI definitions, as the active implementation of AI-based products and services in various industries changes the meaning of the term, making it difficult to create a comprehensive and flexible definition that would cover all approaches to AI implementation. Moreover, AI is a broad field of knowledge based on the research of various sciences (computer science, statistics, economics, neuroscience, linguistics, psychology, and philosophy), each of which has its own conceptual apparatus, subject area of research, and methodological basis.

For the purposes of our research, we propose the following definition: AI is a set of technological solutions that allows imitating human cognitive functions and obtaining results comparable to the results of human intellectual activity in the performance of specific tasks. The set of technological solutions includes software, information and com-

munication infrastructure, data processing and solution search processes and services.

A number of experts distinguish three categories of AI based on the technology's capabilities: weak AI, strong AI, and super-strong AI [5-7].

Weak AI (Artificial Narrow Intelligence, ANI) is defined as a set of algorithms focused on solving highly specialized application tasks. Within weak AI, three types can be conditionally distinguished:

Traditional AI is a type of AI that imitates mental activity and is capable of making predictions and conclusions based on analysis. In higher education, it is used to analyze students' academic performance, adapt curricula, and automate administrative processes [7, P. 54].

Adaptive AI is a type of AI in which the model can learn and dynamically adapt to changes in the environment by collecting real-time feedback.

Generative AI is a type of AI that is able to create new content (text, images, audio, and video) in response to user requests, which is a key difference from traditional AI.

The growing capabilities of generative AI, as well as its ability to perform a much wider range of tasks compared to traditional AI models, are seen by some researchers as a step to the evolution of traditional AI algorithms towards the so-called "strong AI" [8, P. 52].

According to experts, the global market for AI-based solutions will grow from USD 196.6 billion to USD 1.8 trillion in 2023-2030 with an average annual growth rate of 37 % [9]. According to McKinsey experts, the total economic potential of AI implementation in various industries is USD 17.1-25.6 trillion [10]. Growth will be ensured by increasing business productivity through automation of workflows, rising labor productivity, and increasing demand for AI-enabled products due to their improved quality. This effect will also be made possible by reducing the cost of implementing AI models in organizations' activities, as well as increasing the availability of data for training such models.

The main trends in the AI development include the democratization of technology, the convergence of the Internet of Things and AI, as well as the growth of user trust in this technology [11, P. 7]. The democratization of AI technologies is taking place due to the reduction in the cost, distribution, and accessibility of AI solutions for a wide range of users and organizations, including small and medium-sized businesses. This process is supported by the development of Low-code/No-code learning platforms, open-source software, and cloud services. The convergence of the Internet of Things and AI allows smart devices to collect data that AI can use for training, which, with the growing number of such devices, leads to an increase in the amount of data available to AI [12, P. 466].

The AI development also depends on the level of user trust in it. The growing popularity of the Responsible AI concept helps to reduce the bias of algorithms, increase transparency, security, and privacy in the development and use of AI. Researchers emphasize the spread of AI TRiSM (AI Trust, Risk and Security Management) principles – the concept of trust, risk, and security management in AI, which involves the creation of reliable models that ensure equity for different social groups, security, and efficiency of data processing [13, P. 360]. This increases user trust and promotes the use of AI.

One of the most dynamically growing technologies in

the field of AI is generative AI, in particular, Large Language Models (LLM), which are used to create text, audio, visual, and video content [14, P. 225]. According to Bloomberg Intelligence, the global market for generative AI will grow more than 13 times in 2023-2030, from USD 67 billion to USD 897 billion [10]. The public interest in AI is largely related to the development of generative models that open up a wide potential for their application in the areas of user interaction optimization, marketing automation, customer services, and software development.

Large language models are based on the architecture of transformers that use the Attention Mechanism to analyze textual data. They require significant amounts of textual information for training, for example, GPT-3 was trained on 45 terabytes of textual data, which is equivalent to about 300 million pages of text [15, P. 809]. One of the most promising solutions is the generation of synthetic data – artificial sets of information that do not contain personal data but imitate real customer data. The use of such data can help to reduce the cost of training AI models and solve privacy issues. According to forecasts, by 2030, synthetic data may completely replace real customer data in AI model training [9].

Along with the development of generative AI, the number of Deepfakes – machine-generated audio, video, and images that can be used to manipulate information and spread disinformation – is growing [16, P. 1224]. Many countries are already developing mechanisms for legal regulation of deepfakes to minimize these risks.

It should be noted that the study of modern practices of implementing AI technologies in higher education allows to distinguish three fundamental points [6; 15; 17]. First, regardless of the attitude of the educational community to AI tools, it is impossible to ignore them, as they are already integrated into all levels of the educational process, affecting teaching methods and knowledge assessment. Second, in the face of the impossibility of avoiding the influence of algorithmic technologies, it is necessary to conduct a systematic study of their role in transforming traditional educational goals, objectives, and institutional mechanisms. Third, to maintain a balance between technological development and the humanistic values of education, it is necessary to establish regulatory and ethical restrictions on the use of AI in education, defining areas where its use is unacceptable.

It is expected that in the near future, AI will be able to effectively perform the functions of an instructor in the educational process, ensuring the transfer of knowledge and controlling its assimilation. At the same time, scientific management goes beyond the cognitive capabilities of AI, as this process involves not only systematizing knowledge but also forming a new worldview. The research supervisor, even with insufficient qualifications, contributes to the development of critical thinking of the student, offering alternative approaches to the problem and the formation of their own research position. AI, being deprived of an independent conceptual understanding of reality, cannot initiate such changes, as its capabilities are limited to generalizing existing knowledge without producing original ideas. Thus, the use of AI in the field of research supervision can lead to simplification and standardization of the research process, which contradicts the essential principles of academic creativity.

The issue of using AI in the educational environment is part of a broader discussion about its role in areas of

existential importance to humans. How justified is the integration of AI into medicine when it comes to diagnosis, surgical decision-making, or patient communication? Is it reasonable to consider AI as an autonomous combat resource? Can it fulfill social roles, such as a romantic partner? These questions raise the problem of regulatory and ethical control of the AI application and the need to establish clear boundaries for its use. Determining such limitations is a key area for the formation of human-centered principles for the development of AI.

Moving to the question of the vectors of AI usage in new generation universities, there are five new areas that need to be mastered for its effective application in the educational process:

1. *Creation of educational content.* AI tools generate materials based on the analysis of a large amount of data containing parameters and historical contexts already developed by humans. Instead of teachers spending considerable time creating materials from scratch, AI can be used to prepare initial drafts that are later adjusted and adapted to specific learning objectives. As with any algorithmic tool, the effectiveness of AI depends on the accuracy of the query and the clarity of the identified educational needs.

2. *Organizing and conducting knowledge assessment.* Conducting exams and credits is one of the most time-consuming tasks for teachers. Currently, these processes can be partially automated with the help of AI. Generative algorithms are able to generate preliminary questions for tests, help with interviews and checking written works. At the same time, the preparation of initial data, adaptation of test content to the specifics of academic disciplines, and final assessment should remain under the control of teachers.

3. *Automation of administrative tasks.* Since modern universities in the market socio-economic environment strive to optimize costs, AI can be used to automate answers to frequently asked questions from students, staff, and researchers about the organization of the learning process, changes to curricula, drafting and filling out documents related to events, etc. The most optimal solution is to create a chatbot based on AI. An example of such an application is the chatbot of the Private Higher Education Institution "European University" (@european_univer_bot), which, using natural language processing technologies, provides

automated support for students and teachers, including answering questions about schedules, assignments, and marks, providing consulting support, sending reminders of important events, allowing interaction via text messages, optimizing administrative processes, and tracking the status of submitted documents or tasks.

4. *Individualization of the learning process.* The use of AI helps students avoid common mistakes while studying the educational material and identify promising areas for further development according to their interests and achievements in previous modules or courses.

5. *Assessing the level of student engagement.* Thanks to advances in AI in the field of pattern recognition, teachers can receive real-time objective data on the level of student engagement in the learning process, which allows them to quickly adjust teaching approaches.

In addition to these areas, there are two critical tasks related to the integration of AI technologies into higher education: the development of computational thinking among students and cybersecurity, which is especially important in the context of the digitalization of the educational environment.

CONCLUSION

Integration of artificial intelligence technologies into the higher education system is one of the key vectors of digital transformation of modern universities. The conducted research has confirmed that AI contributes to the efficiency of the educational process by automating educational and administrative tasks, personalizing learning, and improving knowledge assessment methods. At the same time, its implementation is accompanied by challenges related to ethics, data security, and the need to adapt traditional educational models to new technological realities.

Considering the above, promising areas for further development include improving the legal and regulatory framework for the use of AI in higher education, expanding research on the impact of algorithmic technologies on the educational process, and forming effective mechanisms for integrating AI into educational and scientific activities. Defining the boundaries of artificial intelligence applications, ensuring its responsible use, and combining it with traditional approaches to learning will help achieve an optimal balance between innovation and academic values.

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ВЕКТОРИ ЗАСТОСУВАННЯ ШТУЧНОГО ІНТЕЛЕКТУ В УНІВЕРСИТЕТАХ НОВОГО ПОКОЛІННЯ

Розвиток технологій штучного інтелекту (ШІ) є важливим напрямом цифрової трансформації, що впливає на освітній процес у закладах вищої освіти. Сучасні університети активно впроваджують алгоритмічні рішення для оптимізації навчання, автоматизації адміністративних процесів та персоналізації освітнього середовища. Незважаючи на значний потенціал, широкомасштабне застосування ШІ в освітній сфері викликає дискусії стосовно його етичних аспектів, впливу на традиційні підходи до навчання та необхідності забезпечення інформаційної безпеки. Мета дослідження – визначення основних векторів застосування ШІ в університетах нового покоління, аналіз можливостей та викликів його інтеграції у навчальний процес, адміністративне управління та академічну взаємодію. Результати дослідження показали, що ШІ має широкий спектр застосування у вищій освіті. Виокремлено три основні категорії ШІ: слабкий, сильний та суперсильний, з яких у сфері освіти найбільшого поширення набули традиційні, адаптивні та генеративні алгоритми. Зростаючий потенціал генеративного ШІ сприяє розширенню його застосування у створенні навчальних матеріалів, організації оцінювання знань, автоматизації адміністративних завдань та підвищенні рівня залученості студентів у навчальний процес. Важливим аспектом є поєднання алгоритмічних моделей з традиційними підходами до викладання для збереження академічних цінностей. Впровадження ШІ в університетах нового покоління відкриває значні можливості для вдосконалення навчального процесу та адміністративного управління. Водночас це вимагає розроблення ефективних механізмів регулювання, що враховують етичні та нормативні аспекти. Подальші дослідження має бути зосереджено на розробленні стратегій інтеграції ШІ в освітній процес із забезпеченням його відповідального застосування та безпеки даних.

Ключові слова: автоматизація навчального процесу, цифровий університет, цифровізація освіти, цифрові технології, штучний інтелект